FACULTY OF LIFE SCIENCES

SYLLABUS

for

BACHELOR OF PHARMACY

(Credit Based Evaluation & Grading System)

(Semester: I - VI) As per PCI Rules for New Students

(Semester: VII-VIII) For Old Students

Examinations: 2019-20

GURU NANAK DEV UNIVERSITY AMRITSAR

BACHELOR OF PHARMACY (SEMESTER SYSTEM)
(Credit Based Evaluation & Grading System)

Note

New syllabus for the Bachelor of Pharmacy Degree Program as recommended by Pharmacy Council of India (PCI) implemented w.e.f. session 2017-18.

SEMESTER-I

Course code	Name of the course	Lecture (L)	Tutorial (T)	Practical	Credit points
BP101T	Human Anatomy and Physiology I– Theory	3	1		4
BP107P	Human Anatomy and Physiology – Practical	-	-	4	2
BP102T	Pharmaceutical Analysis I –Theory	3	1		4
BP108P	Pharmaceutical Analysis I – Practical	-	-	4	2
BP103T	Pharmaceutics I – Theory	3	1		4
BP109P	Pharmaceutics I – Practical	-	-	4	2
BP104T	Pharmaceutical Inorganic Chemistry -Theory	3	1		4
BP110P	Pharmaceutical Inorganic Chemistry Practical	-	-	4	2
BP105T	Communication skills – Theory	2	-		2
BP111P	Communication skills – Practical	-	-	2	1
BP106RBT	Remedial Biology/	2	-	-	2
BP112RBP	Remedial Biology – Practical	-	-	**2**	1
BP106RMT	Remedial Mathematics – Theory	2	-	-	2
PBL-121 **PBL-122**	Punjabi Compulsory **OR** ***ਮੁੱਢਲੀ ਪੰਜਾਬੀ **OR** ****Punjab History & Culture	2	-	-	2
SOA 101	***Drug Abuse: Problem, Management and Prevention (Compulsory ID Course)	3	0	0	3
			Total Credit		**31$/32#**

#Applicable ONLY for the students who have studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology (RB) course**.**

$Applicable ONLY for the students who have studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics (RM) course**.**

Candidates who did not pass Biology subject in entry qualification (+2 Sc. Etc.) examination are required to take Remedial Biology (T&P), and those who did not pass Mathematics subject are required to take Remedial Mathematics.

Candidates who passed both Biology and Mathematics subjects wile take Remedial Biology (T&P BP106RBT & BP112RBP) or Remedial Mathematics (BP106RMT) on basis he/she admitted for course.

Note: (1) Lecture/tutorial: One lecture hour per week = One Credit
(2) Practical: two hours per week = One credit

Note:

1. ***Special Paper in lieu of Punjabi Compulsory**
2. ****For those students who are not domicile of Punjab**
3. ***** Student can opt this Paper whether in 1st or 2nd Semester.**

BACHELOR OF PHARMACY (SEMESTER SYSTEM)
(Credit Based Evaluation & Grading System)

Tables: Scheme for Internal Assessment

Semester-I

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP101T	Human Anatomy and Physiology I- Theory	10	15	1 Hr	25	75	3 Hrs	100
BP102T	Pharmaceutical Analysis I - Theory	10	15	1 Hr	25	75	3 Hrs	100
BP103T	Pharmaceutics I - Theory	10	15	1 Hr	25	75	3 Hrs	100
BP104T	Pharmaceutical Inorganic Chemistry - Theory	10	15	1 Hr	25	75	3 Hrs	100
BP105T	Communication skills - Theory *	5	10	1 Hr	15	35	1.5 Hrs	50
BP106RBT BP106RM	Remedial Biology/ Mathematics - Theory*	5	10	1 Hr	15	35	1.5 Hrs	50
BP107P	Human Anatomy and Physiology - Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP108P	Pharmaceutical Analysis I - Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP109P	Pharmaceutics I - Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP110P	Pharmaceutical Inorganic Chemistry - Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP111P	Communication skills - Practical*	5	5	2 Hrs	10	15	2 Hrs	25
BP112RBP	Remedial Biology - Practical*	5	5	2 Hrs	10	15	2 Hrs	25
	Total	70/75$/80#	115/125$/130#	23/24$/26# Hrs	185/200$/210#	490/525$/ 540#	31.5/33$/ 35# Hrs	675/725$/ 750#

Applicable ONLY for the students studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology (RB) course.
Applicable ONLY for the students studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics (RM) course.
* Non University Examination (NUE)

BACHELOR OF PHARMACY (SEMESTER SYSTEM)
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SEMESTER-II

Course Code	Name of the course	Lecture (L)	Tutorial (T)	Practical (P)	Credit points
BP201T	Human Anatomy and Physiology II – Theory	3	1	-	4
BP207P	Human Anatomy and Physiology II –Practical	0	0	4	2
BP202T	Pharmaceutical Organic Chemistry I – Theory	3	1	-	4
BP208P	Pharmaceutical Organic Chemistry I– Practical	0	0	4	2
BP203T	Biochemistry – Theory	3	1	-	4
BP209P	Biochemistry – Practical	0	0	4	2
BP204T	Pathophysiology – Theory	3	1	-	4
BP205T	Computer Applications in Pharmacy – Theory	3	-	-	3
BP210P	Computer Applications in Pharmacy – Practical	0	0	2	1
PBL131 PBL132	Punjabi Compulsory **OR** ***ਮੁੱਢਲੀ ਪੰਜਾਬੀ **OR** ****Punjab History & Culture	2	0	0	2
SOA 101	*****Drug Abuse: Problem, Management and Prevention (Compulsory ID Course)	3	0	0	3
					28

Note-1.

1. ***Special Paper in lieu of Punjabi Compulsory**
2. ****For those students who are not domicile of Punjab**
3. ***** Student can opt this Paper whether in 1st or 2nd Semester.**

Note-2. (1) Lecture/Tutorials: One Lecture Hour Per Week = One Credit.
(2) Practical: Two Hrs. Per Week = One Credit.

Tables: Scheme for Internal Assessment

Semester-II

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP201T	Human Anatomy and Physiology II - Theory	10	15	1 Hr	25	75	3 Hrs	100
BP202T	Pharmaceutical Organic Chemistry I - Theory	10	15	1 Hr	25	75	3 Hrs	100
BP203T	Biochemistry - Theory	10	15	1 Hr	25	75	3 Hrs	100
BP204T	Pathophysiology - Theory	10	15	1 Hr	25	75	3 Hrs	100
BP205T	Computer Applications in Pharmacy - Theory*	10	15	1 Hr	25	50	2 Hrs	75
BP206T	Environmental sciences - Theory*	10	15	1 Hr	25	50	2 Hrs	75
BP207P	Human Anatomy and Physiology II - Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP208P	Pharmaceutical Organic Chemistry I- Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP209P	Biochemistry - Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP210P	Computer Applications in Pharmacy - Practical*	5	5	2 Hrs	10	15	2 Hrs	25
	Total	80	125	20 Hrs	205	520	30 Hrs	725

* The subject experts at college level shall conduct examinations

Note : PSL-053 ID Course Human Rights & Constitutional Duties (Compulsory ID Paper). Students can opt. this paper in any Semester except the 1st Semester. This ID Paper is one of the total ID Papers of this course.

BACHELOR OF PHARMACY (SEMESTER SYSTEM)

Question paper pattern for theory Sessional examinations		
For subjects having University examination		
I. Multiple Choice Questions (MCQs)		
(Answer all the questions)	=	10 x 1 = 10
I. Long Answers (Answer 1 out of 2)	=	1 x 10 = 10
II. Short Answers (Answer 2 out of 3)	=	2 x 5 = 10

Total	=	30 marks

For subjects having Non University Examination		
I. Long Answers (Answer 1 out of 2)	=	1 x 10 = 10
II. Short Answers (Answer 4 out of 6)	=	4 x 5 = 20

Total	=	30 marks

Question paper pattern for practical sessional examinations		
I. Synopsis	=	10
II. Experiments	=	25
III. Viva voce	=	05

Total	=	40 marks

Question paper pattern for end semester theory examinations				
For 75 marks paper				
I. Multiple Choice Questions(MCQs)				
(Answer all the questions)		=	20 x 1	= 20
I. Long Answers (Answer 2 out of 3)		=	2 x 10 = 20	
II. Short Answers (Answer 7 out of 9)		=	7 x 5	= 35

	Total	=	75 marks	

For 50 marks paper				
I. Long Answers (Answer 2 out of 3)		=	2 x 10 = 20	
II. Short Answers (Answer 6 out of 8)		=	6 x 5	= 30

	Total	=	50 marks	

For 35 marks paper				
I. Long Answers (Answer 1 out of 2)		=	1 x 10	=10
II. Short Answers (Answer 5 out of 7)		=	5 x 5	= 25

	Total	=	35 marks	

Question paper pattern for end semester practical examinations				
I. Synopsis			=	5
II. Experiments			=	25
III. Viva voce			=	5

		Total	=	35 marks

BACHELOR OF PHARMACY (SEMESTER SYSTEM)
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SEMESTER-III

S. No	Course Code	Subject	Lecture (L)	Tutorial (T)	Practical (P)	Credit
1.	BP301T	Pharmaceutical Organic Chemistry-II (Theory)	3	1	0	4
2.	BP302T	Physical Pharmaceutics-I (Theory)	3	1	0	4
3.	BP303T	Pharmaceutical Microbiology (Theory)	3	1	0	4
4.	BP304T	Pharmaceutical Engineering (Theory)	3	1	0	4
5.	BP305P	Pharmaceutical Organic Chemistry-II	0	0	4	2
6.	BP306P	Physical Pharmaceutics-I (Practical)	0	0	4	2
7.	BP307P	Pharmaceutical Microbiology (Practical)	0	0	4	2
8.	BP308P	Pharmaceutical Engineering (Practical)	0	0	4	2
9	*ESL-220	Environmental Studies (Compulsory)	4			
					Total Credits	**24**

Note: (1) Lecture/tutorial: One lecture hour per week = One Credit
(2) Practical: two hours per week = One Credit

***Note : Credits will not be included in the total.**

Tables: Scheme for Internal Assessment

Semester III

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP301T	Pharmaceutical Organic Chemistry II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP302T	PhysicalPharmaceuticsI –Theory	10	15	1 Hr	25	75	3 Hrs	100
BP303T	Pharmaceutical Microbiology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP304T	Pharmaceutical Engineering – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP305P	Pharmaceutical Organic Chemistry II – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP306P	Physical Pharmaceutics I – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP307P	Pharmaceutical Microbiology – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP308P	Pharmaceutical Engineering – Practical	5	10	4 Hr	15	35	4 Hrs	50
Total		**60**	**100**	**20**	**160**	**440**	**28Hrs**	**600**

BACHELOR OF PHARMACY (SEMESTER SYSTEM)
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SEMESTER--IV

SR. No:	Course Code	Subject	Lecture (L)	Tutorial (T)	Practical (P)	Credits
1	BP401T	Pharmaceutical Organic Chemistry III– Theory	3	1	0	4
2	BP402T	Medicinal Chemistry I – Theory	3	1	0	4
3	BP403T	Physical Pharmaceutics II – Theory	3	1	0	4
4	BP404T	Pharmacology I – Theory	3	1	0	4
5	BP405T	Pharmacognosy and Phytochemistry I– Theory	3	1	0	4
6	BP406P	Medicinal Chemistry I – Practical	0	0	2	2
7	BP407P	Physical Pharmaceutics II – Practical	0	0	2	2
8	BP408P	Pharmacology I – Practical	0	0	2	2
9	BP409P	Pharmacognosy and Phytochemistry I – Practical	0	0	2	2
					Total Credits	**28**

Note: (1) Lecture/Tutorials: One lecture hour per week = One Credit.
(2) Practical: Two Laboratories per week = One Credit.

Tables: Scheme for Internal Assessment

Semester IV

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP401T	Pharmaceutical Organic Chemistry III– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP402T	Medicinal Chemistry I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP403T	Physical Pharmaceutics II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP404T	Pharmacology I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP405T	Pharmacognosy I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP406P	Medicinal Chemistry I – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP407P	Physical Pharmaceutics II – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP408P	Pharmacology I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP409P	Pharmacognosy I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
Total		**70**	**115**	**21 Hrs**	**185**	**515**	**31 Hrs**	**700**

BACHELOR OF PHARMACY (SEMESTER SYSTEM)
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SEMESTER-V

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP501T	Medicinal Chemistry II – Theory	3	1	4
BP502T	Industrial Pharmacy I– Theory	3	1	4
BP503T	Pharmacology II – Theory	3	1	4
BP504T	Pharmacognosy and Phytochemistry II– Theory	3	1	4
BP505T	Pharmaceutical Jurisprudence – Theory	3	1	4
BP506P	Industrial Pharmacy I – Practical	4	-	2
BP507P	Pharmacology II – Practical	4	-	2
BP508P	Pharmacognosy and Phytochemistry II – Practical	4	-	2
	Total	**27**	**5**	**26**

Note: (1) Lecture/Tutorials: One Lecture Hour Per Week = One Credit.
(2) Practical: Two Hrs. Per Week = One Credit.

Tables: Scheme for Internal Assessment

B Pharmacy Semester-V

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP501T	Medicinal Chemistry II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP502T	Industrial PharmacyI– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP503T	Pharmacology II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP504T	Pharmacognosy II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP505T	Pharmaceutical Jurisprudence – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP506P	Industrial PharmacyI– Practical	5	10	4 Hr	15	35	4 Hrs	50
BP507P	Pharmacology II – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP508P	Pharmacognosy II – Practical	5	10	4 Hr	15	35	4 Hrs	50
Total		**65**	**105**	**17 Hr**	**170**	**480**	**27 Hrs**	**650**

BACHELOR OF PHARMACY (SEMESTER SYSTEM)
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SEMESTER-VI

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP601T	Medicinal Chemistry III – Theory	3	1	4
BP602T	Pharmacology III – Theory	3	1	4
BP603T	Herbal Drug Technology – Theory	3	1	4
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	3	1	4
BP605T	Pharmaceutical Biotechnology – Theory	3	1	4
BP606T	Quality Assurance –Theory	3	1	4
BP607P	Medicinal chemistry III – Practical	4	-	2
BP608P	Pharmacology III – Practical	4	-	2
BP609P	Herbal Drug Technology – Practical	4	-	2
	Total	**30**	**6**	**30**

Note: (1) Lecture/Tutorials: One Lecture Hour Per Week = One Credit.
(2) Practical: Two Hrs. Per Week = One Credit.

Tables: Scheme for Internal Assessment

B Pharmacy Semester-VI

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP601T	Medicinal Chemistry III – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP602T	Pharmacology III – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP603T	Herbal Drug Technology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP605T	Pharmaceutical Biotechnology– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP606T	Quality Assurance– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP607P	Medicinal chemistry III – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP608P	Pharmacology III – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP609P	Herbal Drug Technology – Practical	5	10	4 Hrs	15	35	4 Hrs	50
Total		**75**	**120**	**18 Hrs**	**195**	**555**	**30 Hrs**	**750**

BACHELOR OF PHARMACY (SEMESTER SYSTEM)

SEMESTER-VII

S. No.	Course Code	Subject	Lecture (L)	Tutorial (T)	Practical (P)	Credits
1.	PHL157	Medicinal Chemistry-II	2	1	0	3
2.	PHL158	Pharmaceutical Technology-II	2	1	0	3
3.	PHL159	Pharmaceutical Management	2	1	0	3
4.	PHL160	Pharmacology	2	1	0	3
5.	PHL161	Pharmaceutical Biotechnology	2	1	0	3
6.	PHP162	Pharmaceutical Technology–II	0	0	1.5	1.5
7.	PHP163	Pharmacology	0	0	1.5	1.5
8.	PHP164	Pharmaceutical Biotechnology	0	0	1.5	1.5

***Interdisciplinary Course(s)**					08
				Total Credits	**27.5**

Note: (1) Lecture/tutorial: One lecture hour per week = One credit
(2) Practical: two hours per week = One credit
(3) PSL-053 ID Course Human Rights & Constitutional Duties (Compulsory Paper) Students can opt. this paper in any odd semester. This ID Paper is one of the total ID Papers of this course.

BACHELOR OF PHARMACY (SEMESTER SYSTEM)

(Credit Based Continuous Evaluation Grading System)

BACHELOR OF PHARMACY (SEMESTER SYSTEM)

SEMESTER-VIII

S. No.	Course Code	Subject	Lecture (L)	Tutorial (T)	Practical (P)	Credits
1.	PHL164	Medicinal Chemistry-III	2	1	0	3
2.	PHL170	Pharm. Chem. XV: Pharmaceutical analysis	2	1	0	3
3.	PHL166	Pharmacology	2	1	0	3
4.	PHL167	Pharmacognosy	2	1	0	3
5.	PHL168	Pharmaceutical Jurisprudance	2	1	0	3
6.	PHL169	Pharmacokinetics & Biopharmaceutics	2	1	0	3
7.	PHP170	Pharmacology	0	0	1.5	1.5
8.	PHP171	Pharmacokinetics & Biopharmaceutics	0	0	1.5	1.5
9.	PHP172	Pharmacognosy	0	0	1.5	1.5
					Total Credits	22.5

Note: Lecture/tutorial: One lecture hour per week = One credit

Practical: two hours per week = One credit

BACHELOR OF PHARMACY (SEMESTER-I)
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BP101T. HUMAN ANATOMY AND PHYSIOLOGY-I (Theory)

4Credits (3-1-0)
45 Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

Objectives: Upon completion of this course the student should be able to

1. Explain the gross morphology, structure and functions of various organs of the human body. Perform the various experiments related to special senses and nervous system.
2. Describe the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of human body.
4. Appreciate coordinated working pattern of different organs of each system

Course Content:

Unit I

10 hours

1. **Introduction to human body**
   Definition and scope of anatomy and physiology, levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminology.
2. **Cellular level of organization**
   Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, intracellular signaling pathway activation by extracellular signal molecule, Forms of intracellular signaling:
   a) Contact-dependent b) Paracrine c) Synaptic d) Endocrine
3. **Tissue level of organization**
   Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues.

Unit II

10 hours

1. **Integumentary system** Structure and functions of skin
2. **Skeletal system**
   Divisions of skeletal system, types of bone, salient features and functions of bones of axial and appendicular skeletal system
   Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction
3. **Joints**
   Structural and functional classification, types of joints movements and its articulation

Unit III

10 hours

1. **Body fluids and blood**
2. Body fluids, composition and functions of blood, hemopoeisis, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood, Reticulo endothelial system.
3. **Lymphatic system**

   Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system

Unit IV

08 hours

4. **Peripheral nervous system**:

   Classification of peripheral nervous system: Structure and functions of sympathetic and parasympathetic nervous system.

   Origin and functions of spinal and cranial nerves.
5. **Special senses**

   Structure and functions of eye, ear, nose and tongue and their disorders.

Unit V

07 hours

6. **Cardiovascular system**

   Heart – anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, elements of conduction system of heart and heart beat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.

BP107P. HUMAN ANATOMY AND PHYSIOLOGY (Practical)

2 Credits (0-0-2)
4 Hours/week

Practical physiology is complimentary to the theoretical discussions in physiology. Practical's allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject.

1. Study of compound microscope.
2. Microscopic study of epithelial and connective tissue
3. Microscopic study of muscular and nervous tissue
4. Identification of axial bones
5. Identification of appendicular bones
6. Introduction to hemocytometry.
7. Enumeration of white blood cell (WBC) count
8. Enumeration of total red blood corpuscles (RBC) count
9. Determination of bleeding time
10. Determination of clotting time
11. Estimation of hemoglobin content
12. Determination of blood group.
13. Determination of erythrocyte sedimentation rate (ESR).
14. Determination of heart rate and pulse rate.
15. Recording of blood pressure.

Recommended Books (Latest Editions)

1 Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.

2 Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York

3 Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co,Riverview,MI USA

4 Text book of Medical Physiology- Arthur C,Guyton andJohn.E. Hall. Miamisburg, OH, U.S.A.

5 Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.

6 Textbook of Human Histology by Inderbir Singh, Jaypee brother's medical publishers, New Delhi.
7 Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.
8 Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

Reference Books (Latest Editions)

1 Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
2 Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
3 Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje ,Academic Publishers Kolkata

BACHELOR OF PHARMACY (SEMESTER-I)
(Credit Based Evaluation & Grading System)

BP102T. PHARMACEUTICAL ANALYSIS (Theory)

4 Credits (3-1-0)
45 Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs

Objectives: Upon completion of the course student shall be able to understand the principles of volumetric and electro chemical analysis

1. carryout various volumetric and electrochemical titrations
2. develop analytical skills

Course Content:

UNIT-I

10 Hours

a. Pharmaceutical analysis- Definition and scope

i. Different techniques of analysis

ii. Methods of expressing concentration

Primary and secondary standards.

Preparation and standardization of various molar and normal solutions- Oxalic acid, sodium hydroxide, hydrochloric acid, sodium thiosulphate, sulphuric acid, potassium permanganate and ceric ammonium sulphate

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

c. Pharmacopoeia, Sources of impurities in medicinal agents,limit tests.

UNIT-II

10 Hours

1. **Acid base titration**: Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves
2. **Non aqueous titration**: Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl

UNIT-III

10 Hours

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

2. **Complexometric titration**: Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate.
3. **Gravimetry**: Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate.
4. Basic Principles,methods and application of diazotisation titration.

UNIT-IV

08 Hours

1. Redox titrations

(a) Concepts of oxidation and reduction
(b) Types of redox titrations (Principles and applications)

Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate

UNIT-V

07 Hours

Electrochemical methods of analysis

1. **Conductometry-** Introduction, Conductivity cell, Conductometric titrations, application
2. **Potentiometry -** Electrochemical cell, construction and working of reference (Standard hydrogen, silver chloride electrode and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications.
3. **Polarography -** Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum electrode, applications

BACHELOR OF PHARMACY (SEMESTER-I)
(Credit Based Evaluation & Grading System)

BP108P. PHARMACEUTICAL ANALYSIS (Practical)

2 Credits (0-0-2)
4 Hours / Week

I Limit Test of the following

a. Chloride
b. Sulphate
c. Iron
d. Arsenic

II Preparation and standardization of

1. Sodium hydroxide
2. Sulphuric acid
3. Sodium thiosulfate
4. Potassium permanganate
5. Ceric ammonium sulphate

III Assay of the following compounds along with Standardization of Titrant

1. Ammonium chloride by acid base titration
2. Ferrous sulphate by Cerimetry
3. Copper sulphate by Iodometry
4. Calcium gluconate by complexometry
5. Hydrogen peroxide by Permanganometry
6. Sodium benzoate by non-aqueous titration
7. Sodium Chloride by precipitation titration

IV Determination of Normality by electro-analytical methods

1. Conductometric titration of strong acid against strong base
2. Conductometric titration of strong acid and weak acid against strong base
3. Potentiometric titration of strong acid against strong base

Recommended Books: (Latest Editions)

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry
4. Bentley and Driver's Textbook of Pharmaceutical Chemistry
5. John H. Kennedy, Analytical chemistry principles
6. Indian Pharmacopoeia.

BACHELOR OF PHARMACY (SEMESTER-I)
(Credit Based Evaluation & Grading System)

BP103T. PHARMACEUTICS- I (Theory)

4 Credits (3-1-0)
45 Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: This course is designed to impart a fundamental knowledge on the preparatory pharmacy with arts and science of preparing the different conventional dosage forms.

Objectives: Upon completion of this course the student should be able to:

1. Know the history of profession of pharmacy
2. Understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations
3. Understand the professional way of handling the prescription
4. Preparation of various conventional dosage forms

Course Content:

UNIT – I

10 Hours

1. **Historical background and development of profession of pharmacy**: History of profession of Pharmacy in India in relation to pharmacy education, industry and organization, Pharmacy as a career, Pharmacopoeias: Introduction to IP, BP, USP and Extra Pharmacopoeia.
2. **Dosage forms:** Introduction to dosage forms, classification and definitions
3. **Prescription:** Definition, Parts of prescription, handling of Prescription and Errors in prescription.
4. **Posology:** Definition, Factors affecting posology. Pediatric dose calculations based on age, body weight and body surface area.

UNIT – II

10 Hours

1. **Pharmaceutical calculations**: Weights and measures – Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point and molecular weight.
2. **Powders:** Definition, classification, advantages and disadvantages,Simple & compound powders – official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions.

3. **Liquid dosage forms:** Advantages and disadvantages of liquid dosage forms. Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques

UNIT – III

08 Hours

1. **Monophasic liquids:** Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments and Lotions.
2. **Biphasic liquids:**
3. **Suspensions:** Definition, advantages and disadvantages, classifications, Preparation of suspensions; Flocculated and Deflocculated suspension & stability problems and methods to overcome.
4. **Emulsions:** Definition, classification, emulsifying agent, test for the identification of type ofEmulsion, Methods of preparation & stability problems and methods to overcome.

UNIT – IV

08 Hours

1. **Suppositories**: Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories.
2. **Pharmaceutical incompatibilities**: Definition, classification, physical, chemical and therapeutic incompatibilities with examples.

UNIV – V

07 Hours

1. **Semisolid dosage forms:** Definitions, classification, mechanisms and factors influencing dermal penetration of drugs. Preparation of ointments, pastes, creams and gels. Excipients used in semi solid dosage forms. Evaluation of semi solid dosages forms

BP109P. PHARMACEUTICS-I (Practical)

2 Credits (0-0-2)
2 Hours / week

1. **Syrups**
   a. Syrup IP
   b. Paracetamol pediatric syrup
2. **Elixirs**
   a) Piperazine citrate elixir
   b) Paracetamol pediatric elixir
3. **Linctus**
   a) Simple Linctus BPC
4. **Solutions**
   a) Strong solution of ammonium acetate
   b) Cresol with soap solution
5. **Suspensions**
   a) Calamine lotion
   b) Magnesium Hydroxide mixture
6. **Emulsions**
   a) Turpentine Liniment
   b) Liquid paraffin emulsion
7. **Powders and Granules**
   a) ORS powder (WHO)
   b) Effervescent granules
   c) Dusting powder
8. **Suppositories**
   a) Glycero gelatin suppository
   b) Soap glycerin suppository
9. **Semisolids**
   a) Sulphur ointment
   b) Non staining iodine ointment with methyl salicylate
   c) Bentonite gel
10. **Gargles and Mouthwashes**
    a) Potassium chlorate gargle
    b) Chlorhexidine mouthwash

Recommended Books: (Latest Editions)

1. H.C. Ansel et al., Pharmaceutical Dosage Form and Drug Delivery System, Lippincott Williams and Walkins, New Delhi.
2. Carter S.J., Cooper and Gunn's-Dispensing for Pharmaceutical Students, CBS publishers, New Delhi.
3. M.E. Aulton, Pharmaceutics, The Science& Dosage Form Design, Churchill Livingstone, Edinburgh.
4. Indian pharmacopoeia.
5. British pharmacopoeia.
6. Lachmann. Theory and Practice of Industrial Pharmacy,Lea& Febiger Publisher, The University of Michigan.
7. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott Williams, New Delhi.
8. Carter S.J., Cooper and Gunn's. Tutorial Pharmacy, CBS Publications, New Delhi.
9. E.A. Rawlins, Bentley's Text Book of Pharmaceutics, English Language Book Society, Elsevier Health Sciences, USA.
10. Isaac Ghebre Sellassie: Pharmaceutical Pelletization Technology, Marcel Dekker, INC, New York.
11. Dilip M. Parikh: Handbook of Pharmaceutical Granulation Technology, Marcel Dekker, INC, New York.
12. Francoise Nieloud and Gilberte Marti-Mestres: Pharmaceutical Emulsions and Suspensions, Marcel Dekker, INC, New York.

BACHELOR OF PHARMACY (SEMESTER-I)
(Credit Based Evaluation & Grading System)

BP104T. PHARMACEUTICAL INORGANIC CHEMISTRY (Theory)

4 Credits (3-1-0)

45 Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: This subject deals with the monographs of inorganic drugs and pharmaceuticals.

Objectives: Upon completion of course student shall be able to

1. know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals
2. understand the medicinal and pharmaceutical importance of inorganic compounds

Course Content:

UNIT I

10 Hours

1. **Impurities in pharmaceutical substances:** History of Pharmacopoeia, Sources and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate
2. **General methods of preparation**, assay for the compounds superscripted with **asterisk (*),** properties and medicinal uses of inorganic compounds belonging to the following classes

UNIT II

10 Hours

1 **Acids, Bases and Buffers:** Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.

2 **Major extra and intracellular electrolytes**: Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride*, Potassium chloride, Calcium gluconate* and Oral Rehydration Salt (ORS), Physiological acid base balance.

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

UNIT III

10 Hours

1. **Gastrointestinal agents**

   Acidifiers: Ammonium chloride* and Dil. HCl

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

   Cathartics: Magnesium sulphate, Sodium orthophosphate, Kaolin and Bentonite

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

UNIT IV

08 Hours

1. **Miscellaneous compounds**

   Expectorants: Potassium iodide, Ammonium chloride*.

   Emetics: Copper sulphate*, Sodium potassium tartarate

   Haematinics: Ferrous sulphate*, Ferrous gluconate

   Poison and Antidote: Sodium thiosulphate*, Activated charcoal, Sodium nitrite333

   Astringents: Zinc Sulphate, Potash Alum

UNIT V

07 Hours

1. **Radiopharmaceuticals**: Radio activity, Measurement of radioactivity, Properties of α, β, γ radiations, Half life, radio isotopes and study of radio isotopes - Sodium iodide I^{131}, Storage conditions, precautions & pharmaceutical application of radioactive substances.

BP110P. PHARMACEUTICAL INORGANIC CHEMISTRY (Practical)

2 Credits (0-0-2)
4 Hours / Week

1. **Limit tests for following ions**
   Limit test for Chlorides and Sulphates
   Modified limit test for Chlorides and Sulphates Limit test for Iron
   Limit test for Heavy metals Limit test for Lead
   Limit test for Arsenic
1. **Identification test**
   Magnesium hydroxide
   Ferrous sulphate
   Sodium bicarbonate
   Calcium gluconate Copper sulphate
1 **Test for purity**
   Swelling power of Bentonite
   Neutralizing capacity of aluminum hydroxide gel
   Determination of potassium iodate and iodine in potassium Iodide
IV **Preparation of inorganic pharmaceuticals**
   Boric acid
   Potash alum
   Ferrous sulphate

Recommended Books (Latest Editions)

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London, 4th edition.
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry, 3rd Edition
4. M.L Schroff, Inorganic Pharmaceutical Chemistry
5. Bentley and Driver's Textbook of Pharmaceutical Chemistry
6. Anand & Chatwal, Inorganic Pharmaceutical Chemistry
7. Indian Pharmacopoeia

BACHELOR OF PHARMACY (SEMESTER-I)
(Credit Based Evaluation & Grading System)

BP105T.COMMUNICATION SKILLS (Theory)

30Hours
Max. Marks: 35
Internal Assessment: 15
Total Marks: 50

Scope: This course will prepare the young pharmacy student to interact effectively with doctors, nurses, dentists, physiotherapists and other health workers. At the end of this course the student will get the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business.

Objectives:

Upon completion of the course the student shall be able to

1. Understand the behavioral needs for a Pharmacist to function effectively in the areas of pharmaceutical operation
2. Communicate effectively (Verbal and Non Verbal)
3. Effectively manage the team as a team player
4. Develop interview skills
5. Develop Leadership qualities and essentials

Course content:

UNIT – I

07 Hours

1. **Communication Skills:** Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context

2. **Barriers to communication:** Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers

3. **Perspectives in Communication:** Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment

UNIT – II

07 Hours

5. **Elements of Communication:** Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication
6. **Communication Styles:** Introduction, The Communication Styles Matrix with example for each -Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style

UNIT – III

07 Hours

1 **Basic Listening Skills:** Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations

2 **Effective Written Communication:** Introduction, When and When Not to Use Written Communication - Complexity of the Topic, Amount of Discussion' Required, Shades of Meaning, Formal Communication

3 **Writing Effectively:** Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message

UNIT – IV

05 Hours

1 **Interview Skills:** Purpose of an interview, Do's and Dont's of an interview

2 **Giving Presentations:** Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery

UNIT – V

04 Hours

1 **Group Discussion:** Introduction, Communication skills in group discussion, Do's and Dont's of group discussion

BACHELOR OF PHARMACY (SEMESTER-I)
(Credit Based Evaluation & Grading System)

BP111P.COMMUNICATION SKILLS (Practical)

2 Hours / week

The following learning modules are to be conducted using words worth® English language lab software

Basic communication covering the following topics

Meeting People
Asking Questions
Making Friends
What did you do?
Do's and Dont's

Pronunciations covering the following topics

Pronunciation (Consonant Sounds)
Pronunciation and Nouns
Pronunciation (Vowel Sounds)

Advanced Learning

Listening Comprehension / Direct and Indirect Speech
Figures of Speech
Effective Communication
Writing Skills
Effective Writing
Interview Handling Skills
E-Mail etiquette
Presentation Skills

Recommended Books: (Latest Edition)

1. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011
2. Communication skills, Sanjay Kumar, Pushpalata, 1stEdition, Oxford Press, 2011
3. Organizational Behaviour, Stephen .P. Robbins, 1stEdition, Pearson, 2011
4. Brilliant- Communication skills, Gill Hasson, 1stEdition, Pearson Life, 2011
5. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5thEdition, Pearson, 2013
6. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010
7. Communication skills for professionals, Konar nira, 2ndEdition, New arrivals – PHI, 2011
8. Personality development and soft skills, Barun K Mitra, 1stEdition, Oxford Press, 2011
9. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning india pvt.ltd, 2011
10. Soft skills and professional communication, Francis Peters SJ, 1stEdition, Mc Graw Hill Education, 2011
11. Effective communication, John Adair, 4thEdition, Pan Mac Millan,2009
12. Bringing out the best in people, Aubrey Daniels, 2ndEdition, Mc Graw Hill, 1999

BACHELOR OF PHARMACY (SEMESTER-I)
(Credit Based Evaluation & Grading System)

BP 106RBT.REMEDIAL BIOLOGY (Theory)

2 Credits (2-0-0)
30 Hours
Max. Marks: 35
Internal Assessment: 15
Total Marks: 50

Scope: To learn and understand the components of living world, structure and functional system of plant and animal kingdom.

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

1. know the classification and salient features of five kingdoms of life
2. understand the basic components of anatomy & physiology of plant
3. know understand the basic components of anatomy & physiology animal with special reference to human

UNIT I

07 Hours

Living world:

1. Definition and characters of living organisms
2. Diversity in the living world
3. Binomial nomenclature
4. Five kingdoms of life and basis of classification. Salient features of Monera, Potista, Fungi, Animalia and Plantae, Virus,

Morphology of Flowering plants

γ. Morphology of different parts of flowering plants – Root, stem, inflorescence, flower, leaf, fruit, seed.
η. General Anatomy of Root, stem, leaf of monocotyledons & Dicotylidones.

UNIT II

07 Hours

Body fluids and circulation

1. Composition of blood, blood groups, coagulation of blood
2. Composition and functions of lymph
3. Human circulatory system
4. Structure of human heart and blood vessels
5. Cardiac cycle, cardiac output and ECG

Digestion and Absorption

1. Human alimentary canal and digestive glands
2. Role of digestive enzymes
3. Digestion, absorption and assimilation of digested food

Breathing and respiration

1. Human respiratory system
2. Mechanism of breathing and its regulation
3. Exchange of gases, transport of gases and regulation of respiration
4. Respiratory volumes

UNIT III

07 Hours

Excretory products and their elimination

1. Modes of excretion
2. Human excretory system- structure and function
3. Urine formation
4. Rennin angiotensin system

Neural control and coordination

1. Definition and classification of nervous system
2. Structure of a neuron
3. Generation and conduction of nerve impulse
4. Structure of brain and spinal cord
5. Functions of cerebrum, cerebellum, hypothalamus and medulla oblongata

Chemical coordination and regulation

1. Endocrine glands and their secretions
2. Functions of hormones secreted by endocrine glands

Human reproduction

1. Parts of female reproductive system
2. Parts of male reproductive system
3. Spermatogenesis and Oogenesis
4. Menstrual cycle

UNIT IV

05 Hours

Plants and mineral nutrition:

1. Essential mineral, macro and micronutrients
2. Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation

Photosynthesis

1. Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis.

UNIT V

04 Hours

Plant respiration: Respiration, glycolysis, fermentation (anaerobic).

Plant growth and development

1. Phases and rate of plant growth, Condition of growth,Introduction to plant growth regulators

Cell - The unit of life

1 Structure and functions of cell and cell organelles.Cell division

Tissues

2 Definition, types of tissues, location and functions.

Text Books

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

Reference Books

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

BACHELOR OF PHARMACY (SEMESTER-I)
(Credit Based Evaluation & Grading System)

BP112RBP.REMEDIAL BIOLOGY (Practical)

1 Credits (0-0-1)
30 Hours

1 Introduction to experiments in biology
  1.1 Study of Microscope
  1.2 Section cutting techniques
  1.3 Mounting and staining
  1.4 Permanent slide preparation
2 Study of cell and its inclusions
3 Study of Stem, Root, Leaf and its modifications
4 Detailed study of frog by using computer models
5 Microscopic study and identification of tissues
6 Identification of bones
7 Determination of blood group
8 Determination of blood pressure
9 Determination of tidal volume

Reference Books

1. Practical human anatomy and physiology. by S.R.Kale and R.R.Kale.
2. A Manual of pharmaceutical biology practical by S.B.Gokhale, C.K.Kokate and S.P.Shriwastava.
3. Biology practical manual according to National core curriculum .Biology forum of Karnataka. Prof .M.J.H.Shafi

BACHELOR OF PHARMACY (SEMESTER-I)
(Credit Based Evaluation & Grading System)

BP 106RMT.REMEDIAL MATHEMATICS (Theory)

2 Credits (2-0-0)
30 Hours
Max. Marks: 35
Internal Assessment: 15
Total Marks: 50

Scope: This is an introductory course in mathematics. This subject deals with the introduction to Partial fraction, Logarithm, matrices and Determinant, Analytical geometry, Calculus, differential equation and Laplace transform.

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

1) Know the theory and their application in Pharmacy
2) Solve the different types of problems by applying theory
3) Appreciate the important application of mathematics in Pharmacy

Course Content:

UNIT – I

06 Hours

1. **Partial fraction:** Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction , Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics
2. **Logarithms:** Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems.
3. **Function***:* Real Valued function, Classification of real valued functions
4. **Limits and continuity** :

Introduction , Limit of a function, Definition of limit of a function ($\in$ - δ definition) , $\lim_{x \to a} \frac{x^n - a^n}{x - a} = na^{n-1}$, $\lim_{\theta \to 0} \frac{\sin\theta}{\theta} = 1$,

UNIT –II

06 Hours

1. **Matrices and Determinant:**

Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants, Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix , Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method, Cramer's rule, Characteristic equation and roots of a square matrix, Cayley–Hamilton theorem,Applicationof Matrices in solving Pharmacokinetic equations

UNIT – III

06 Hours

Calculus Differentiation : Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function , Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula), Derivative of the quotient of two functions (Quotient formula) – **Without Proof**, Derivative of x^n *w.r.t* x, where *n* is any rational number, Derivative of e^x,, Derivative of $\log_e x$, Derivative of a^x, Derivative of trigonometric functions from first principles **(without Proof)**, Successive Differentiation, Conditions for a function to be a maximum or a minimum at a point. Application

UNIT – IV

06 Hours

- **Analytical Geometry**
  Introduction: Signs of the Coordinates, Distance formula,
  Straight Line : Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines, Slope of a line joining two points, Slope – intercept form of a straight line
  Integration:
  Introduction, Definition, Standard formulae, Rules of integration, Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application

UNIT-V

06 Hours

- **Differential Equations** : Some basic definitions, Order and degree, Equations in separable form , Homogeneous equations, Linear Differential equations, Exact equations, **Application in solving Pharmacokinetic equations**
- **Laplace Transform** : Introduction, Definition, Properties of Laplace transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives, Application to solve Linear differential equations, **Application in solving Chemical kinetics and Pharmacokinetics equations**

Recommended Books (Latest Edition)

1. Differential Calculus by Shanthinarayan
2. Pharmaceutical Mathematics with application to Pharmacy by Panchaksharappa Gowda D.H.
3. Integral Calculus by Shanthinarayan
4. Higher Engineering Mathematics by Dr.B.S.Grewal

BACHELOR OF PHARMACY (SEMESTER-I)
(Credit Based Evaluation & Grading System)

PBL 121 : ਪੰਜਾਬੀ ਲਾਜ਼ਮੀ - I (Credit Based)

Credit : 2-0-0

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

ਸੈਕਸ਼ਨ-ਏ

I. **ਦੋ ਰੰਗ** (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿਚੋਂ ਹੇਠ ਲਿਖੇ ਕਵੀ :
(ੳ) ਭਾਈ ਵੀਰ ਸਿੰਘ
(ਅ) ਧਨੀ ਰਾਮ ਚਾਤ੍ਰਿਕ
(ਇ) ਪ੍ਰੋ. ਪੂਰਨ ਸਿੰਘ
(ਕਵੀ ਦਾ ਜੀਵਨ, ਕਵਿਤਾ-ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਾਵਿ-ਕਲਾ)

II. ਗੁਰਮੁਖੀ ਔਰਥੋਗਰਾਫੀ ਦੀ ਜੁਗਤ (ਪੈਂਤੀ, ਮੁਹਾਰਨੀ, ਬਿੰਦੀ, ਟਿੱਪੀ ਤੇ ਅੱਧਕ); ਵਿਸ਼ਰਾਮ ਚਿੰਨ੍ਹ, ਸ਼ਬਦ ਜੋੜ (ਸ਼ੁਧ-ਅਸ਼ੁਧ)

ਸੈਕਸ਼ਨ-ਬੀ

I. **ਦੋ ਰੰਗ** (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿਚੋਂ ਹੇਠ ਲਿਖੇ ਕਵੀ :
(ੳ) ਫਿਰੋਜ਼ਦੀਨ ਸ਼ਰਫ
(ਅ) ਪ੍ਰੋ. ਮੋਹਨ ਸਿੰਘ
(ਕਵੀ ਦਾ ਜੀਵਨ, ਕਵਿਤਾ-ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਾਵਿ-ਕਲਾ)

II. ਲੇਖ ਰਚਨਾ (ਜੀਵਨੀ-ਪਰਕ, ਸਮਾਜਕ ਅਤੇ ਚਲੰਤ ਵਿਸ਼ਿਆਂ ਉੱਤੇ) : 10 ਲੇਖ ਲਿਖਵਾਉਣੇ
(ਕਲਾਸ ਵਿਚ ਅਤੇ ਘਰ ਲਈ ਅਭਿਆਸ)

ਸੈਕਸ਼ਨ-ਸੀ

I. **ਦੋ ਰੰਗ** (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿਚੋਂ ਹੇਠ ਲਿਖੇ ਕਵੀ :
(ੳ) ਨੰਦ ਲਾਲ ਨੂਰਪੁਰੀ
(ਅ) ਅਮ੍ਰਿਤਾ ਪ੍ਰੀਤਮ
(ਇ) ਡਾ. ਹਰਿਭਜਨ ਸਿੰਘ
(ਕਵੀ ਦਾ ਜੀਵਨ, ਕਵਿਤਾ-ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਾਵਿ-ਕਲਾ)

II. ਸ਼ੁੱਧ, ਅਸ਼ੁੱਧ : ਦਿੱਤੇ ਪੈਰ੍ਹੇ ਵਿਚੋਂ ਅਸ਼ੁੱਧ ਸ਼ਬਦਾਂ ਨੂੰ ਸ਼ੁੱਧ ਕਰਨਾ
(15 ਪੈਰ੍ਹਿਆਂ ਦੇ ਸ਼ੁੱਧ ਅਸ਼ੁੱਧ ਅਭਿਆਸ ਕਰਵਾਉਣੇ)

ਸੈਕਸ਼ਨ-ਡੀ

I. **ਦੋ ਰੰਗ** (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿਚੋਂ ਹੇਠ ਲਿਖੇ ਕਵੀ :
(ੳ) ਸ਼ਿਵ ਕੁਮਾਰ ਬਟਾਲਵੀ
(ਅ) ਸੁਰਜੀਤ ਪਾਤਰ
(ਕਵੀ ਦਾ ਜੀਵਨ, ਕਵਿਤਾ-ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਾਵਿ-ਕਲਾ)

II. ਅਖ਼ਬਾਰੀ ਇਸ਼ਤਿਹਾਰ : ਨਿੱਜੀ, ਦਫ਼ਤਰੀ ਤੇ ਸਮਾਜਕ ਗਤੀਵਿਧੀਆਂ ਨਾਲ ਸੰਬੰਧਤ

BACHELOR OF PHARMACY (SEMESTER-I)
(Credit Based Evaluation & Grading System)

PBL-122: ਮੁੱਢਲੀ ਪੰਜਾਬੀ
(In lieu of Punjabi Compulsory)

Credits: 2-0-0

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

ਪਾਠ-ਕ੍ਰਮ

ਸੈਕਸ਼ਨ-ਏ

ਪੈਂਤੀ ਅੱਖਰੀ, ਅੱਖਰ ਕ੍ਰਮ,
ਮਾਤ੍ਰਾਵਾਂ (ਮੁਢਲੀ ਜਾਣ-ਪਛਾਣ)
ਲਗਾਖਰ (ਬਿੰਦੀ, ਟਿੱਪੀ, ਅੱਧਕ) : ਪਛਾਣ ਤੇ ਵਰਤੋਂ

ਸੈਕਸ਼ਨ-ਬੀ

ਪੰਜਾਬੀ ਸ਼ਬਦ ਬਣਤਰ : ਮੁੱਢਲੀ ਜਾਣ-ਪਛਾਣ
ਸਾਧਾਰਨ ਸ਼ਬਦ, ਸੰਯੁਕਤ ਸ਼ਬਦ, ਮਿਸ਼ਰਤ ਸ਼ਬਦ
ਮੂਲ ਸ਼ਬਦ, ਅਗੇਤਰ ਅਤੇ ਪਿਛੇਤਰ

ਸੈਕਸ਼ਨ-ਸੀ

ਸ਼ੁੱਧ ਅਸ਼ੁੱਧ : ਦਿੱਤੇ ਪੈਰ੍ਹੇ ਵਿਚੋਂ ਅਸ਼ੁੱਧ ਸ਼ਬਦ ਨੂੰ ਸ਼ੁੱਧ ਕਰਨਾ।
ਸਮਾਨਾਰਥਕ ਤੇ ਵਿਰੋਧਾਰਥਕ ਸ਼ਬਦ

ਸੈਕਸ਼ਨ-ਡੀ

ਹਫਤੇ ਦੇ ਸੱਤ ਦਿਨਾਂ ਦੇ ਨਾਂ, ਬਾਰ੍ਹਾਂ ਮਹੀਨਿਆਂ ਦੇ ਨਾਂ, ਰੁੱਤਾਂ ਦੇ ਨਾਮ, ਇਕ ਤੋਂ ਸੌ ਤੱਕ ਗਿਣਤੀ ਸ਼ਬਦਾਂ ਵਿੱਚ।

BACHELOR OF PHARMACY (SEMESTER-I)
(Credit Based Evaluation & Grading System)

HSL-101 : Punjab History & Culture (1450-1716)
(Special paper in lieu of Punjabi Compulsory)
(For those students who are not domicile of Punjab)

Credits: 2-0-0
Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section-A

1. Land and the People.
2. Bhakti Movement

Section-B

3. Life and Teaching of Guru Nanak Dev.
4. Contribution of Guru Angad Dev, Guru Arjun Dev ,Guru Amar Das and Guru Ram Das.

Section-C

5. Guru Hargobind.
6. Martyrdom of Guru Teg Bahadur

Section-D

7. Guru Gobind Singh and the Khalsa.
8. Banda Singh Bahadur: Conquests and Execution.

Suggested Reading

1. Kirpal Singh(ed.), *History and Culture of the Punjab, Part-ii, Punjabi University,* Patiala, 1990.
2. Fauja Singh (ed.), *History of Punjab, Vol, III Punjabi University, Patiala, 1987.*
3. J.S. Grewal, *The Sikhs of the Punjab, Cup, Cambridge, 1991.*
4. Khushwant Singh, *A History of the Sikhs,* Vol. I, OUP, New Delhi, 1990

BACHELOR OF PHARMACY (SEMESTER-I)
(Credit Based Evaluation & Grading System)

SOA-101 : DRUG ABUSE: PROBLEM, MANAGEMENT AND PREVENTION
(COMPULSORY ID COURSE)
(Student can opt. this paper whether in 1st or 2nd Semester)

PROBLEM OF DRUG ABUSE

Time: 3 Hours **Credit 3-0-0**

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section – A

Meaning of Drug Abuse:

1) Meaning, Nature and Extent of Drug Abuse in India and Punjab.

2) Consequences of Drug Abuse for:

Individual	:	Education, Employment, Income.
Family	:	Violence.
Society	:	Crime.
Nation	:	Law and Order problem.

Section – B

Management of Drug Abuse:

(i) Medical Management: Medication for treatment and to reduce withdrawal effects.
(ii) Psychiatric Management: Counselling, Behavioural and Cognitive therapy.
(iii) Social Management: Family, Group therapy and Environmental Intervention.

Section – C

Prevention of Drug abuse:

(i) Role of family: Parent child relationship, Family support, Supervision, Shaping values, Active Scrutiny.
(ii) School: Counselling, Teacher as role-model. Parent-teacher-Health Professional Coordination, Random testing on students.

Section – D

Controlling Drug Abuse:

(i) Media: Restraint on advertisements of drugs, advertisements on bad effects of drugs, Publicity and media, Campaigns against drug abuse, Educational and awareness program
(ii) Legislation: NDPs act, Statutory warnings, Policing of Borders, Checking Supply/Smuggling of Drugs, Strict enforcement of laws, Time bound trials.

References:

1. Ahuja, Ram (2003), *Social Problems in India*, Rawat Publication, Jaipur.
2. Extent, Pattern and Trend of Drug Use in India, Ministry of Social Justice and Empowerment, Government of India, 2004.
3. Inciardi, J.A. 1981. *The Drug Crime Connection.* Beverly Hills: Sage Publications.
4. Kapoor. T. (1985) *Drug epidemic among Indian Youth*, New Delhi: Mittal Pub.
5. Kessel, Neil and Henry Walton. 1982, *Alcohalism. Harmond Worth:* Penguin Books.
6. Modi, Ishwar and Modi, Shalini (1997) *Drugs: Addiction and Prevention*, Jaipur: Rawat Publication.
7. National Household Survey of Alcohol and Drug abuse. (2003) New Delhi, Clinical Epidemiological Unit, All India Institute of Medical Sciences, 2004.
8. Ross Coomber and Others. 2013, *Key Concept in Drugs and Society*. New Delhi: Sage Publications.
9. Sain, Bhim 1991, *Drug Addiction Alcoholism*, Smoking obscenity New Delhi: Mittal Publications.
10. Sandhu, Ranvinder Singh, 2009, *Drug Addiction in Punjab*: A Sociological Study. Amritsar: Guru Nanak Dev University.
11. Singh, Chandra Paul 2000. *Alcohol and Dependence among Industrial Workers*: Delhi: Shipra.
12. Sussman, S and Ames, S.L. (2008). *Drug Abuse: Concepts, Prevention and Cessation*, Cambridge University Press.
13. Verma, P.S. 2017, *"Punjab's Drug Problem: Contours and Characterstics"*, Economic and Political Weekly, Vol. LII, No. 3, P.P. 40-43.
14. World Drug Report 2016, United Nations office of Drug and Crime.
15. World Drug Report 2017, United Nations office of Drug and Crime.

BACHELOR OF PHARMACY (SEMESTER-II)
(Credit Based Evaluation & Grading System)

BP 201T. HUMAN ANATOMY AND PHYSIOLOGY-II (Theory)

4 Credits (3-1-0)
45 Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

Objectives: Upon completion of this course the student should be able to:

1. Explain the gross morphology, structure and functions of various organs of the human body.
2. Describe the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of human body.
4. Perform the hematological tests like blood cell counts, haemoglobin estimation, bleeding/clotting time etc and also record blood pressure, heart rate, pulse and respiratory volume.
5. Appreciate coordinated working pattern of different organs of each system
6. Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body.

Course Content:

Unit I

10 hours

- **Nervous system**

  Organization of nervous system, neuron, neuroglia, classification and properties of nerve fibre, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters.

  Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. structure and functions of brain (cerebrum, brain stem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity)

Unit II

06 hours

- **Digestive system**

  Anatomy of GI Tract with special reference to anatomy and functions of stomach, (Acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsin role in protein digestion) small intestine and large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT.

- **Energetics**
  Formation and role of ATP, Creatinine Phosphate and BMR.

Unit III

10 hours

- **Respiratory system**
  Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration

  Lung Volumes and capacities transport of respiratory gases, artificial respiration, and resuscitation methods.

- **Urinary system**
  Anatomy of urinary tract with special reference to anatomy of kidney and nephrons, functions of kidney and urinary tract, physiology of urine formation, micturition reflex and role of kidneys in acid base balance, role of RAS in kidney and disorders of kidney.

Unit IV

10 hours

- **Endocrine system**
  Classification of hormones, mechanism of hormone action, structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland, thymus and their disorders.

Unit V

09 hours

- **Reproductive system**

  Anatomy of male and female reproductive system, Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition

- **Introduction to genetics**

  Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance.

BACHELOR OF PHARMACY (SEMESTER-II)
(Credit Based Evaluation & Grading System)

BP 207 P. HUMAN ANATOMY AND PHYSIOLOGY (Practical)

2 Credits (0-0-2)
4 Hours/week

Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject**.**

1 To study the integumentary and special senses using specimen, models, etc.,
2 To study the nervous system using specimen, models, etc.,
3 To study the endocrine system using specimen, models, etc
4 To demonstrate the general neurological examination
5 To demonstrate the function of olfactory nerve
6 To examine the different types of taste.
7 To demonstrate the visual acuity
8 To demonstrate the reflex activity
9 Recording of body temperature
10 To demonstrate positive and negative feedback mechanism.
11 Determination of tidal volume and vital capacity.
12 Study of digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens.
13 Recording of basal mass index .
14 Study of family planning devices and pregnancy diagnosis test.
15 Demonstration of total blood count by cell analyser
16 Permanent slides of vital organs and gonads.

Recommended Books (Latest Editions)

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co,Riverview,MI USA

4. Text book of Medical Physiology- Arthur C,Guyton andJohn.E. Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
6. Textbook of Human Histology by Inderbir Singh, Jaypee brothers medical publishers, New Delhi.
7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brothers medical publishers, New Delhi.
8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

Reference Books:

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje ,Academic Publishers Kolkata

BACHELOR OF PHARMACY (SEMESTER-II)
(Credit Based Evaluation & Grading System)

BP202T. PHARMACEUTICAL ORGANIC CHEMISTRY –I (Theory)

4 Credits (3-1-0)

45 Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: This subject deals with classification and nomenclature of simple organic compounds, structural isomerism, intermediates forming in reactions, important physical properties, reactions and methods of preparation of these compounds. The syllabus also emphasizes on mechanisms and orientation of reactions.

Objectives: Upon completion of the course the student shall be able to

1. write the structure, name and the type of isomerism of the organic compound
2. write the reaction, name the reaction and orientation of reactions
3. account for reactivity/stability of compounds,
4. identify/confirm the identification of organic compound

Course Content:

General methods of preparation and reactions of compounds superscripted with asterisk (*) to be explained

To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences

UNIT-I

07 Hours

- **Classification, nomenclature and isomerism**
  Classification of Organic Compounds
  Common and IUPAC systems of nomenclature of organic compounds (up to 10 Carbons open chain and carbocyclic compounds)
  Structural isomerisms in organic compounds

UNIT-II

10 Hours

Alkanes*, Alkenes* and Conjugated dienes*

SP^3 hybridization in alkanes, Halogenation of alkanes, uses of paraffins. Stabilities of alkenes, SP^2 hybridization in alkenes

E_1 and E_2 reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeffs orientation and evidences. E_1 verses E_2 reactions, Factors affecting E_1 and E_2 reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation.

Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement

UNIT-III

10 Hours

- **Alkyl halides***

  SN_1 and SN_2 reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations.

  SN_1 versus SN_2 reactions, Factors affecting SN_1 and SN_2 reactions

  Structure and uses of ethylchloride, Chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform.

- **Alcohols*-** Qualitative tests, Structure and uses of Ethyl alcohol, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol

UNIT-IV

10 Hours

- **Carbonyl compounds* (Aldehydes and ketones)**

  Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanilin, Cinnamaldehyde.

UNIT-V

08 Hours

- **Carboxylic acids***

  Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids ,amide and ester

  Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid. Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid

- **Aliphatic amines* -** Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine

BACHELOR OF PHARMACY (SEMESTER-II)
(Credit Based Evaluation & Grading System)

BP208P. PHARMACEUTICAL ORGANIC CHEMISTRY -I (Practical)

2 Credits (0-0-2)
4 Hours / week

1. Systematic qualitative analysis of unknown organic compounds like

   i) Preliminary test: Color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc.
   ii) Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test
   iii) Solubility test
   iv) Functional group test like Phenols, Amides/ Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides.
   v) Melting point/Boiling point of organic compounds
   vi) Identification of the unknown compound from the literature using melting point/ boiling point.
   vii) Preparation of the derivatives and confirmation of the unknown compound by melting point/ boiling point.
   viii) Minimum 5 unknown organic compounds to be analysed systematically.

2. Preparation of suitable solid derivatives from organic compounds
3. Construction of molecular models

Recommended Books (Latest Editions)

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar , Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P.L.Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. Vogel's text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K.Vishnoi.
8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.
9. Reaction and reaction mechanism by Ahluwaliah/Chatwal.

BACHELOR OF PHARMACY (SEMESTER-II)
(Credit Based Evaluation & Grading System)

BP203 T. BIOCHEMISTRY (Theory)

4 Credits (3-1-0)
45Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells. The scope of the subject is providing biochemical facts and the principles to understand metabolism of nutrient molecules in physiological and pathological conditions. It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.

Objectives: Upon completion of course student shell able to

1. Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
2. Understand the metabolism of nutrient molecules in physiological and pathological conditions.
3. Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

Course Content:

UNIT I

08 Hours

1. **Biomolecules**
   Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins.

2. **Bioenergetics**
   Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential.
   Energy rich compounds; classification; biological significances of ATP and cyclic AMP

UNIT II

- **Carbohydrate metabolism**

  Glycolysis – Pathway, energetics and significance

  Citric acid cycle- Pathway, energetics and significance

  HMP shunt and its significance; Glucose-6-Phosphate dehydrogenase (G6PD) deficiency
  Glycogen metabolism Pathways and glycogen storage diseases

  (GSD) Gluconeogenesis- Pathway and its significance

  Hormonal regulation of blood glucose level and Diabetes mellitus

- **Biological oxidation**

  Electron transport chain (ETC) and its mechanism.
  Oxidative phosphorylation & its mechanism and substrate level phosphorylation
  Inhibitors ETC and oxidative phosphorylation/Uncouplers

UNIT III

10 Hours

- **Lipid metabolism**

  β-Oxidation of saturated fatty acid (Palmitic acid)
  Formation and utilization of ketone bodies; ketoacidosis De novo synthesis of fatty acids (Palmitic acid)
  Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D
  Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity.

- **Amino acid metabolism**

  General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders
  Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenyketonuria, Albinism, alkeptonuria, tyrosinemia)
  Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline
  Catabolism of heme; hyperbilirubinemia and jaundice

UNIT IV

10 Hours

- **Nucleic acid metabolism and genetic information transfer**

  Biosynthesis of purine and pyrimidine nucleotides
  Catabolism of purine nucleotides and Hyperuricemia and Gout disease Organization of mammalian genome
  Structure of DNA and RNA and their functions DNA replication (semi conservative model) Transcription or RNA synthesis
  Genetic code, Translation or Protein synthesis and inhibitors

UNIT V

07 Hours

Enzymes

Introduction, properties, nomenclature and IUB classification of enzymes Enzyme kinetics (Michaelis plot, Line Weaver Burke plot)
Enzyme inhibitors with examples
Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation
Therapeutic and diagnostic applications of enzymes and isoenzymes
Coenzymes –Structure and biochemical functions

BACHELOR OF PHARMACY (SEMESTER-II)
(Credit Based Evaluation & Grading System)

BP 209 P. BIOCHEMISTRY (Practical)

2 Credits (0-0-2)
4 Hours / Week

1. Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch)
2. Identification tests for Proteins (albumin and Casein)
3. Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method)
4. Qualitative analysis of urine for abnormal constituents
5. Determination of blood creatinine
6. Determination of blood sugar
7. Determination of serum total cholesterol
8. Preparation of buffer solution and measurement of pH
9. Study of enzymatic hydrolysis of starch
10. Determination of Salivary amylase activity
11. Study the effect of Temperature on Salivary amylase activity.
12. Study the effect of substrate concentration on salivary amylase activity.

Recommended Books (Latest Editions)

1. Principles of Biochemistry by Lehninger.
2. Harper's Biochemistry by Robert K. Murry, Daryl K. Granner and Victor W. Rodwell.
3. Biochemistry by Stryer.
4. Biochemistry by D. Satyanarayan and U.Chakrapani
5. Textbook of Biochemistry by Rama Rao.
6. Textbook of Biochemistry by Deb.
7. Outlines of Biochemistry by Conn and Stumpf
8. Practical Biochemistry by R.C. Gupta and S. Bhargavan.
9. Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition)
10. Practical Biochemistry for Medical students by Rajagopal and Ramakrishna.
11. Practical Biochemistry by Harold Varley.

BACHELOR OF PHARMACY (SEMESTER-II)
(Credit Based Evaluation & Grading System)

BP 204T.PATHOPHYSIOLOGY (THEORY)

4 Credits (3-1-0)

45Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

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

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

1. Describe the etiology and pathogenesis of the selected disease states;
2. Name the signs and symptoms of the diseases; and
3. Mention the complications of the diseases.

Course content:

Unit I

10Hours

- **Basic principles of Cell injury and Adaptation:**
  Introduction, definitions, Homeostasis, Components and Types of Feedback systems, Causes of cellular injury**,** Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage)**,**Morphology of cell injury – Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia)**,**Cell swelling, Intra cellular accumulation, Calcification, Enzyme leakage and Cell Death Acidosis &Alkalosis, Electrolyte imbalance.
- **Basic mechanism involved in the process of inflammation and repair:**
  Introduction, Clinical signs of inflammation, Different types of Inflammation, Mechanism of Inflammation – Alteration in vascular permeability and blood flow, migration of WBC's, Mediators of inflammation, Basic principles of wound healing in the skin, Pathophysiology of Atherosclerosis

Unit II

10Hours

- **Cardiovascular System:**
  Hypertension, congestive heart failure, ischemic heart disease (angina,myocardial infarction, atherosclerosis and arteriosclerosis)
- **Respiratory system:** Asthma, Chronic obstructive airways diseases.
- **Renal system:** Acute and chronic renal failure .

Unit III

10Hours

- **Haematological Diseases:**
  Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cell anemia, thalasemia, hereditary acquired anemia, hemophilia
- **Endocrine system:** Diabetes, thyroid diseases, disorders of sex hormone
- **Nervous system:** Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease.
- **Gastrointestinal system:** Peptic Ulcer

Unit IV

8 Hours

- Inflammatory bowel diseases, jaundice, hepatitis (A,B,C,D,E,F) alcoholic liver disease.
- **Disease of bones and joints:** Rheumatoid arthritis, osteoporosis and gout
- **Principles of cancer:** classification, etiology and pathogenesis of cancer
- **Diseases of bones and joints:** Rheumatoid Arthritis, Osteoporosis, Gout
- **Principles of Cancer:** Classification, etiology and pathogenesis of Cancer

Unit V

7 Hours

- **Infectious diseases:** Meningitis, Typhoid, Leprosy, Tuberculosis Urinary tract infections
- **Sexually transmitted diseases:** AIDS, Syphilis, Gonorrhea

Recommended Books (Latest Editions)

1. Vinay Kumar, Abul K. Abas, Jon C. Aster; Robbins &Cotran Pathologic Basis of Disease; South Asia edition; India; Elsevier; 2014.
2. Harsh Mohan; Text book of Pathology; 6th edition; India; Jaypee Publications; 2010.
3. Laurence B, Bruce C, Bjorn K. ; Goodman Gilman's The Pharmacological Basis of Therapeutics; 12th edition; New York; McGraw-Hill; 2011.
4. Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12th ed; united states
5. William and Wilkins, Baltimore;1991 [1990 printing].
6. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston;Davidson's Principles and Practice of Medicine; 21st edition; London; ELBS/Churchill Livingstone; 2010.
7. Guyton A, John .E Hall; Textbook of Medical Physiology; 12th edition; WB Saunders Company; 2010.
8. Joseph DiPiro, Robert L. Talbert, Gary Yee, Barbara Wells, L. Michael Posey;
9. Pharmacotherapy: A Pathophysiological Approach; 9th edition; London; McGraw-Hill Medical; 2014.

10. V. Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6th edition; Philadelphia; WB Saunders Company; 1997.
11. Roger Walker, Clive Edwards; Clinical Pharmacy and Therapeutics; 3rd edition; London; Churchill Livingstone publication; 2003.

Recommended Journals

1. The Journal of Pathology. ISSN: 1096-9896 (Online)
2. The American Journal of Pathology. ISSN: 0002-9440
3. Pathology. 1465-3931 (Online)
4. International Journal of Physiology, Pathophysiology and Pharmacology. ISSN: 1944-8171 (Online)
5. Indian Journal of Pathology and Microbiology. ISSN-0377-4929.

BACHELOR OF PHARMACY (SEMESTER-II)
(Credit Based Evaluation & Grading System)

BP205 T. COMPUTER APPLICATIONS IN PHARMACY (Theory)

3 Credits (3-0-0)
30 Hrs
Max. Marks: 35
Internal Assessment: 15
Total Marks: 50

Scope: This subject deals with the introduction Database, Database Management system, computer application in clinical studies and use of databases.

Objectives: Upon completion of the course the student shall be able to

1. know the various types of application of computers in pharmacy
2. know the various types of databases
3. know the various applications of databases in pharmacy

Course content:

UNIT – I

06 hours

Number System: Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One's complement, Two's complement method, binary multiplication, binary division

Concept of Information Systems and Software: Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project

UNIT –II

06 Hours

Web Technologies: Introduction to HTML, XML,CSS and Programming languages, introduction to web servers and Server Products
Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database

06 hours

UNIT – III

Application of Computers in Pharmacy – Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring

Diagnostic System, Lab-diagnostic System, Patient Monitoring System,
Pharma Information System

UNIT – IV

06 hours

Bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery

UNIT-V

06 hours

Computers as Data Analysis in Preclinical Development: Chromatographic dada analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMS)

BACHELOR OF PHARMACY (SEMESTER-II)
(Credit Based Evaluation & Grading System)

BP210P. COMPUTER APPLICATIONS IN PHARMACY (Practical)

1 Credits (0-0-1)

1. Design a questionnaire using a word processing package to gather information about a particular disease.
2. Create a HTML web page to show personal information.
3. Retrieve the information of a drug and its adverse effects using online tools
4. Creating mailing labels Using Label Wizard , generating label in MS WORD
5. Create a database in MS Access to store the patient information with the required fields Using access
6. Design a form in MS Access to view, add, delete and modify the patient record in the database
7. Generating report and printing the report from patient database
8. Creating invoice table using – MS Access
9. Drug information storage and retrieval using MS Access
10. Creating and working with queries in MS Access
11. Exporting Tables, Queries, Forms and Reports to web pages
12. Exporting Tables, Queries, Forms and Reports to XML pages

Recommended books (Latest edition):

1. Computer Application in Pharmacy – William E.Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.
2. Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley-Interscience, A John Willey and Sons, INC., Publication, USA
3. Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA)
4. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi - 110002

BACHELOR OF PHARMACY (SEMESTER-II)
(Credit Based Evaluation & Grading System)

PBL 131 : ਪੰਜਾਬੀ ਲਾਜ਼ਮੀ - II (Credit Based)

Credit : 2-0-0
Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

ਸੈਕਸ਼ਨ-ਏ

I. **ਦੋ ਰੰਗ** (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿਚੋਂ ਹੇਠ ਲਿਖੇ ਕਹਾਣੀਕਾਰ :
(ੳ) ਨਾਨਕ ਸਿੰਘ : **ਭੂਆ**
(ਅ) ਗੁਰਮੁਖ ਸਿੰਘ ਮੁਸਾਫਿਰ : **ਬਾਗੀ ਦੀ ਧੀ**
(ਇ) ਸੰਤ ਸਿੰਘ ਸੇਖੋਂ : **ਪੇਮੀ ਦੇ ਨਿਆਣੇ**
(ਕਹਾਣੀਕਾਰ ਦਾ ਜੀਵਨ, ਕਹਾਣੀ ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਹਾਣੀ ਕਲਾ)

II. ਪੰਜਾਬੀ ਸ਼ਬਦ ਬਣਤਰ : ਧਾਤੂ/ਮੂਲ, ਵਧੇਤਰ (ਅਗੇਤਰ, ਪਿਛੇਤਰ, ਵਿਉਂਤਪਤ ਅਤੇ ਰੁਪਾਂਤਰੀ), ਸਮਾਸ।

ਸੈਕਸ਼ਨ-ਬੀ

I. **ਦੋ ਰੰਗ** (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿਚੋਂ ਹੇਠ ਲਿਖੇ ਕਹਾਣੀਕਾਰ :
(ੳ) ਸੁਜਾਨ ਸਿੰਘ : **ਬਾਗਾਂ ਦਾ ਰਾਖਾ**
(ਅ) ਕਰਤਾਰ ਸਿੰਘ ਦੁੱਗਲ : **ਤੈਂ ਕੀ ਦਰਦ ਨਾ ਆਇਆ**
(ਕਹਾਣੀਕਾਰ ਦਾ ਜੀਵਨ, ਕਹਾਣੀ ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਹਾਣੀ ਕਲਾ)

II. ਪੈਰ੍ਹਾ ਰਚਨਾ : ਕਲਾਸ ਵਿਚ 10 ਵਿਸ਼ਿਆਂ (ਸਭਿਆਚਾਰ, ਧਾਰਮਕ ਅਤੇ ਰਾਜਨੀਤਕ) 'ਤੇ ਪੈਰ੍ਹਾ ਰਚਨਾ ਦੇ ਅਭਿਆਸ ਕਰਵਾਉਣੇ।

ਸੈਕਸ਼ਨ-ਸੀ

I. **ਦੋ ਰੰਗ** (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿਚੋਂ ਹੇਠ ਲਿਖੇ ਕਹਾਣੀਕਾਰ :
(ੳ) ਕੁਲਵੰਤ ਸਿੰਘ ਵਿਰਕ : **ਧਰਤੀ ਹੇਠਲਾ ਬੌਲਦ**
(ਅ) ਨਵਤੇਜ ਸਿੰਘ : **ਦੂਜੀ ਵਾਰ ਜੇਬ ਕੱਟੀ ਗਈ**
(ਇ) ਪ੍ਰੇਮ ਪ੍ਰਕਾਸ਼ : **ਲੱਛੀ**
(ਕਹਾਣੀਕਾਰ ਦਾ ਜੀਵਨ, ਕਹਾਣੀ ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਹਾਣੀ ਕਲਾ)

II. ਮੁਹਾਵਰੇ ਤੇ ਅਖਾਣ (ਅਖਾਣ ਤੇ ਮੁਹਾਵਰਾ ਕੋਸ਼ ਵਿਚ) 200 ਮੁਹਾਵਰਿਆਂ ਅਤੇ 100 ਅਖਾਣਾਂ ਨੂੰ ਵਾਕਾਂ ਵਿਚ ਵਰਤਣ ਦੇ ਅਭਿਆਸ ਕਰਵਾਉਣੇ (ਕਲਾਸ ਵਿਚ ਤੇ ਘਰ ਲਈ)।

ਸੈਕਸ਼ਨ-ਡੀ

I. **ਦੋ ਰੰਗ** (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿਚੋਂ ਹੇਠ ਲਿਖੇ ਕਹਾਣੀਕਾਰ :
(ੳ) ਅਜੀਤ ਕੌਰ : **ਖੁੰਡ ਸ਼ਿਕਨ**
(ਅ) ਦਲੀਪ ਕੌਰ ਟਿਵਾਣਾ : **ਬੱਸ ਕੰਡਕਟਰ**
(ਕਹਾਣੀਕਾਰ ਦਾ ਜੀਵਨ, ਕਹਾਣੀ ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਹਾਣੀ ਕਲਾ)

II. ਸ਼ਬਦ ਸ਼੍ਰੇਣੀਆਂ : ਨਾਂਵ, ਪੜਨਾਂਵ, ਵਿਸ਼ੇਸ਼ਣ, ਕਿਰਿਆ, ਕਿਰਿਆ ਵਿਸ਼ੇਸ਼ਣ, ਸੰਬੰਧਕ

BACHELOR OF PHARMACY (SEMESTER-II)
(Credit Based Evaluation & Grading System)

PBL-132: ਮੁੱਢਲੀ ਪੰਜਾਬੀ

(In lieu of Punjabi Compulsory)

Credits: 2-0-0

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ।ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

ਪਾਠ-ਕ੍ਰਮ

ਸੈਕਸ਼ਨ-ਏ

ਸਬਦ ਸ਼੍ਰੇਣੀਆ : ਪਛਾਣ ਅਤ ਵਰਤ

(ਨਾਂਵ, ਪੜਨਾਂਵ, ਵਿਸ਼ੇਸ਼ਣ, ਕਿਰਿਆ, ਕਿਰਿਆ ਵਿਸ਼ੇਸ਼ਣ)

ਸੈਕਸ਼ਨ-ਬੀ

ਅਨੁਵਾਦ ਦਾ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ : ਬਾਜ਼ਾਰ, ਵਪਾਰ, ਵਿਰਸਤ-ਨਾਤੇ, ਖੇਤੀ ਅਤੇ ਹੋਰ ਧੰਦਿਆਂ ਨਾਲ ਸਬੰਧਤ ।

ਸੈਕਸ਼ਨ-ਸੀ

ਪੰਜਾਬੀ ਵਾਕ-ਬਣਤਰ

ਸਾਧਾਰਨ-ਵਾਕ (ਪਛਾਣ ਅਤ ਵਰਤ)

ਸੰਯੁਕਤ-ਵਾਕ (ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ)

ਮਿਸ਼ਰਤ-ਵਾਕ (ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ)

ਸੈਕਸ਼ਨ-ਡੀ

ਪਰ੍ਹਾ ਰਚਨਾ

ਸੰਖੇਪ ਰਚਨਾ

BACHELOR OF PHARMACY (SEMESTER-II)
(Credit Based Evaluation & Grading System)

HSL-102 : Punjab History & Culture (1717-1947)
(Special paper in lieu of Punjabi Compulsory)
(For those students who are not domicile of Punjab)

Credits: 2-0-0

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section-A

1. Sikh Struggle for Sovereignty.
2. Ranjit Singh : Conquests, Administration and the Anglo-Sikh Relations.

Section-B

3. Anglo-Sikh Wars and the Annexation.
4. The Punjab under the British: New Administration, Education and social Change.

Section-C

5. Economic Changes: Agricultural
6. Socio-Religious Reform Movements.

Section-D

7. Role of Punjab in the Freedom Struggle.
8. Fairs and Festivals.

Suggested Reading

1. Kirpal Singh (ed.), *History and Culture of the Punjab,* Part-II, Punjabi University, Patiala, 1990.
2. Fauja Singh (ed.), *History of Punjab,* Vol, III, Punjabi University, Patiala, 1987.
3. J.S. Grewal, *The Sikhs of the Punjab, Cup, Cambridge, 1991.*
4. Khushwant Singh, *A History of the Sikhs,* Vol. I, OUP, New Delhi, 1990

BACHELOR OF PHARMACY (SEMESTER-II)
(Credit Based Evaluation & Grading System)

SOA-101 : DRUG ABUSE: PROBLEM, MANAGEMENT AND PREVENTION (COMPULSORY ID COURSE)

(Student can opt. this paper whether in 1st or 2nd semester)

PROBLEM OF DRUG ABUSE

Time: 3 Hours **Credit 3-0-0**

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section – A

Meaning of Drug Abuse:

1. Meaning, Nature and Extent of Drug Abuse in India and Punjab.

2. Consequences of Drug Abuse for:

Individual	:	Education, Employment, Income.
Family	:	Violence.
Society	:	Crime.
Nation	:	Law and Order problem.

Section – B

Management of Drug Abuse:

(iv) Medical Management: Medication for treatment and to reduce withdrawal effects.
(v) Psychiatric Management: Counselling, Behavioural and Cognitive therapy.
(vi) Social Management: Family, Group therapy and Environmental Intervention.

Section – C

Prevention of Drug abuse:

(iii) Role of family: Parent child relationship, Family support, Supervision, Shaping values, Active Scrutiny.
(iv) School: Counselling, Teacher as role-model. Parent-teacher-Health Professional Coordination, Random testing on students.

Section – D

Controlling Drug Abuse:

(iii) Media: Restraint on advertisements of drugs, advertisements on bad effects of drugs, Publicity and media, Campaigns against drug abuse, Educational and awareness program
(iv) Legislation: NDPs act, Statutory warnings, Policing of Borders, Checking Supply/Smuggling of Drugs, Strict enforcement of laws, Time bound trials.

References:

1. Ahuja, Ram (2003), *Social Problems in India*, Rawat Publication, Jaipur.
2. Extent, Pattern and Trend of Drug Use in India, Ministry of Social Justice and Empowerment, Government of India, 2004.
3. Inciardi, J.A. 1981. *The Drug Crime Connection.* Beverly Hills: Sage Publications.
4. Kapoor. T. (1985) *Drug epidemic among Indian Youth*, New Delhi: Mittal Pub.
5. Kessel, Neil and Henry Walton. 1982, *Alcohalism. Harmond Worth:* Penguin Books.
6. Modi, Ishwar and Modi, Shalini (1997) *Drugs: Addiction and Prevention*, Jaipur: Rawat Publication.
7. National Household Survey of Alcohol and Drug abuse. (2003) New Delhi, Clinical Epidemiological Unit, All India Institute of Medical Sciences, 2004.
8. Ross Coomber and Others. 2013, *Key Concept in Drugs and Society.* New Delhi: Sage Publications.
9. Sain, Bhim 1991, *Drug Addiction Alcoholism,* Smoking obscenity New Delhi: Mittal Publications.
10. Sandhu, Ranvinder Singh, 2009, *Drug Addiction in Punjab*: A Sociological Study. Amritsar: Guru Nanak Dev University.
11. Singh, Chandra Paul 2000. *Alcohol and Dependence among Industrial Workers*: Delhi: Shipra.
12. Sussman, S and Ames, S.L. (2008). *Drug Abuse: Concepts, Prevention and Cessation,* Cambridge University Press.
13. Verma, P.S. 2017, "*Punjab's Drug Problem: Contours and Characterstics",* Economic and Political Weekly, Vol. LII, No. 3, P.P. 40-43.
14. World Drug Report 2016, United Nations office of Drug and Crime.
15. World Drug Report 2017, United Nations office of Drug and Crime.

BACHELOR OF PHARMACY (SEMESTER-III)
(Credit Based Evaluation & Grading System)

BP301T. PHARMACEUTICAL ORGANIC CHEMISTRY –II (Theory)

45 Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: This subject deals with general methods of preparation and reactions of some organic compounds. Reactivity of organic compounds are also studied here. The syllabus emphasizes on mechanisms and orientation of reactions. Chemistry of fats and oils are also included in the syllabus.

Objectives: Upon completion of the course the student shall be able to

1. write the structure, name and the type of isomerism of the organic compound
2. write the reaction, name the reaction and orientation of reactions
3. account for reactivity/stability of compounds,
4. prepare organic compounds

Course Content:

General methods of preparation and reactions of compounds superscripted with asterisk (*) to be explained

To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences

UNIT I **10 Hours**

•Benzene and its derivatives

A. Analytical, synthetic and other evidences in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's rule

B. Reactions of benzene - nitration, sulphonation, halogenation- reactivity, Friedelcrafts alkylation- reactivity, limitations, Friedelcrafts acylation.

C. Substituents, effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction

D. Structure and uses of DDT, Saccharin, BHC and Chloramine

UNIT II **10 Hours**

- Phenols* - Acidity of phenols, effect of substituents on acidity, qualitative tests, Structure and uses of phenol, cresols, resorcinol, naphthols
- Aromatic Amines* - Basicity of amines, effect of substituents on basicity, and synthetic uses of aryl diazonium salts
- Aromatic Acids* –Acidity, effect of substituents on acidity and important reactions of benzoic acid.

UNIT III **10 Hours**

- **Fats and Oils**
  a. Fatty acids – reactions.
  b. Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils.
  c. Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination.

UNIT IV **08 Hours**

- **Polynuclear hydrocarbons:**
  a. Synthesis, reactions
  b. Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives

UNIT V **07 Hours**

- Cyclo alkanes*

Stabilities – Baeyer's strain theory, limitation of Baeyer's strain theory, Coulson and Moffitt's modification, Sachse Mohr's theory (Theory of strainless rings), reactions of cyclopropane and cyclobutane only

Recommended Books (Latest Editions)

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar , Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P.L.Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. Vogel's text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K.Vishnoi.
8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.

BACHELOR OF PHARMACY (SEMESTER-III)
(Credit Based Evaluation & Grading System)

BP302T. PHYSICAL PHARMACEUTICS-I (Theory)

45Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: The course deals with the various physica and physicochemical properties, and principles involved in dosage forms/formulations. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

Objectives: Upon the completion of the course student shall be able to

1. Understand various physicochemical properties of drug molecules in the designing the dosage forms
2. Know the principles of chemical kinetics & to use them for stability testing nad determination of expiry date of formulations
3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

Course Content:

UNIT-I **10 Hours**

Solubility of drugs: Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions. Partially miscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications

UNIT-II **10Hours**

States of Matter and properties of matter: State of matter, changes in the state of matter, latent heats, vapour pressure, sublimation critical point, eutectic mixtures, gases, aerosols– inhalers, relative humidity, liquid complexes, liquid crystals, glassy states, solid- crystalline, amorphous & polymorphism.

Physicochemical properties of drug molecules: Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications

UNIT-III **08 Hours**

Surface and interfacial phenomenon: Liquid interface, surface & interfacial tensions, surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB Scale, solubilisation, detergency, adsorption at solid interface.

UNIT-IV **08Hours**

Complexation and protein binding: Introduction, Classification of Complexation, Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants.

UNIT-V **07 Hours**

pH, buffers and Isotonic solutions: Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions.

Recommended Books: (Latest Editions)

1. Physical Pharmacy by Alfred Martin
2. Experimental Pharmaceutics by Eugene, Parott.
3. Tutorial Pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical Calculations, Lea &Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, MarcelDekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical Dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical Pharmaceutics by Ramasamy C and ManavalanR.
8. Laboratory Manual of Physical Pharmaceutics, C.V.S. Subramanyam, J. Thimma settee
9. Physical Pharmaceutics by C.V.S. Subramanyam
10. Test book of Physical Phramacy, by Gaurav Jain & Roop K. Khar

BACHELOR OF PHARMACY (SEMESTER-III)
(Credit Based Evaluation & Grading System)

BP 303 T. PHARMACEUTICAL MICROBIOLOGY (Theory)

45Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Study of all categories of microorganisims especially for the production of alchol antibiotics, vaccines, vitamins enzymes etc..

Objectives: Upon completion of the subject student shall be able to;

1. Understand methods of identification, cultivation and preservation of various microorganisms
2. To understand the importance and implementation of sterlization in pharmaceutical processing and industry
3. Learn sterility testing of pharmaceutical products.
4. Carried out microbiological standardization of Pharmaceuticals.
5. Understand the cell culture technology and its applications in pharmaceutical industries.

Course content:

Unit I **10 Hours**

Introduction, history of microbiology, its branches, scope and its importance.
Introduction to Prokaryotes and Eukaryotes
Study of ultra-structure and morphological classification of bacteria, nutritional requirements, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total & viable count).
Study of different types of phase constrast microscopy, dark field microscopy and electron microscopy.

Unit II **10 Hours**

Identification of bacteria using staining techniques (simple, Gram's & Acid fast staining) and biochemical tests (IMViC).
Study of principle, procedure, merits, demerits and applications of physical, chemical gaseous,radiation and mechanical method of sterilization.
Evaluation of the efficiency of sterilization methods.
Equipments employed in large scale sterilization. Sterility indicators.

Unit III **10 Hours**

Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses.
Classification and mode of action of disinfectants
Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions
Evaluation of bactericidal & Bacteriostatic.
Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.

Unit IV **08 Hours**

Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification.

Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids.

Assessment of a new antibiotic.

Unit V **07Hours**

Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage.

Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations.

Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures.

Application of cell cultures in pharmaceutical industry and research.

Recommended Books (Latest edition)

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
5. Rose: Industrial Microbiology.
6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
8. Peppler: Microbial Technology.
9. I.P., B.P., U.S.P.- latest editions.
10. Ananthnarayan : Text Book of Microbiology, Orient-Longman, Chennai
11. Edward: Fundamentals of Microbiology.
12. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
13. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company

BACHELOR OF PHARMACY (SEMESTER-III)
(Credit Based Evaluation & Grading System)

BP 304T. PHARMACEUTICAL ENGINEERING (Theory)

45 Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: This course is designed to impart a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry**.**

Objectives: Upon completion of the course student shall be able:

1. To know various unit operations used in Pharmaceutical industries.
2. To understand the material handling techniques.
3. To perform various processes involved in pharmaceutical manufacturing process.
4. To carry out various test to prevent environmental pollution.
5. To appreciate and comprehend significance of plant lay out design for optimum use of resources.
6. To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

Course content:

UNIT-I **10 Hours**

- **Flow of fluids:** Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter, Pitot tube and Rotometer.
- **Size Reduction:** Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill.
- **Size Separation:** Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank.

UNIT-II **10 Hours**

- **Heat Transfer:** Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers.
- **Evaporation:** Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator& Economy of multiple effect evaporator.
- **Distillation:** Basic Principles and methodology of simple distillation,flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation

UNIT- III **08 Hours**

- **Drying:** Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer.
- **Mixing:** Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier,

UNIT-IV **08 Hours**

- **Filtration:** Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Cartridge filter, membrane filters and Seidtz filter.
- **Centrifugation:** Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge.

UNIT- V **07 Hours**

- **Materials of pharmaceutical plant construction, Corrosion and its prevention**: Factors affecting during materials selected for Pharmaceutical plant construction, Theories of corrosion, types of corrosion and there prevention. Ferrous and nonferrous metals, inorganic and organic non metals, basic of material handling systems.

Recommended Books: (Latest Editions)

1. Introduction to chemical engineering – Walter L Badger & Julius Banchero, Latest edition.
2. Solid phase extraction, Principles, techniques and applications by Nigel J.K. Simpson-Latest edition.
3. Unit operation of chemical engineering – Mcabe Smith, Latest edition.
4. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition.
5. Remington practice of pharmacy- Martin, Latest edition.
6. Theory and practice of industrial pharmacy by Lachmann., Latest edition.
7. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition.
8. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition.

BACHELOR OF PHARMACY (SEMESTER-III)
(Credit Based Evaluation & Grading System)

BP305P. PHARMACEUTICAL ORGANIC CHEMISTRY -II (Practical)
4 Hrs/week

I **Experiments involving laboratory techniques**
- Recrystallization
- Steam distillation

II **Determination of following oil values (including standardization of reagents)**
- Acid value
- Saponification value
- Iodine value

III **Preparation of compounds**
- Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol/Aniline by acylation reaction.
- 2,4,6-Tribromo aniline/Para bromo acetanilide from Aniline/
- Acetanilide by halogenation (Bromination) reaction.
- 5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction.
- Benzoic acid from Benzyl chloride by oxidation reaction.
- Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction.
- 1-Phenyl azo-2-napthol from Aniline by diazotization and coupling reactions.
- Benzil from Benzoin by oxidation reaction.
- Dibenzal acetone from Benzaldehyde by Claison Schmidt reaction
- Cinnammic acid from Benzaldehyde by Perkin reaction
- P-Iodo benzoic acid from P-amino benzoic acid

BP306P. PHYSICAL PHARMACEUTICS – I (Practical)

4 Hrs/week

1. Determination the solubility of drug at room temperature
2. Determination of pKa value by Half Neutralization/ Henderson Hasselbalch equation.
3. Determination of Partition co- efficient of benzoic acid in benzene and water
4. Determination of Partition co- efficient of Iodine in CCl4 and water
5. Determination of % composition of NaCl in a solution using phenol-water system by CST method
6. Determination of surface tension of given liquids by drop count and drop weight method
7. Determination of HLB number of a surfactant by saponification method
8. Determination of Freundlich and Langmuir constants using activated char coal
9. Determination of critical micellar concentration of surfactants
10. Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubility method
11. Determination of stability constant and donor acceptor ratio of Cupric-Glycine complex by pH titration method

BACHELOR OF PHARMACY (SEMESTER-III)
(Credit Based Evaluation & Grading System)

BP 307P.PHARMACEUTICAL MICROBIOLOGY (Practical)

4 Hrs/week

1. Introduction and study of different equipments and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.
2. Sterilization of glassware, preparation and sterilization of media.
3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.
4. Staining methods- Simple, Grams staining and acid fast staining (Demonstration with practical).
5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques.
6. Microbiological assay of antibiotics by cup plate method and other methods
7. Motility determination by Hanging drop method.
8. Sterility testing of pharmaceuticals.
9. Bacteriological analysis of water
10. Biochemical test.

BACHELOR OF PHARMACY (SEMESTER-III)
(Credit Based Evaluation & Grading System)

BP308P - PHARMACEUTICAL ENGINEERING (Practical)

4 Hours/week

1. Determination of radiation constant of brass, iron, unpainted and painted glass.
2. Steam distillation – To calculate the efficiency of steam distillation.
3. To determine the overall heat transfer coefficient by heat exchanger.
4. Construction of drying curves (for calcium carbonate and starch).
5. Determination of moisture content and loss on drying.
6. Determination of humidity of air – i) From wet and dry bulb temperatures –use of Dew point method.
7. Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, de humidifier.
8. Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of varioussize frequency curves including arithmetic andlogarithmic probability plots.
9. Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill.
10. Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such othermajor equipment.
11. Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration and Thickness/ viscosity
12. To study the effect of time on the Rate of Crystallization.

1. To calculate the uniformity Index for given sample by using Double Cone Blender.

BACHELOR OF PHARMACY (SEMESTER-III)
(Credit Based Evaluation & Grading System)

ESL-220 : ENVIRONMENTAL STUDIES (COMPULSORY)

Credits: 4-0-0

Teaching Methodologies
The Core Module Syllabus for Environmental Studies includes class room teaching and field work. The syllabus is divided into 8 Units [Unit-1 to Unit-VII] covering 45 lectures + 5 hours for field work [Unit-VIII]. The first 7 Units will cover 45 lectures which are class room based to enhance knowledge skills and attitude to environment. Unit-VIII comprises of 5 hours field work to be submitted by each candidate to the Teacher in-charge for evaluation latest by 15 December, 2019.

Exam Pattern: **End Semester Examination- 75 marks**
Project Report/Field Study- 25 marks [based on submitted report]
Total Marks- 100

The structure of the question paper being:

Part-A, Short answer pattern with inbuilt choice – **25 marks**
Attempt any five questions out of seven distributed equally from Unit-1 to Unit-VII.
Each question carries 5 marks. Answer to each question should not exceed 2 pages.

Part-B, Essay type with inbuilt choice – **50 marks**
Attempt any five questions out of eight distributed equally from Unit-1 to Unit-VII. Each question carries 10 marks. Answer to each question should not exceed 5 pages.

Project Report / Internal Assessment:

Part-C, Field work – **25 marks [Field work equal to 5 lecture hours]**
The candidate will submit a hand written field work report showing photographs, sketches, observations, perspective of any topic related to Environment or Ecosystem. The exhaustive list for project report/area of study are given just for reference:

1. Visit to a local area to document environmental assets: River / Forest/ Grassland / Hill / Mountain / Water body / Pond / Lake / Solid Waste Disposal / Water Treatment Plant / Wastewater Treatment Facility etc.
2. Visit to a local polluted site – Urban / Rural / Industrial / Agricultural
3. Study of common plants, insects, birds
4. Study of tree in your areas with their botanical names and soil types
5. Study of birds and their nesting habits
6. Study of local pond in terms of wastewater inflow and water quality
7. Study of industrial units in your area. Name of industry, type of industry, Size (Large, Medium or small scale)
8. Study of common disease in the village and basic data from community health centre
9. Adopt any five young plants and photograph its growth
10. Analyze the Total dissolved solids of ground water samples in your area.
11. Study of Particulate Matter ($PM_{2.5}$ or PM_{10}) data from Sameer website. Download from Play store.
12. Perspective on any field on Environmental Studies with secondary data taken from Central Pollution Control Board, State Pollution Control Board, State Science & Technology Council etc.

Unit-I

The multidisciplinary nature of environmental studies
Definition, scope and importance, Need for public awareness

(2 lectures)

Unit-II

Natural Resources: Renewable and non-renewable resources:

Natural resources and associated problems.

(a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

(b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

(c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

(d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

(e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.

(f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

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

(8 Lectures)

Unit-III

Ecosystems

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

(6 Lectures)

Unit-IV

Biodiversity and its conservation

- Introduction – Definition: genetic, species and ecosystem diversity
- Biogeographical classification of India
- Value of biodiversity: consumptive use, productive use, social, ethical aesthetic and option values
- Biodiversity at global, national and local levels
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity

(8 Lectures)

Unit-V

Environmental Pollution

Definition

- Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear pollution
- Solid waste management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides

(8 Lectures)

Unit-VI

Social Issues and the Environment

- From unsustainable to sustainable development
- Urban problems and related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Environmental ethics: Issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation
- Consumerism and waste products
- Environmental Protection Act, 1986
- Air (Prevention and Control of Pollution) Act, 1981
- Water (Prevention and control of Pollution) Act, 1974
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation
- Public awareness

(7 Lectures)

Unit-VII

Human Population and the Environment

- Population growth, variation among nations
- Population explosion – Family Welfare Programmes
- Environment and human health
- Human Rights
- Value Education
- HIV / AIDS
- Women and Child Welfare
- Role of Information Technology in Environment and Human Health
- Case Studies

(6 Lectures)

Unit-VIII

Field Work

- Visit to a local area to document environmental assets river/forest/grassland/hill/mountain
- Visit to a local polluted site – Urban / Rural / Industrial / Agricultural
- Study of common plants, insects, birds
- Study of simple ecosystems-pond, river, hill slopes, etc

(Field work equal to 5 lecture hours)

References:

1. Bharucha, E. 2005. Textbook of Environmental Studies, Universities Press, Hyderabad.
2. Down to Earth, Centre for Science and Environment, New Delhi.
3. Heywood, V.H. & Waston, R.T. 1995. Global Biodiversity Assessment, Cambridge House, Delhi.
4. Joseph, K. & Nagendran, R. 2004. Essentials of Environmental Studies, Pearson Education (Singapore) Pte. Ltd., Delhi.
5. Kaushik, A. & Kaushik, C.P. 2004. Perspective in Environmental Studies, New Age International (P) Ltd, New Delhi.
6. Rajagopalan, R. 2011. Environmental Studies from Crisis to Cure. Oxford University Press, New Delhi.
7. Sharma, J. P., Sharma. N.K. & Yadav, N.S. 2005. Comprehensive Environmental Studies, Laxmi Publications, New Delhi.
8. Sharma, P. D. 2009. Ecology and Environment, Rastogi Publications, Meerut.
9. State of India's Environment 2018 by Centre for Sciences and Environment, New Delhi
10. Subramanian, V. 2002. A Text Book in Environmental Sciences, Narosa Publishing House, New Delhi.

BACHELOR OF PHARMACY (SEMESTER-IV)
(Credit Based Evaluation & Grading System)

BP401T. PHARMACEUTICAL ORGANIC CHEMISTRY –III (Theory)

45 Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: This subject imparts knowledge on stereo-chemical aspects of organic compounds and organic reactions, important named reactions, chemistry of important hetero cyclic compounds. It also emphasizes on medicinal and other uses of organic compounds.

Objectives: At the end of the course, the student shall be able to

1. understand the methods of preparation and properties of organic compounds
2. explain the stereo chemical aspects of organic compounds and stereo chemical reactions
3. know the medicinal uses and other applications of organic compounds

Course Content:

Note: To emphasize on definition, types, mechanisms, examples, uses/applications

UNIT-I **10 Hours**

Stereo isomerism

Optical isomerism –

Optical activity, enantiomerism, diastereoisomerism, meso compounds Elements of symmetry, chiral and achiral molecules

DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers

Reactions of chiral molecules

Racemic modification and resolution of racemic mixture. Asymmetric synthesis: partial and absolute

UNIT-II **10 Hours**

Geometrical isomerism

Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems)

Methods of determination of configuration of geometrical isomers.

Conformational isomerism in Ethane, n-Butane and Cyclohexane.

Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity.

Stereospecific and stereoselective reactions

UNIT-III **10 Hours**

Heterocyclic compounds:

Nomenclature and classification

Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrrole, Furan, and Thiophene

Relative aromaticity and reactivity of Pyrrole, Furan and Thiophene

UNIT-IV **8 Hours**

Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrazole, Imidazole, Oxazole and Thiazole.

Pyridine, Quinoline, Isoquinoline, Acridine and Indole. Basicity of pyridine Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives

UNIT-V **07 Hours**

Reactions of synthetic importance

Metal hydride reduction (NaBH4 and LiAlH4), Clemmensen reduction, Birch reduction, Wolff Kishner reduction.

Oppenauer-oxidation and Dakin reaction.

Beckmanns rearrangement and Schmidt rearrangement. Claisen-Schmidt condensation

Recommended Books (Latest Editions)

1. Organic chemistry by I.L. Finar, Volume-I & II.
2. A text book of organic chemistry – Arun Bahl, B.S. Bahl.
3. Heterocyclic Chemistry by Raj K. Bansal
4. Organic Chemistry by Morrison and Boyd
5. Heterocyclic Chemistry by T.L. Gilchrist

BACHELOR OF PHARMACY (SEMESTER-IV)
(Credit Based Evaluation & Grading System)

BP402T. MEDICINAL CHEMISTRY – I (Theory)

45 Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

Objectives: Upon completion of the course the student shall be able to

1. understand the chemistry of drugs with respect to their pharmacological activity
2. understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3. know the Structural Activity Relationship (SAR) of different class of drugs
4. write the chemical synthesis of some drugs

Course Content:

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*)

UNIT- I **10 Hours**

Introduction to Medicinal Chemistry

History and development of medicinal chemistry Physicochemical properties in relation to biological action

Ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein binding, Chelation, Bioisosterism, Optical and Geometrical isomerism.

Drug metabolism

Drug metabolism principles- Phase I and Phase II.

Factors affecting drug metabolism including stereo chemical aspects.

UNIT- II **10 Hours**

Drugs acting on Autonomic Nervous System Adrenergic Neurotransmitters:

Biosynthesis and catabolism of catecholamine.

Adrenergic receptors (Alpha & Beta) and their distribution.

Sympathomimetic agents: SAR of Sympathomimetic agents

Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine*, Dopamine, Methyldopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline.

- **Indirect acting agents:** Hydroxyamphetamine, Pseudoephedrine, Propylhexedrine.
- Agents with mixed mechanism: Ephedrine, Metaraminol.

Adrenergic Antagonists:

Alpha adrenergic blockers: Tolazoline*, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide.

Beta adrenergic blockers: SAR of beta blockers, Propranolol*, Metibranolol, Atenolol, Betazolol, Bisoprolol, Esmolol, Metoprolol, Labetolol, Carvedilol.

UNIT-III **10 Hours**

Cholinergic neurotransmitters:

Biosynthesis and catabolism of acetylcholine.

Cholinergic receptors (Muscarinic & Nicotinic) and their distribution.

Parasympathomimetic agents: SAR of Parasympathomimetic agents

Direct acting agents: Acetylcholine, Carbachol*, Bethanechol, Methacholine, Pilocarpine.

Indirect acting/ Cholinesterase inhibitors (Reversible & Irreversible): Physostigmine, Neostigmine*,

Pyridostigmine, Edrophonium chloride, Tacrine hydrochloride, Ambenonium chloride, Isofluorphate, Echothiophate iodide, Parathione, Malathion.

Cholinesterase reactivator: Pralidoxime chloride.

Cholinergic Blocking agents: SAR of cholinolytic agents

Solanaceous alkaloids and analogues: Atropine sulphate, Hyoscyamine sulphate, Scopolamine hydrobromide, Homatropine hydrobromide, Ipratropium bromide*.

Synthetic cholinergic blocking agents: Tropicamide, Cyclopentolate hydrochloride, Clidinium bromide, Dicyclomine hydrochloride*, Glycopyrrolate, Methantheline bromide, Propantheline bromide, Benztropine mesylate, Orphenadrine citrate, Biperidine hydrochloride, Procyclidine hydrochloride*, Tridihexethyl chloride, Isopropamide iodide, Ethopropazine hydrochloride.

UNIT- IV **08 Hours**

Drugs acting on Central Nervous System

A. Sedatives and Hypnotics:

Benzodiazepines: SAR of Benzodiazepines, Chlordiazepoxide, Diazepam*, Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem

Barbiturtes: SAR of barbiturates, Barbital*, Phenobarbital, Mephobarbital, Amobarbital, Butabarbital, Pentobarbital, Secobarbital

Miscelleneous:

Amides & imides: Glutethmide.

Alcohol & their carbamate derivatives: Meprobomate, Ethchlorvynol. Aldehyde & their derivatives: Triclofos sodium, Paraldehyde.

B. Antipsychotics

Phenothiazeines: SAR of Phenothiazeines - Promazine hydrochloride, Chlorpromazine hydrochloride*, Trifluprомazine, Thioridazine hydrochloride, Piperacetazine hydrochloride, Prochlorperazine maleate, Trifluoperazine hydrochloride.

Ring Analogues of Phenothiazeines: Chlorprothixene, Thiothixene, Loxapine succinate, Clozapine.

Fluro buterophenones: Haloperidol, Droperidol, Risperidone.

Beta amino ketones: Molindone hydrochloride.

Benzamides: Sulpieride.

C. **Anticonvulsants:** SAR of Anticonvulsants, mechanism of anticonvulsant action

Barbiturates: Phenobarbitone, Methabarbital. Hydantoins: Phenytoin*, Mephenytoin, Ethotoin Oxazolidine diones: Trimethadione, Paramethadione Succinimides: Phensuximide, Methsuximide, Ethosuximide* Urea and monoacylureas: Phenacemide, Carbamazepine* Benzodiazepines: Clonazepam

Miscellaneous: Primidone, Valproic acid , Gabapentin, Felbamate

UNIT – V **07 Hours**

Drugs acting on Central Nervous System

General anesthetics:

Inhalation anesthetics: Halothane*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane.

Ultra short acting barbitutrates: Methohexital sodium*, Thiamylal sodium, Thiopental sodium.

Dissociative anesthetics: Ketamine hydrochloride.*

Narcotic and non-narcotic analgesics

Morphine and related drugs: SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anilerdine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride,

Fentanyl citrate*, Methadone hydrochloride*, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartarate.

Narcotic antagonists: Nalorphine hydrochloride, Levallorphan tartarate, Naloxone hydrochloride.

Anti-inflammatory agents: Sodium salicylate, Aspirin, Mefenamic acid*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepriac, Diclofenac, Ketorolac, Ibuprofen*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.

Recommended Books (Latest Editions)

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

BACHELOR OF PHARMACY (SEMESTER-IV)
(Credit Based Evaluation & Grading System)

BP 403 T. PHYSICAL PHARMACEUTICS-II (Theory)

45Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: The course deals with the various physica and physicochemical properties, and principles involved in dosage forms/formulations. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

Objectives: Upon the completion of the course student shall be able to

1. Understand various physicochemical properties of drug molecules in the designing the dosage forms
2. Know the principles of chemical kinetics & to use them for stability testing nad determination of expiry date of formulations
3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

Course Content:

UNIT-I **07 Hours**

Colloidal dispersions: Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles, classification of colloids & comparative account of their general properties. Optical, kinetic & electrical properties. Effect of electrolytes, coacervation, peptization& protective action.

UNIT-II **10 Hours**

Rheology: Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling Sphere, rotational viscometers

Deformation of solids: Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus

UNIT-III **10 Hours**

Coarse dispersion: Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of flocculated and deflocculated suspensions. Emulsions and theories of emulsification, microemulsion and multiple emulsions; Stability of emulsions, preservation of emulsions, rheological properties of emulsions and emulsion formulation by HLB method.

UNIT-IV **10Hours**

Micromeretics: Particle size and distribution, mean particle size, number and weight distribution, particle number, methods for determining particle size by different methods, counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.

UNIT-V **10 Hours**

Drug stability: Reaction kinetics: zero, pseudo-zero, first & second order, units of basic rate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific & general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention

Recommended Books: (Latest Editions)

1. Physical Pharmacy by Alfred Martin, Sixth edition
2. Experimental pharmaceutics by Eugene, Parott.
3. Tutorial pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical calculations, Lea & Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical Pharmaceutics by Ramasamy C, and Manavalan R.

BACHELOR OF PHARMACY (SEMESTER-IV)
(Credit Based Evaluation & Grading System)

BP 404 T. PHARMACOLOGY-I (Theory)

45 Hrs
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: The main purpose of the subject is to understand what drugs do to the living organisms and how their effects can be applied to therapeutics. The subject covers the information about the drugs like, mechanism of action, physiological and biochemical effects (pharmacodynamics) as well as absorption, distribution, metabolism and excretion (pharmacokinetics) along with the adverse effects, clinical uses, interactions, doses, contraindications and routes of administration of different classes of drugs.

Objectives: Upon completion of this course the student should be able to

1. Understand the pharmacological actions of different categories of drugs
2. Explain the mechanism of drug action at organ system/sub cellular/ macromolecular levels.
3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
4. Observe the effect of drugs on animals by simulated experiments
5. Appreciate correlation of pharmacology with other bio medical sciences

Course Content:

UNIT-I **08 hours**

1. General Pharmacology

a. Introduction to Pharmacology- Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists(competitive and non competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy.

b. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs .Enzyme induction, enzyme inhibition, kinetics of elimination

UNIT-II **12 Hours**

General Pharmacology

a. **Pharmacodynamics-** Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal transduction mechanisms, G-protein–coupled receptors, ion channel receptor, transmembrane enzyme linked receptors, transmembrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action.

b. Adverse drug reactions.

c. Drug interactions (pharmacokinetic and pharmacodynamic)

d. Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.

UNIT-III **10 Hours**

2. Pharmacology of drugs acting on peripheral nervous system
   a. Organization and function of ANS.
   b. Neurohumoral transmission,co-transmission and classification of neurotransmitters.
   c. Parasympathomimetics, Parasympatholytics, Sympathomimetics, sympatholytics.
   d. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).
   e. Local anesthetic agents.
   f. Drugs used in myasthenia gravis and glaucoma

UNIT-IV **08 Hours**

3. Pharmacology of drugs acting on central nervous system
   a. Neurohumoral transmission in the C.N.S.special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine.
   b. General anesthetics and pre-anesthetics.
   c. Sedatives, hypnotics and centrally acting muscle relaxants.
   d. Anti-epileptics
   e. Alcohols and disulfiram

UNIT-V **07 Hours**

4. Pharmacology of drugs acting on central nervous system
   a. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, anti-manics and hallucinogens.
   b. Drugs used in Parkinsons disease and Alzheimer's disease.
   c. CNS stimulants and nootropics.
   d. Opioid analgesics and antagonists
   e. Drug addiction, drug abuse, tolerance and dependence.

Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology,.Churchil Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology
6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert,
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
10. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan,

BACHELOR OF PHARMACY (SEMESTER-IV)
(Credit Based Evaluation & Grading System)

BP 405 T.PHARMACOGNOSY AND PHYTOCHEMISTRY I (Theory)

45 Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: The subject involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.

Objectives: Upon completion of the course, the student shall be able

1. to know the techniques in the cultivation and production of crude drugs
2. to know the crude drugs, their uses and chemical nature
3. know the evaluation techniques for the herbal drugs
4. to carry out the microscopic and morphological evaluation of crude drugs

Course Content:

UNIT-I **10 Hours**

Introduction to Pharmacognosy:

(a) Definition, history, scope and development of Pharmacognosy
(b) Sources of Drugs – Plants, Animals, Marine & Tissue culture
(c) Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins).

Classification of drugs:

Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs

Quality control of Drugs of Natural Origin:

Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties.
Quantitative microscopy of crude drugs including lycopodium spore method, leafconstants, camera lucida and diagrams of microscopic objects to scale with camera lucida.

UNIT-II **10 Hours**

Cultivation, Collection, Processing and storage of drugs of natural origin:

Cultivation and Collection of drugs of natural origin Factors influencing cultivation of medicinal plants. Plant hormones and their applications.
Polyploidy, mutation and hybridization with reference to medicinal plants
Conservation of medicinal plants

UNIT-III **07 Hours**

Plant tissue culture:

Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance.

Applications of plant tissue culture in pharmacognosy. Edible vaccines

Pharmacognosy in various systems of medicine:

UNIT IV **10 Hours**

Role of Pharmacognosy in allopathy and traditional systems of medicine namely, Ayurveda, Unani, Siddha, Homeopathy and Chinese systems of medicine.

Introduction to secondary metabolites:

Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins

UNIT V **08 Hours**

Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs

Plant Products:

Fibers - Cotton, Jute, Hemp

Hallucinogens, Teratogens, Natural allergens

Primary metabolites:

General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic used and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites:

Carbohydrates: Acacia, Agar, Tragacanth, Honey

Proteins and Enzymes : Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin).

Lipids(Waxes, fats, fixed oils) : Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax

Marine Drugs:

Novel medicinal agents from marine sources

Recommended Books: (Latest Editions)

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009.
2. Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988.
3. Text Book of Pharmacognosy by T.E. Wallis
4. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
5. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi
6. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
7. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007
8. Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhlae
9. Anatomy of Crude Drugs by M.A. Iy

BP406P. MEDICINAL CHEMISTRY – I (Practical)

4 Hours/Week

A. Preparation of drugs/ intermediates

1. 1,3-pyrazole

2. 1,3-oxazole

3. Benzimidazole

4. Benztriazole

5. 2,3- diphenyl quinoxaline

6. Benzocaine

7. Phenytoin

8. Phenothiazine

9. Barbiturate

B. Assay of drugs

1. Chlorpromazine
2. Phenobarbitone
3. Atropine
4. Ibuprofen
5. Aspirin
6. Furosemide

III **Determination of Partition coefficient for any two drugs**

BP 407P. PHYSICAL PHARMACEUTICS- II (Practical)
3 Hrs/week

1. Determination of particle size, particle size distribution using sieving method
2. Determination of particle size, particle size distribution using Microscopic method
3. Determination of bulk density, true density and porosity
4. Determine the angle of repose and influence of lubricant on angle of repose
5. Determination of viscosity of liquid using Ostwald's viscometer
6. Determination sedimentation volume with effect of different suspending agent
7. Determination sedimentation volume with effect of different concentration of single suspending agent
8. Determination of viscosity of semisolid by using Brookfield viscometer
9. Determination of reaction rate constant first order.
10. Determination of reaction rate constant second order
11. Accelerated stability studies

BACHELOR OF PHARMACY (SEMESTER-IV)
(Credit Based Evaluation & Grading System)

BP 408P.PHARMACOLOGY-I (Practical)

4Hrs/Week

1. Introduction to experimental pharmacology.
2. Commonly used instruments in experimental pharmacology.
3. Study of common laboratory animals.
4. Maintenance of laboratory animals as per CPCSEA guidelines.
5. Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies
6. Study of different routes of drugs administration in mice/rats.
7. Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice.
8. Effect of drugs on ciliary motility of frog oesophagus
9. Effect of drugs on rabbit eye.
10. Effects of skeletal muscle relaxants using rota-rod apparatus.
11. Effect of drugs on locomotor activity using actophotometer.
12. Anticonvulsant effect of drugs by MES and PTZ method.
13. Study of stereotype and anti-catatonic activity of drugs on rats/mice.
14. Study of anxiolytic activity of drugs using rats/mice.
15. Study of local anesthetics by different methods

Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares and videos

BP409 P. PHARMACOGNOSY AND PHYTOCHEMISTRY I (Practical)

4 Hours/Week

1. Analysis of crude drugs by chemical tests: (i)Tragaccanth (ii) Acacia (iii)Agar (iv) Gelatin (v) starch (vi) Honey (vii) Castor oil
2. Determination of stomatal number and index
3. Determination of vein islet number, vein islet termination and paliside ratio
4. Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer
5. Determination of Fiber length and width
6. Determination of number of starch grains by Lycopodium spore method
7. Determination of Ash value
8. Determination of Extractive values of crude drugs
9. Determination of moisture content of crude drugs
10. Determination of swelling index and foamin

BACHELOR OF PHARMACY (SEMESTER-V)
(Credit Based Continuous Evaluation Grading System)

BP501T. MEDICINAL CHEMISTRY – II (Theory)

4 Credits (3-1-0) 45 Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

Objectives: Upon completion of the course the student shall be able to

1. Understand the chemistry of drugs with respect to their pharmacological activity
2. Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3. Know the Structural Activity Relationship of different class of drugs
4. Study the chemical synthesis of selected drugs

Course Content:

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*)

UNIT- I **10 Hours**

Antihistaminic agents: Histamine, receptors and their distribution in the human body
H_1–antagonists: Diphenhydramine hydrochloride*, Dimenhydrinate, Doxylamines cuccinate, Clemastine fumarate, Diphenylphyraline hydrochloride, Tripelenamine hydrochloride, Chlorcyclizine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride*, Phenidamine tartarate, Promethazine hydrochloride*, Trimeprazine tartrate, Cyproheptadine hydrochloride, Azatidine maleate, Astemizole, Loratadine, Cetirizine, Levocetrazine Cromolyn sodium
H_2-antagonists: Cimetidine*, Famotidine, Ranitidin.
Gastric Proton pump inhibitors: Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole
Anti-neoplastic agents:
Alkylating agents: Meclorethamine*, Cyclophosphamide, Melphalan, Chlorambucil, Busulfan, Thiotepa
Antimetabolites: Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine

Antibiotics: Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin

Plant products: Etoposide, Vinblastin sulphate, Vincristin sulphate

Miscellaneous: Cisplatin, Mitotane

UNIT – II **10 Hours**

Anti-anginal:
Vasodilators: Amyl nitrite, Nitroglycerin*, Pentaerythritol tetranitrate, Isosorbide dinitrite*, Dipyridamole.
Calcium channel blockers: Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine.

Diuretics:
Carbonic anhydrase inhibitors: Acetazolamide*, Methazolamide, Dichlorphenamide.
Thiazides: Chlorthiazide*, Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide,
Loop diuretics: Furosemide*, Bumetanide, Ethacrynic acid.
Potassium sparing Diuretics: Spironolactone, Triamterene, Amiloride.
Osmotic Diuretics: Mannitol
Anti-hypertensive Agents: Timolol, Captopril, Lisinopril, Enalapril, Benazepril hydrochloride, Quinapril hydrochloride, Methyldopate hydrochloride,* Clonidine hydrochloride, Guanethidine monosulphate, Guanabenz acetate, Sodium nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride.

UNIT- III **10 Hours**

Anti-arrhythmic Drugs: Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcainide hydrochloride, Amiodarone, Sotalol.

Anti-hyperlipidemic agents: Clofibrate, Lovastatin, Cholesteramine and Cholestipol
Coagulant & Anticoagulants: Menadione, Acetomenadione, Warfarin*, Anisindione, clopidogrel
Drugs used in Congestive Heart Failure: Digoxin, Digitoxin, Nesiritide, Bosentan, Tezosentan.

UNIT- IV **08 Hours**

Drugs acting on Endocrine system

Nomenclature, Stereochemistry and metabolism of steroids

Sex hormones: Testosterone, Nandralone, Progestrones, Oestriol, Oestradiol, Oestrione, Diethyl stilbestrol.
Drugs for erectile dysfunction: Sildenafil, Tadalafil.
Oral contraceptives: Mifepristone, Norgestril, Levonorgestrol
Corticosteroids: Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone
Thyroid and antithyroid drugs: L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.

UNIT – V **07 Hours**

Antidiabetic agents:

Insulin and its preparations

Sulfonyl ureas: Tolbutamide*, Chlorpropamide, Glipizide, Glimepiride. Biguanides: Metformin. Thiazolidinediones: Pioglitazone, Rosiglitazone. Meglitinides: Repaglinide, Nateglinide. Glucosidase inhibitors: Acrabose, Voglibose.

Local Anesthetics: SAR of Local anesthetics

Benzoic Acid derivatives: Cocaine, Hexylcaine, Meprylcaine, Cyclomethycaine, Piperocaine.

Amino Benzoic acid derivatives: Benzocaine*, Butamben, Procaine*, Butacaine, Propoxycaine, Tetracaine, Benoxinate.

Lidocaine/Anilide derivatives: Lignocaine, Mepivacaine, Prilocaine, Etidocaine.

Miscellaneous: Phenacaine, Diperodon, and Dibucaine.*

Recommended Books (Latest Editions)

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1to 5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

BACHELOR OF PHARMACY (SEMESTER-V)
(Credit Based Continuous Evaluation Grading System)

BP 502T. Industrial Pharmacy I (Theory)

4 Credits (3-1-0) 45 Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.

Objectives: Upon completion of the course the student shall be able to

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms
3. Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

Course content:

UNIT-I **07 Hours**

Preformulation Studies: Introduction to preformulation, goals and objectives, study of physicochemical characteristics of drug substances.

a. Physical properties: Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism

b. Chemical Properties: Hydrolysis, oxidation, reduction, racemisation, polymerization

BCS classification of drugs & its significant

Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.

UNIT-II ***10 Hours***

Tablets:

a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipments and tablet tooling.

b. Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating.

c. Quality control tests: In process and finished product tests

Liquid orals: Formulation and manufacturing consideration of syrups and elixirs suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia

UNIT-III 08 Hours

Capsules:

a. ***Hard gelatin capsules:*** Introduction, Production of hard gelatin capsule shells. Size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. In process and final product quality control tests for capsules.

b. ***Soft gelatin capsules:*** Nature of shell and capsule content, size of capsules, importance of base adsorption and minim/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules and their applications.

Pellets: Introduction, formulation requirements, pelletization process, equipments for manufacture of pellets

UNIT-IV 10 Hours

Parenteral Products:

a. Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity

b. Production procedure, production facilities and controls, aseptic processing

c. Formulation of injections, sterile powders, large volume parenterals and lyophilized products.

d. Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests of parenteral products.

Ophthalmic Preparations: Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations

UNIT-V 10 Hours

Cosmetics: Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens.

Pharmaceutical Aerosols: Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies.

Packaging Materials Science: Materials used for packaging of pharmaceutical products, factors influencing choice of containers, legal and official requirements for containers, stability aspects of packaging materials, quality control tests.

BACHELOR OF PHARMACY (SEMESTER-V)
(Credit Based Continuous Evaluation Grading System)

BP 506 P. Industrial Pharmacy I (Practical)

2 Credits (0-0-2)
4 Hours/week

1. Preformulation studies on paracetamol/asparin/or any other drug
2. Preparation and evaluation of Paracetamol tablets
3. Preparation and evaluation of Aspirin tablets
4. Coating of tablets- film coating of tables/granules
5. Preparation and evaluation of Tetracycline capsules
6. Preparation of Calcium Gluconate injection
7. Preparation of Ascorbic Acid injection
8. Qulaity control test of (as per IP) marketed tablets and capsules
9. Preparation of Eye drops/ and Eye ointments
10. Preparation of Creams (cold / vanishing cream)
11. Evaluation of Glass containers (as per IP)

Recommended Books: (Latest Editions)

1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman & J.B.Schwartz
2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman
3. Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman
4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition
5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)
6. Theory and Practice of Industrial Pharmacy by Liberman & Lachman
7. Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchill livingstone, Latest edition
8. Introduction to Pharmaceutical Dosage Forms by H. C.Ansel, Lea &Febiger, Philadelphia, 5thedition, 2005
9. Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.

BACHELOR OF PHARMACY (SEMESTER-V)
(Credit Based Continuous Evaluation Grading System)

BP503T. PHARMACOLOGY-II (Theory)

4 Credits (3-1-0) 45 Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on different systems of body and in addition, emphasis on the basic concepts of bioassay.

Objectives: Upon completion of this course the student should be able to

1. Understand the mechanism of drug action and its relevance in the treatment of different diseases
2. Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments
3. Demonstrate the various receptor actions using isolated tissue preparation
4. Appreciate correlation of pharmacology with related medical sciences

Course Content:

UNIT-I **10 hours**

1. Pharmacology of drugs acting on cardio vascular system

a. Introduction to hemodynamic and electrophysiology of heart.
b. Drugs used in congestive heart failure
c. Anti-hypertensive drugs.
d. Anti-anginal drugs.
e. Anti-arrhythmic drugs.
f. Anti-hyperlipidemic drugs.

UNIT-II **10 hours**

1. Pharmacology of drugs acting on cardio vascular system

a. Drug used in the therapy of shock.
b. Hematinics, coagulants and anticoagulants.
c. Fibrinolytics and anti-platelet drugs
d. Plasma volume expanders

2. Pharmacology of drugs acting on urinary system

a. Diuretics
b. Anti-diuretics.

UNIT-III **10 hours**

3. Autocoids and related drugs

a. Introduction to autacoids and classification
b. Histamine, 5-HT and their antagonists.
c. Prostaglandins, Thromboxanes and Leukotrienes.
d. Angiotensin, Bradykinin and Substance P.
e. Non-steroidal anti-inflammatory agents
f. Anti-gout drugs
g. Antirheumatic drugs

UNIT-IV **08 hours**

5. Pharmacology of drugs acting on endocrine system

a. Basic concepts in endocrine pharmacology.
b. Anterior Pituitary hormones- analogues and their inhibitors.
c. Thyroid hormones- analogues and their inhibitors.
d. Hormones regulating plasma calcium level- Parathormone, Calcitonin and Vitamin-D.
d. Insulin, Oral Hypoglycemic agents and glucagon.
e. ACTH and corticosteroids.

UNIT-V **07 hours**

5. Pharmacology of drugs acting on endocrine system

a. Androgens and Anabolic steroids.
b. Estrogens, progesterone and oral contraceptives.
c. Drugs acting on the uterus.

6. Bioassay

a. Principles and applications of bioassay. b.Types of bioassay

c. Bioassay of insulin, oxytocin, vasopressin, ACTH, d-tubocurarine, digitalis, histamine and 5-HT

BP 507 P. PHARMACOLOGY-II (Practical)

2 Credits (0-0-2)
4 Hours/week

1. Introduction to *in-vitro* pharmacology and physiological salt solutions.
2. Effect of drugs on isolated frog heart.
3. Effect of drugs on blood pressure and heart rate of dog.
4. Study of diuretic activity of drugs using rats/mice.
5. DRC of acetylcholine using frog rectus abdominis muscle.
6. Effect of physostigmine and atropine on DRC of acetylcholine using frog rectus abdominis muscle and rat ileum respectively.
7. Bioassay of histamine using guinea pig ileum by matching method.
8. Bioassay of oxytocin using rat uterine horn by interpolation method.
9. Bioassay of serotonin using rat fundus strip by three point bioassay.
10. Bioassay of acetylcholine using rat ileum/colon by four point bioassay.
11. Determination of PA2 value of prazosin using rat anococcygeus muscle (by Schilds plot method).
12. Determination of PD2 value using guinea pig ileum.
13. Effect of spasmogens and spasmolytics using rabbit jejunum.
14. Anti-inflammatory activity of drugs using carrageenan induced paw-edema model.
15. Analgesic activity of drug using central and peripheral methods

Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares and videos

Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill.
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins.
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology.
6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert.
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
10. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakasha

BACHELOR OF PHARMACY (SEMESTER-V)
(Credit Based Continuous Evaluation Grading System)

BP504T. PHARMACOGNOSY AND PHYTOCHEMISTRY II (Theory)

4 Credits (3-1-0) 45 Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: The main purpose of subject is to impart the students the knowledge of how the secondary metabolites are produced in the crude drugs, how to isolate and identify and produce them industrially. Also this subject involves the study of producing the plants and phytochemicals through plant tissue culture, drug interactions and basic principles of traditional system of medicine

Objectives: Upon completion of the course, the student shall be able

1. to know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents
2. to understand the preparation and development of herbal formulation.
3. to understand the herbal drug interactions
4. to carryout isolation and identification of phytoconstituents

Course Content:

UNIT-I **7 Hours**

Metabolic pathways in higher plants and their determination

a) Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways- Shikimic acid pathway, Acetate pathways and Amino acid pathway.

b) Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.

UNIT-II **14 Hours**

General introduction, composition, chemistry & chemical classes, biosources, therapeutic uses and commercial applications of following secondary metabolites:

Alkaloids: Vinca, Rauwolfia, Belladonna, Opium,
Phenylpropanoids and Flavonoids: Lignans, Tea, Ruta
Steroids, Cardiac Glycosides & Triterpenoids: Liquorice, Dioscorea, Digitalis
Volatile oils: Mentha, Clove, Cinnamon, Fennel, Coriander,
Tannins: Catechu, Pterocarpus
Resins: Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony
Glycosides: Senna, Aloes, Bitter Almond
Iridoids, Other terpenoids & Naphthaquinones: Gentian, Artemisia, taxus, carotenoids

UNIT-III **06 Hours**

Isolation, Identification and Analysis of Phytoconstituents

a) Terpenoids: Menthol, Citral, Artemisin
b) Glycosides: Glycyrhetinic acid & Rutin
c) Alkaloids: Atropine,Quinine,Reserpine,Caffeine
d) Resins: Podophyllotoxin, Curcumin

UNIT-IV **10 Hours**

Industrial production, estimation and utilization of the following phytoconstituents: Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastine

UNIT V **8 Hours**

Basics of Phytochemistry

Modern methods of extraction, application of latest techniques like Spectroscopy, chromatography and electrophoresis in the isolation, purification and identification of crude drugs.

BP 508P. PHARMACOGNOSY AND PHYTOCHEMISTRY II (Practical)

2 Credits (0-0-2)
4 Hours/week

1. Morphology, histology and powder characteristics & extraction & detection of: Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander
2. Exercise involving isolation & detection of active principles
   a. Caffeine - from tea dust.
   b. Diosgenin from Dioscorea
   c. Atropine from Belladonna
   d. Sennosides from Senna
3. Separation of sugars by Paper chromatography
4. TLC of herbal extract
5. Distillation of volatile oils and detection of phytoconstitutents by TLC
6. Analysis of crude drugs by chemical tests: **(**i) Asafoetida (ii) Benzoin (iii) Colophony (iv) Aloes (v) Myrrh

Recommended Books: (Latest Editions)

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009.
2. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
3. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
4. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
5. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007
6. Herbal Cosmetics by H.Pande, Asia Pacific Business press, Inc, New Delhi.
7. A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.
8. R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994.
9. Pharmacognosy & Pharmacobiotechnology. James Bobbers, Marilyn KS, VE Tylor.
10. The formulation and preparation of cosmetic, fragrances and flavours.
11. Remington's Pharmaceutical sciences.
12. Text Book of Biotechnology by Vyas and Dixit.
13. Text Book of Biotechnology by R.C. Dubey

BACHELOR OF PHARMACY (SEMESTER-V)
(Credit Based Continuous Evaluation Grading System)

BP 505T. PHARMACEUTICAL JURISPRUDENCE (Theory)

4 Credits (3-1-0) 45 Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: This course is designed to impart basic knowledge on important legislations related to the profession of pharmacy in India.

Objectives: Upon completion of the course, the student shall be able to understand:

1. The Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals.
2. Various Indian pharmaceutical Acts and Laws
3. The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
4. The code of ethics during the pharmaceutical practice

Course Content:

UNIT-I 10 Hours

Drugs and Cosmetics Act, 1940 and its rules 1945:

Objectives, Definitions, Legal definitions of schedules to the Act and Rules

Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties**.**

Manufacture of drugs – Prohibition of manufacture and sale of certain drugs,

Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.

UNIT-II 10 Hours

Drugs and Cosmetics Act, 1940 and its rules 1945.

Detailed study of Schedule G, H, M, N, P, T, U, V, X, Y, Part XII B, Sch F & DMR (OA) Sale

of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties

Labeling & Packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties.

Administration of the Act and Rules – Drugs Technical Advisory Board, Central drugs Laboratory, Drugs Consultative Committee, Government drug analysts, licensing authorities, controlling authorities, Drugs Inspectors

UNIT-III **10 Hours**

- **Pharmacy Act –1948**: Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of Pharmacists, Offences and Penalties
- **Medicinal and Toilet Preparation Act –1955**: Objectives, Definitions, Licensing, Manufacture In bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations. Offences and Penalties.
- **Narcotic Drugs and Psychotropic substances Act-1985 and Rules**: Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties

UNIT-IV **08 Hours**

- **Study of Salient Features of Drugs and Magic Remedies Act and its rules:** Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties
- **Prevention of Cruelty to animals Act-1960:** Objectives, Definitions, Institutional Animal Ethics Committee, CPCSEA guidelines for Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties
- **National Pharmaceutical Pricing Authority:** Drugs Price Control Order (DPCO)-2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of Essential Medicines (NLEM)

UNIT-V **07 Hours**

- **Pharmaceutical Legislations –** A brief review, Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee
- **Code of Pharmaceutical ethics** Definition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath
- **Medical Termination of Pregnancy Act**
- **Right to Information Act**
- **Introduction to Intellectual Property Rights (IPR)**

Recommended books: (Latest Edition)

1. Forensic Pharmacy by B. Suresh
2. Text book of Forensic Pharmacy by B.M. Mithal
3. Hand book of drug law-by M.L. Mehra
4. A text book of Forensic Pharmacy by N.K. Jain
5. Drugs and Cosmetics Act/Rules by Govt. of India publications.
6. Medicinal and Toilet preparations act 1955 by Govt. of India publications.
7. Narcotic drugs and psychotropic substances act by Govt. of India publications
8. Drugs and Magic Remedies act by Govt. of India publication
9.Bare Acts of the said laws published by Government. Reference books (Theory)

BACHELOR OF PHARMACY (SEMESTER-VI)
(Credit Based Continuous Evaluation Grading System)

BP601T. MEDICINAL CHEMISTRY – III (Theory)

4 Credits (3-1-0) 45 Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

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

Objectives: Upon completion of the course student shall be able to

1. Understand the importance of drug design and different techniques of drug design.
2. Understand the chemistry of drugs with respect to their biological activity.
3. Know the metabolism, adverse effects and therapeutic value of drugs.
4. Know the importance of SAR of drugs.

Course Content:

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted by (*)

UNIT – I 10 Hours

Antibiotics

Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.
β-Lactam antibiotics: Penicillin, Cepholosporins, β- Lactamase inhibitors, Monobactams
Aminoglycosides: Streptomycin, Neomycin, Kanamycin
Tetracyclines: Tetracycline,Oxytetracycline, Chlortetracycline, Minocycline, Doxycycline

UNIT – II 10 Hours

Antibiotics

Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.
Macrolide: Erythromycin Clarithromycin, Azithromycin.
Miscellaneous: Chloramphenicol*, Clindamycin.
Prodrugs: Basic concepts and application of prodrugs design.
Antimalarials: Etiology of malaria.
Quinolines: SAR, Quinine sulphate, Chloroquine*, Amodiaquine, Primaquine phosphate, Pamaquine*, Quinacrine hydrochloride, Mefloquine.
Biguanides and dihydro triazines: Cycloguanil pamoate, Proguanil.
Miscellaneous: Pyrimethamine, Artesunete, Artemether, Atovoquone.

UNIT – III **10 Hours**

Anti-tubercular Agents

Synthetic anti tubercular agents: Isoniozid*, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid.*

Anti tubercular antibiotics: Rifampicin, Rifabutin, Cycloserine Streptomycine, Capreomycin sulphate.

Urinary tract anti-infective agents

Quinolones: SAR of quinolones, Nalidixic Acid,Norfloxacin, Enoxacin, Ciprofloxacin*, Ofloxacin, Lomefloxacin, Sparfloxacin, Gatifloxacin, Moxifloxacin

Miscellaneous: Furazolidine, Nitrofurantoin*, Methanamine.

Antiviral agents: Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine trifluoride, Acyclovir*, Gancyclovir, Zidovudine, Didanosine, Zalcitabine, Lamivudine, Loviride, Delavirding, Ribavirin, Saquinavir, Indinavir, Ritonavir.

UNIT – IV **08 Hours**

Antifungal agents:

Antifungal antibiotics: Amphotericin-B, Nystatin, Natamycin, Griseofulvin.

Synthetic Antifungal agents: Clotrimazole, Econazole, Butoconazole, Oxiconazole Tioconozole, Miconazole*, Ketoconazole, Terconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate*.

Anti-protozoal Agents: Metronidazole*, Tinidazole, Ornidazole, Diloxanide, Iodoquinol, Pentamidine Isethionate, Atovaquone, Eflornithine.

Anthelmintics: Diethylcarbamazine citrate*, Thiabendazole, Mebendazole*, Albendazole, Niclosamide, Oxamniquine, Praziquantal, Ivermectin.

Sulphonamides and Sulfones

Historical development, chemistry, classification and SAR of Sulfonamides: Sulphamethizole, Sulfisoxazole, Sulphamethizine, Sulfacetamide*, Sulphapyridine, Sulfamethoxaole*, Sulphadiazine, Mefenide acetate, Sulfasalazine.

Folate reductase inhibitors: Trimethoprim*, Cotrimoxazole.

Sulfones: Dapsone*.

UNIT – V **07 Hours**

Introduction to Drug Design

Various approaches used in drug design.

Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient, Hammet's electronic parameter, Tafts steric parameter and Hansch analysis. Pharmacophore modeling and docking techniques.

Combinatorial Chemistry: Concept and applications chemistry: solid phase and solution phase synthesis of combinatorial

BP607P. MEDICINAL CHEMISTRY- III (Practical)

2 Credits (0-0-2)
4 Hours/week

I Preparation of drugs and intermediates

1 Sulphanilamide
2 7-Hydroxy, 4-methyl coumarin
3 Chlorobutanol
4 Triphenyl imidazole
5 Tolbutamide
6 Hexamine

II Assay of drugs

1 Isonicotinic acid hydrazide
2 Chloroquine
3 Metronidazole
4 Dapsone
5 Chlorpheniramine maleate
6 Benzyl penicillin

III Preparation of medicinally important compounds or intermediates by Microwave irradiation technique

IV Drawing structures and reactions using chem draw®

V Determination of physicochemical properties such as logP, clogP, MR, Molecular weight, Hydrogen bond donors and acceptors for class of drugs course content using drug design software Drug likeliness screening (Lipinskies RO5)

Recommended Books (Latest Editions)

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

BACHELOR OF PHARMACY (SEMESTER-VI)
(Credit Based Continuous Evaluation Grading System)

BP602 T. PHARMACOLOGY-III (Theory)

4 Credits (3-1-0) 45 Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on respiratory and gastrointestinal system, infectious diseases, immuno-pharmacology and in addition, emphasis on the principles of toxicology and chronopharmacology.

Objectives: Upon completion of this course the student should be able to:

1. understand the mechanism of drug action and its relevance in the treatment of different infectious diseases
2. comprehend the principles of toxicology and treatment of various poisonings and
3. Appreciate correlation of pharmacology with related medical sciences.

Course Content:

UNIT-I **10 hours**

1. Pharmacology of drugs acting on Respiratory system

a. Anti -asthmatic drugs
b. Drugs used in the management of COPD
c. Expectorants and antitussives
d. Nasal decongestants
e. Respiratory stimulants

2. Pharmacology of drugs acting on the Gastrointestinal Tract

a. Antiulcer agents.
b. Drugs for constipation and diarrhoea.
c. Appetite stimulants and suppressants.
d. Digestants and carminatives.
e. Emetics and anti-emetics.

UNIT-II **10 hours**

3. Chemotherapy

a. General principles of chemotherapy.
b. Sulfonamides and cotrimoxazole.
c. Antibiotics- Penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides

UNIT-III **10hours**

3. Chemotherapy

a. Antitubercular agents
b. Antileprotic agents
c. Antifungal agents

d. Antiviral drugs
e.Anthelmintics
f. Antimalarial drugs
g. Antiamoebic agents

UNIT-IV **08hours**

3. Chemotherapy

a. Urinary tract infections and sexually transmitted diseases.
b. Chemotherapy of malignancy.

4. Immunopharmacology

a. Immunostimulants
b. Immunosuppressant

Protein drugs, monoclonal antibodies, target drugs to antigen, biosimilars

UNIT-V **07hours**

5. Principles of toxicology

a. Definition and basic knowledge of acute, subacute and chronic toxicity.
b. Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity
c. General principles of treatment of poisoning
d. Clinical symptoms and management of barbiturates, morphine, organophosphosphorus compound and lead, mercury and arsenic poisoning.

6. Chronopharmacology

a. Definition of rhythm and cycles.
b. Biological clock and their significance leading to chronotherapy.

BP 608 P. PHARMACOLOGY-III (Practical)

2 Credits (0-0-2)
4 Hours/week

1. Dose calculation in pharmacological experiments
2. Antiallergic activity by mast cell stabilization assay
3. Study of anti-ulcer activity of a drug using pylorus ligand (SHAY) rat model and NSAIDS induced ulcer model.
4. Study of effect of drugs on gastrointestinal motility
5. Effect of agonist and antagonists on guinea pig ileum
6. Estimation of serum biochemical parameters by using semi-autoanalyser
7. Effect of saline purgative on frog intestine
8. Insulin hypoglycemic effect in rabbit
9. Test for pyrogens (rabbit method)
10. Determination of acute oral toxicity (LD50) of a drug from a given data
11. Determination of acute skin irritation / corrosion of a test substance
12. Determination of acute eye irritation / corrosion of a test substance
13. Calculation of pharmacokinetic parameters from a given data
14. Biostatistics methods in experimental pharmacology(student's t test, ANOVA)
15. Biostatistics methods in experimental pharmacology (Chi square test, Wilcoxon Signed Rank test)

**Experiments are demonstrated by simulated experiments/videos*

Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs. The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology
6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert,
8. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata,
9. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan,
10. N.Udupa and P.D. Gupta, Concepts in Chronopharmacology.

BACHELOR OF PHARMACY (SEMESTER-VI)
(Credit Based Continuous Evaluation Grading System)

BP 603T. HERBAL DRUG TECHNOLOGY (Theory)

4 Credits (3-1-0) 45 Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: This subject gives the student the knowledge of basic understanding of herbal drug industry, the quality of raw material, guidelines for quality of herbal drugs, herbal cosmetics, natural sweeteners, nutraceutical etc. The subject also emphasizes on Good Manufacturing Practices (GMP), patenting and regulatory issues of herbal drugs

Objectives: Upon completion of this course the student should be able to:

1. understand raw material as source of herbal drugs from cultivation to herbal drug product
2. know the WHO and ICH guidelines for evaluation of herbal drugs
3. know the herbal cosmetics, natural sweeteners, nutraceuticals
4. appreciate patenting of herbal drugs, GMP .

Course content:

UNIT-I **11 Hours**

Herbs as raw materials

Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation Source of Herbs Selection, identification and authentication of herbal materials processing of herbal raw material

Biodynamic Agriculture

Good agricultural practices in cultivation of medicinal plants including Organic farming. Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides.

Indian Systems of Medicine

a) Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy

b) Preparation and standardization of Ayurvedic formulations viz Aristas and Asawas, Ghutika, Churna, Lehya and Bhasma.

UNIT-II **7 Hours**

Nutraceuticals

General aspects, Market, growth, scope and types of products available in the market. Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases.

Study of following herbs as health food: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina

Herbal-Drug and Herb-Food Interactions: General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra.

UNIT-III **10 Hours**

Herbal Cosmetics: Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.

Herbal excipients: Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes.

Herbal formulations: Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes

UNIT- IV **10 Hours**

Evaluation of Drugs WHO & ICH guidelines for the assessment of herbal drugs Stability testing of herbal drugs.

Patenting and Regulatory requirements of natural products:

a) Definition of the terms: Patent, IPR, Farmers right, Breeder's right Bioprospecting and Biopiracy

b) Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma & Neem.

Regulatory Issues - Regulations in India (ASU DTAB, ASU DCC), Regulation of manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs.

UNIT-V **07 Hours**

General Introduction to Herbal Industry

Herbal drugs industry: Present scope and future prospects. A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India.

S**chedule T – Good Manufacturing Practice of Indian systems of medicine**

Components of GMP (Schedule – T) and its objective Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records.

BP 609 P. HERBAL DRUG TECHNOLOGY (Practical)
2 Credits (0-0-2)
4 Hours/week

1. To perform preliminary phytochemical screening of crude drugs.
2. Determination of the alcohol content of Asava and Arista
3. Evaluation of excipients of natural origin
4. Incorporation of prepared and standardized extract in cosmetic formulations like creams, lotions and shampoos and their evaluation.
5. Incorporation of prepared and standardized extract in formulations like syrups, mixtures and tablets and their evaluation as per Pharmacopoeial requirements.
6. Monograph analysis of herbal drugs from recent Pharmacopoeias
7. Determination of Aldehyde content
8. Determination of Phenol content
9. Determination of total alkaloids

Recommended Books: (Latest Editions)

1. Textbook of Pharmacognosy by Trease & Evans.
2. Textbook of Pharmacognosy by Tyler, Brady & Robber.
3. Pharmacognosy by Kokate, Purohit and Gokhale
4. Essential of Pharmacognosy by Dr.S.H.Ansari
5. Pharmacognosy & Phytochemistry by V.D.Rangari
6. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy)
7. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.

BACHELOR OF PHARMACY (SEMESTER-VI)
(Credit Based Continuous Evaluation Grading System)

BP 604 T. BIOPHARMACEUTICS AND PHARMACOKINETICS
(Theory)

4 Credits (3-1-0) 45 Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: This subject is designed to impart knowledge and skills of Biopharmaceutics and pharmacokinetics and their applications in pharmaceutical development, design of dose and dosage regimen and in solving the problems arised therein.

Objectives: Upon completion of the course student shall be able to:

1. Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance.
2. Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.
3. To understand the concepts of bioavailability and bioequivalence of drug products and their significance.
4. Understand various pharmacokinetic parameters, their significance & applications.

Course Content:

UNIT-I 10 Hours

Introduction to Biopharmaceutics

Absorption; Mechanisms of drug absorption through GIT, factors influencing drug absorption though GIT, absorption of drug from Non per oral extra-vascular routes,

Distribution Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting protein-drug binding. Kinetics of protein binding, Clinical significance of protein binding of drugs

UNIT- II 10 Hours

Elimination: Drug metabolism and basic understanding metabolic pathways renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non renal routes of drug excretion of drugs

Bioavailability and Bioequivalence: Definition and Objectives of bioavailability, absolute and relative bioavailability, measurement of bioavailability, *in-vitro* drug dissolution models, *in-vitro-in-vivo* correlations, bioequivalence studies, methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.

UNIT- III 10 Hours

Pharmacokinetics: Definition and introduction to Pharmacokinetics, Compartment models, Non compartment models, physiological models, one compartment open model. (a). Intravenous Injection (Bolus) (b). Intravenous infusion and (c) Extra vascular administrations. Pharmacokinetics parameters - K_E, t1/2,Vd, AUC, Ka, Cl_t and CL_R- definitions methods of eliminations, understanding of their significance and application

UNIT- IV **08 Hours**

Multicompartment models: Two compartment open model. IV bolus Kinetics of multiple dosing, steady state drug levels, calculation of loading and mainetnance doses and their significance in clinical settins.

UNIT- V **07 Hours**

Nonlinear Pharmacokinetics: a. Introduction, b. Factors causing Non-linearity.

c. Michaelis-menton method of estimating parameters, Explanation with example of drugs.

Recommended Books: (Latest Editions)

1. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi.
2. Biopharmaceutics and Pharmacokinetics; By Robert F Notari
3. Applied biopharmaceutics and pharmacokinetics, Leon Shargel and Andrew B.C.YU 4th edition,Prentice-Hall Inernational edition.USA
4. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B.Jaiswal,Vallabh Prakashan Pitampura, Delhi
5. Pharmacokinetics: By Milo Glbaldi Donald, R. Mercel Dekker Inc.
6. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.
7. Biopharmaceutics; By Swarbrick
8. Clinical Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and
9. Thomas, N. Tozen, Lea and Febrger, Philadelphia, 1995.
10. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company,Pennsylvania 1989.
11. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Rebort F Notari Marcel Dekker Inn, New York and Basel, 1987.
12. Remington’s Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvnia

BACHELOR OF PHARMACY (SEMESTER-VI)
(Credit Based Continuous Evaluation Grading System)

P605T. PHARMACEUTICAL BIOTECHNOLOGY (Theory)

4 Credits (3-1-0) 45 Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope:

- Biotechnology has a long promise to revolutionize the biological sciences and technology.
- Scientific application of biotechnology in the field of genetic engineering, medicine and fermentation technology makes the subject interesting.
- Biotechnology is leading to new biological revolutions in diagnosis, prevention and cure of diseases, new and cheaper pharmaceutical drugs.
- Biotechnology has already produced transgenic crops and animals and the future promises lot more.
- It is basically a research-based subject.

Objectives: Upon completion of the subject student shall be able to;

1. Understanding the importance of Immobilized enzymes in Pharmaceutical Industries
2. Genetic engineering applications in relation to production of pharmaceuticals
3. Importance of Monoclonal antibodies in Industries
4. Appreciate the use of microorganisms in fermentation technology

Unit I 10 Hours

a) Brief introduction to Biotechnology with reference to Pharmaceutical Sciences.

b) Enzyme Biotechnology- Methods of enzyme immobilization and applications.

c) Biosensors- Working and applications of biosensors in Pharmaceutical Industries.

d) Brief introduction to Protein Engineering.

e) Use of microbes in industry. Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase.

f) Basic principles of genetic engineering.

Unit II 10 Hours

a) Study of cloning vectors, restriction endonucleases and DNA ligase.

b) Recombinant DNA technology. Application of genetic engineering in medicine.

c) Application of r DNA technology and genetic engineering in the production of:

i) Interferon ii) Vaccines- hepatitis- B iii) Hormones-Insulin.

d) Brief introduction to PCR

Unit II **10 Hours**

Types of immunity- humoral immunity, cellular immunity

a) Structure of Immunoglobulins
b) Structure and Function of MHC
c) Hypersensitivity reactions, Immune stimulation and Immune suppressions.
d) General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity.
e) Storage conditions and stability of official vaccines
f) Hybridoma technology- Production, Purification and Applications
g) Blood products and Plasma Substituties.

Unit IV **08 Hours**

a) Immuno blotting techniques- ELISA, Western blotting, Southern blotting.
b) Genetic organization of Eukaryotes and Prokaryotes
c) Microbial genetics including transformation, transduction, conjugation, plasmids and transposons.
d) Introduction to Microbial biotransformation and applications.
e) Mutation: Types of mutation/mutants.

Unit V **07 Hour**

a) Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring.
b) Large scale production fermenter design and its various controls.
c) Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin,
d) Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substituties.

Recommended Books (Latest edition):

1. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of RecombinantDNA: ASM Press Washington D.C.
2. RA Goldshy et. al., : Kuby Immunology.
3. J.W. Goding: Monoclonal Antibodies.
4. J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by Royal Society of Chemistry.
5. Zaborsky: Immobilized Enzymes, CRC Press, Degraland, Ohio.
6. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication.
7. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi

BACHELOR OF PHARMACY (SEMESTER-VI)
(Credit Based Continuous Evaluation Grading System)

BP606T PHARMACEUTICAL QUALITY ASSURANCE (Theory)

4 Credits (3-1-0) 45 Hours
Max. Marks: 75
Internal Assessment: 25
Total Marks: 100

Scope: This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It deals with the important aspects like cGMP, QC tests, documentation, quality certifications and regulatory affairs.

Objectives: Upon completion of the course student shall be able to:

- understand the cGMP aspects in a pharmaceutical industry
- appreciate the importance of documentation
- understand the scope of quality certifications applicable to pharmaceutical industries
- understand the responsibilities of QA & QC departments

Course content:

UNIT – I 10 Hours

Quality Assurance and Quality Management concepts: Definition and concept of Quality control, Quality assurance and GMP

Total Quality Management (TQM): Definition, elements, philosophies

ICH Guidelines: purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines

Quality by design (QbD): Definition, overview, elements of QbD program, tools

ISO 9000 & ISO14000: Overview, Benefits, Elements, steps for registration

NABL accreditation: Principles and procedures

UNIT – II 10 Hours

Organization and personnel: Personnel responsibilities, training, hygiene and personal records. **Premises:** Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination.

Equipments and raw materials: Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials.

UNIT – III 10 Hours

Quality Control: Quality control test for containers, rubber closures and secondary packing materials.

Good Laboratory Practices: General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities

UNIT IV 08 Hours

Complaints: Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal.

Document maintenance in pharmaceutical industry: Batch Formula Record, Master Formula Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, distribution records.

UNIT V 07 Hours

Calibration and Validation: Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation.

Warehousing: Good warehousing practice, materials management

Recommended Books: (Latest Edition)

1. Quality Assurance Guide by organization of Pharmaceutical Products of India.
2. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69.
3. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Related materials Vol I WHO Publications.
4. A guide to Total Quality Management- Kushik Maitra and Sedhan K Ghosh
5. How to Practice GMP's – P P Sharma.
6. ISO 9000 and Total Quality Management – Sadhank G Ghosh
7. The International Pharmacopoeia – Vol I, II, III, IV- General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excipients and Dosage forms
8. Good laboratory Practices – Marcel Deckker Series

ICH guidelines, ISO 9000 and 14000 guidelines

BACHELOR OF PHARMACY (SEMESTER-VII)
(Credit Based Continuous Evaluation Grading System)

PHL157: MEDICINAL CHEMISTRY-II

3 Credits (2-1-0)

1. Introduction to drug design and development: History and objectives of drug designing. Economic aspects of drug designing. Procedures followed in drug designing. Drug discovery without a lead-de Novodrug designing. Lead based methods. Approaches to lead discovery. Dissection of a drug molecule into biofunctional moieties. Identification of Pharmacophore. Structural modifications: homologation, chain branching and ring chain transformations. Bioisosterism. Modulation of phamacokinetics by molecular manipulations. QSAR

2. Pharmaceutical Chemistry (Source/ synthesis, Structure, stereochemistry, physicochemical properties, Structure activity relationships. Mode of action and Applications) of the following classes of drugs:

(a) Adrenergic Agents: Adrenergic neuro transmitters. Adrenrrgic receptors. Sympathomimetic agents. Adrenergic Blockers.

(b) Cholinergic Drugs and Related Agents: Cholinergic neuro transmitters. Cholinergic agonists. Cholinergic blocking agents. Parasympathetic postganglionic blocking agents. Solanaceous alkaloid and synthetic analogs. Synthetic amino alcohol esters. Ganglionic blocking agents. Neuromuscular blocking agents.

(c) Local Anaesthetics: Nervous tissue, Mechanism of action of local anaesthetics Products.

(d) Cardiovascular Drugs: Antianginal drugs and vasodilators. Antiarrhythmic agents. Antihypertinsive drugs. Antihyperlipidemic agents. Coagulants and anticoagulants. Selerosing agents, Synthetic hypoglycemic drugs. Thyroid hormones and antithyroid drugs. Cardiotonic agents.

(e) Diuretics: Water and osmotic agents. Acidifying salts. Mercurials phenoxyacetic acids. Purines and related heterocycles. Sulfonamides, Sulfamyl benzoic acid derivatives. Endocrine antagonists. Miscellaneous compounds.

(f) Anti-infective agents: Local anti-infective agents, phenols and their derivatives. Urinary tract anti-infectives and anticeptics. Antiscabious and antipedicular agents preservatives.

(g) Diagnostic agents: Radioopaque diagnostic agents. Agents for kidney functi on test. Agents for liver function tests. Miscellaneous diagnostic agents.

BACHELOR OF PHARMACY (SEMESTER-VII)
(Credit Based Continuous Evaluation Grading System)

Books Recommended (Latest editions unless specified):

1. Wilson & Gisvold's Text Book of organic Medicinal and Pharmaceutical Chemistry, 10th Edition. J. B. Lippincott Co, Philadelphia, USA.
2. W.C. Foye, Principle of Medicinal Chemistry, Lea & Febiger, Philadelphia, USA
3. H. Singh and V. K. Kapoor, Medicinal and Pharmaceutical Chemistry, Vallabh Prakashan, New Delhi (Latest Edition).
4. M.E.Wolff, Ed. Burger's Medicinal Chemistry and Drug Discovery, John Wiley and Sons, New York (Latest edition).
5. J. E. F. Reynolds, Martindale, The Extra Pharm Acepoeia. The Pharmaceutical Press, London, U. K.
6. B. G. Raben and H. A. Wittcoff, Pharmaceuticals Chemicals in Perspective John Wiley & Sons, New York, 1989.
7. The Organic Chemistry of Drug Design and Drug Action by R.B. Silverman, 2nd Edition, Academic Press, 2004.
8. Drug Design- A Series of Monographs in Medicinal Chemistry ed. E. J. Ariens, Ist Edition, Vol. 1., Vol. II., Vol. V., Vol. VIII & Vol. IX.
9. Comprehensive Medicinal Chemistry, Pcrgamon Press, 1990, Vol. 4.

BACHELOR OF PHARMACY (SEMESTER-VII)
(Credit Based Continuous Evaluation Grading System)

PHL158: Pharmaceutical Technology-II

3 Credits (2-1-0)

1 **Preformulation Studies:** Organoleptic properties, purity, particle size, shape, surface area, solubility and dissolution of drugs. Chemical reactions involving drug excipient interactions, solid state stability studies.

2 **Parenteral Technology:** Preformulation factors, water for injection, pyrogenicity, non aqueous vehicles, isotonicity and it's adjustment methods, emulsions and suspension formulations as parenteral and their formulation. Containers i.e. glass composition and it's suitability, test for alkalinity, plastics container Closures i.e. natural and synthetic rubber and quality control of closures. Pre-filling treatment i.e. washing of containers and closures, preparation of small volume and large volume parenterals. Quality control test for SVP and LVP.

3 **Pharmaceutical Aerosols:** Components, formulation, types of systems, manufacturing, operation of an aerosol package, quality control and testing, oral inhalation nasal and topical aerosols.

4 **Controlled Drug Delivery Systems:** Introduction, terminology and drug targeting. Physiochemical and biological factors influencing design and performance of sustained release products. Design and fabrication of oral controlled release drug delivery system. Introduction to liposomes, microspheres,. endocytosis of macromolecular drug carriers, implantable and transdermal therapeutic systems. Commonly used polymers in controlled drug delivery systems.

5 **Packaging Technology:** Types of containers, materials used for packaging and their interaction with drugs, closures, unit dose packaging and strip packaging materials. Packaging of solid, parenterals and ophthalmic dosage forms. Tamper proof packaging.

6 **Good Manufacturing Practices for Pharmaceuticals:** Status and applicability of regulation. Current good manufacturing practices in manufacturing, processing, packaging and holding of drugs. Production and process controls, ISO 9000 certification.

7 **Dissolution testing of solid dosage forms:** In vitro- In vivo correlation and BCS classification of drugs

BACHELOR OF PHARMACY (SEMESTER-VII)
(Credit Based Continuous Evaluation Grading System)

Books Recommended (Latest editions unless specified):

1. L.A. Lachman, H.A. Liberman and J.L. Kanic, The Theory and Practice of Industrial Pharmacy, 3rd Edition, Lea and Febiger, Philadelphia, U.S.A., 1986.
2. Gilbert S. Banker and Christopher T. Rhodes, Modern Pharmaceutics, 2nd Edition, Marcel Dekker Inc., New York, U.S.A., 1990.
3. M.E. Aulton, Pharmaceutics: The Science of Dosage form Design, English Book Society, London, U.K., 1988.
4. S.H.Willing, M.M. Tuckerman and W.S. Hitchings, Good Manufacturing Practices for Pharmaceuticals: A Plan for Total Quality Control, 2nd Edition, Marcel Dekker Inc., New York, U.S.A., 1984.
5. Yie W.Chien, Novel Drug Delivery Systems: Fundamentals, Developmental Concepts, Biomedical Assesments, Marcel Dekker Inc., New York, U.S.A., 1984.
6. J.R.Robinson and V.H.L.Lee, (ed) Controlled Drug Delivery: Fundamental and Applications, 2nd Edition, Marcel Dekker Inc., New York, U.S.A., 1987.
7. A.R.Gennaro (Ed.) Remington: The Science and Practice of Pharmacy, 19th Edition, Mack Publishing Company, Pennsylvania, U.S.A., 1995.

   Sanjay Kumar Jain , Vandana Soni Bentley's Textbook of Pharmaceutics. Elsevier India 2012.
9. Jain N.K. Pharmaceutical Product Development. CBS Publisher & Distributors P Ltd. 2011.
10 Linda Felton Remington: Essentials of Pharmaceutics. Pharmaceutical Press; 1 edition. 2013

BACHELOR OF PHARMACY (SEMESTER-VII)
(Credit Based Continuous Evaluation Grading System)

PHL159: Pharmaceutical Management

3 Credits (2-1-0)

1. **Concept of Management:** Administrative Management (Planning, Organizing, Staffing, Directing and Controlling), Entrepreneurship development, Operative Management (Personnel, Materials, Production, Financial, Marketing, Time/space, Margin/Morale). Principles of Management (Co-ordination, Communication, Motivation, Decision-making, leadership, Innovation, Creativity, Delegation of Authority / Responsibility, Record Keeping).
2. **Personnel Management:** Definition, importance and objectives: Qualities and functions of personnel manager human resource planning: - Meaning and need, job analysis, job description and job specification. Recruitment and selection process: sources of manpower, recruitment policies, selection procedures. Promotion, demotion, transfer and separation. Employee training.
3. **Materials management:** Materials handling, equipment, inventory management, economic ordering quantity (EOQ), ABC analysis, value analysis, classification and codification of stores, obsolete, surplus and scrap management, lead time, inventory carrying costs, safety stock.
4. **Pharmaceutical Marketing:** Functions, buying, selling, transportation, storage, finance, feedback, information, channels of distribution, wholesale, retail, departmental store, multiple shop and mail order business.
5. **Salesmanship:** Principle of sales promotion, advertising, ethics of sales, merchandising, literature, detailing, Recruitment, training, evaluation, compensation to the pharmacist.
6. **Production Management :** A brief exposure of the different aspects of Production Management – Visible and Invisible inputs, Methodology of Activities Performance Evaluation Technique Process –Flow, Process Know-how, Maintenance Management.
7. **Management of hospital pharmacy**

   a) Introduction to health care systems in India and abroad, health services and hospital Pharmacy, recommendations of various committees and commissions.

   b) Pharmacist's role in administration, dispensing/ manufacturing, quality control, Pharmacy therapeutic committee Hospital formulary and provisioning of drugs in hospitals. Principles of stores management, establishment of central and sub stores in hospitals, centralized and decentralized stores, Precautions of storage of drugs, receipts and issue, OTC products.

BACHELOR OF PHARMACY (SEMESTER-VII)
(Credit Based Continuous Evaluation Grading System)

Recommended Books (Latest editions unless specified):

1. Bhavesh S. Nayak, Biren N. Shah, Vineet C. Jain. A Textbook of Pharmaceutical Industrial Management. Elsevier India Pvt. Ltd., (2010).
2. R.M. Mehta, Pharmaceutical Industrial Management. Vallabh Publications.
3. G. Vidya Sagar.Pharmaceutical Industrial Management. Pharma Book Syndicate (2009).
4. Principals and Methods of Pharmacy Management, H.A. Smith and Lea and Febriger Philadelphia, Tenth Edition (2001).
5. Principles of Management, H. Koontz, C. O. Donnell and H. Weihrich, McGraw Book(P) Ltd. Singapore, Tenth Edition .
6. Marketing: A Managerial Introduction, J. C. Gandhi, Tata McGraw Hill Publishing Co., New Delhi.

BACHELOR OF PHARMACY (SEMESTER-VII)
(Credit Based Continuous Evaluation Grading System)

PHL160: Pharmacology

3 Credits (2-1-0)

1. Introduction to the antimicrobial therapy
2. Chemotherapeutic Agents Part- I
   2.1. Beta- lactam and other cell- wall & membrane- active antibiotics
   2.2. Tetracyclins, macrolides, chloramphenicol & streptogramins
   2.3. Aminoglycosides & spectinomycin
   2.4. Sulfonamides, trimethoprim & quinolones
3. Chemotherapeutic Agents Part- II
   3.1. Antimycobacterial agents
   3.2. Antifungal agents
   3.3. Antiprotozoal agents
   3.4. Antiviral agents
4. Cancer chemotherapy
5. Immunopharmacology
6. Neurodegenerative disorders: Pathophysiology and drug therapy of Alzheimer's disease, Multiple sclerosis, Huntington's chorea.
7. Drug therapy of inflammatory disorders: Disease modifying antirheumatic agents (DMARDS), Gout and Inflammatory Bowel disease

Recommended Books (Latest editions unless specified):

1. J.G. Hardman and L.E. Limbird (Eds), Goodman and Gilman's The Pharmacological Basis of Therapeutics, 11th Edition, McGraw Hill, New-York, U.S.A.
2. B.G. Katzung, Basic and Clinical Pharmacology, 10th ed (or The Latest Ed. Available), McGraw Hill.
3. J.E.F. Reynolds, Martindale, The Extra Pharmacopoeia. The Pharmaceutical Press, London, U. K.
4. T.M. Speight (Ed.), Avery's Drug Treatment: Principles and Practice of Clinical Pharmacology and Therapautics, 3rd Edition, ADIS Press, Aucland, 1987.

BACHELOR OF PHARMACY (SEMESTER-VII)
(Credit Based Continuous Evaluation Grading System)

PHL161: Pharmaceutical Biotechnology

3 Credits (2-1-0)

1. Introduction to pharmaceutical Biotechnology: concepts, basic techniques of biotechnology (such as ELISA, Western blot, Southern blot and Northern blot) and their application in pharmacy, biotechnology industry, products, application of bioreactors for large scale production of useful pharmaceutical products and markets.

2. Genetic recombination: Transformation, conjugation, transduction, protoplast fusion, gene cloning and their applications, Development of hybridoma for monoclonal antibodies, study of drugs produced by biotechnology such as Activase, Humulin, streptokinase, Hepatitis B etc.

3. Microbial transformation: Introduction, types of reactions mediated by microorganism design of biotransformation processes, selection of organism, biotransformation process and its improvements with special reference to steroids.

4. Immunology & Immunological preparation: Principles, antigens and haptens, immune system, cellular humoral immunity, immunological tolerance, antigen antibody reaction and their applications, hypersensitivity, active and passive immunization, vaccines, their preparation, standardization and dosages.

5. Enzyme immobilization: Techniques of immobilization of enzymes and cells, factors affecting enzyme kinetics. Applications in pharmaceutical industry, therapeutics and clinical assays.

6. Plant tissue culture: Introduction, types of cultures, nutritional requirements, application of plant tissue culture for the production of secondary metabolites. Study of callus culture, cell suspension culture, single cell culture, totipotency and Role of plant growth regulators for the production of secondary metabolites. Production and appliction of synthetic seeds.

7. Design of drug delivery system for biotechnological products.

Recommended Books (Latest editions unless specified):

1. Vyas and Dixit Pharmaceutical Biotechnology, 1st CBS Publisher, New Delhi, 1991
2. P. K. Gupta, Elements of Biotechnology, Rastogi Publication, 10th Edition, 2004
3. Daan J. A. Crommelin, Robert D. Sindelar. Pharmaceutical Biotechnology: Fundamentals and Applications, 3rd Edition (2007)
4. K. Sambamurthy, Ashutosh Kar, Pharmaceutical Biotechnology, 2nd Edition, New AGE International (LP) Limited, 2007.
5. Richard A. Goldsby, Thomas J. Kindt, Barbara A. Osborne Kuby Immunology: W H Freeman & Co, 4th Edition (2000)

BACHELOR OF PHARMACY (SEMESTER-VII)
(Credit Based Continuous Evaluation Grading System)

PHP 162: Pharmaceutical Technology II

1.5 Credits (0-0-1.5)

EXPERIMENTS:

1. Experiments based on preparation, characterization and quality control test for tablet, capsules, suspension, emulsion and parenteral dosage forms.
2. Experiments based on preformulation studies of drugs.
3. Experiments based on dissolution testing of immediate release and controlled release dosage forms.
4. Experiments based quality control test for packaging materials.
5. Preparation, characterization and quality control test for tablet, capsules, suspension, emulsion and parenteral dosage forms.
6. Industrial Tour

NOTE: ANY OTHER EXPERIMENT(S) MAY BE INCLUDED IN SUPPORT OF THE THEORETICAL ASPECTS OF THE COURSE.

BACHELOR OF PHARMACY (SEMESTER-VII)
(Credit Based Continuous Evaluation Grading System)

PHP 163: Pharmacology

1.5 Credits (0-0-1.5)

1 Study of toxicity with antimicrobials: Gentamycin induced nephropathy, isoniazid induced peripheral neuropathy etc.
2 Study of drugs useful for inflammatory conditions.
3 Study of drugs with memory enhancing action.
4 Application of statistical analysis using t- test etc.

Animal studies will be supplemented with simulated experiments with software's wherever available.

Books Recommended: **(Latest editions unless specified):**

1 M.N. Ghosh, Fundamentals of Experimental Pharmacology, 2nd Edition, Scientific Books Agency, Calcutta, India, 1984.
2 U.K.Sheth, N.K. Dadkar and U.G. Kamath, Selected Topics in Experimental Pharmacology, Kothari Book Depot, Bombay, India, 1972.
3 Edinburgh University Pharmacology Staff (Ed.), Pharmacological Experiments on Isolated Preparations; Livingstone, London, U.K., 1968.

BACHELOR OF PHARMACY (SEMESTER-VII)
(Credit Based Continuous Evaluation Grading System)

PHP 164: Pharmaceutical Biotechnology

1.5 Credits (0-0-1.5)

EXPERIMENTS:

1. Preparation of Nutrient Media
2. Preparation of plant cell culture media
3. Aseptic Technique and the Transfer of Microorganisms
4. Culture Techniques
    a. Liquid Media Inoculation
    b. Solid Media Inoculation like Streak plate, Pour plate, Stab culture, Swab culture.
5. To isolate the micro-organism from sample of water.
6. Isolation of DNA and its purity estimation
7. Estimation of DNA by Diphenylamine Method
8. To prepare hydrated synthetic seeds in-vitro
9. Isolation of RNA and its purity estimation
10. Enzyme immobilization by Ca-alginate method.
11. To isolate protoplast by mechanical method
12. Separation of green plant pigments by column chromatography
13. Spectrophotometric assay of enzymes
14. Estimation of
    a. Serum Glutamate Oxaloacetate Transaminase (SGOT) Test
    b. Serum Glutamate Pyruvate Transaminase (SGPT) Test
    c. Protein with standard curve by Ninhydrine method
15. Effect of Substrate Concentration on Enzyme Kinetics
16. Effect of temperature on enzyme kinetics

NOTE: ANY OTHER EXPERIMENT(S) MAY BE INCLUDED IN SUPPORT OF THE THEORETICAL ASPECTS OF THE COURSE.

Books Recommended (Latest editions unless specified):

1. Seidman L.A., Kraus M.E., Brandner D, Mowery J. Laboratory Manual for Biotechnology and Laboratory Science: The Basics. Benjamin Cummings; 1 edition 2010.

2. Carson S., Miller H, Witherow D. S., Molecular Biology Techniques, Third Edition: A Classroom Laboratory Manual. Academic Press; 3 edition, 2011.

3. Dutta S., Dutta A., Experimental Biotechnology (Practical Manual Series). New India Publishing Agency 2011.

BACHELOR OF PHARMACY (SEMESTER-VIII)
(Credit Based Continuous Evaluation Grading System)

PHL164: MEDICINAL CHEMISTRY-III

3 CREDITS (2-1-0)

1. **Pharmaceutical Chemistry (Source/ synthesis, Structure, stereochemistry, physicochemical properties, Structure activity relationships. Mode of action and Applications) of the following classes of drugs:**
   a. **Sulfonamides Sulfones and folate reductase inhibitors with antibacterial action**: Sulfonamides and folate reductase inhibitors, Sulfonamides for burn therapy sulfonamidies for intestinal infections.
   b. **Antibiotics:** β-Lactum antibiotics. The aminoglycosides. The tetracyclines. Macrolide antibiotics. Polyene antibiotics. The lincomycins. Polypeptide antibiotics. Fluroquinolones. Chloramphenicol and other unclassified antibiotics. Antitubercular Agents, Antileprosy agents (Dapsone).
   c. **Antimalarials:** Cinchona alkaloids 7-chloro-4- aminoquinolines, 8-Aminoquinolones. 9- Aminoacridines. Mefloquine. Diaminopyridines. Biguanides. Sulfones and other miscellaneous antimalarials.
   d. **Antifungal agents:** Fatty acids and their derivatives, salicylic acid derivatives. Salicylanilids, Tolnaflate p-chloro-Methoxylenol. Acrisorcyin, Azoles, Chlorphenesin, Dithranal.
   e. **Antiviral Agents:** Adamantane derivertives (Amantadine Rimantadine).Idoxuridine, Trifluoruridine, Vidarabine, ibravarine, Acycloguanosine, Inospiplex, Methisazone, Zidovudine. Acycolovir, Ganciclovir, Foscarnet, Human interferon.
   f. **Antineoplastic Agents:** Alkylating agents, Antimetabolites , Antitumor antibiotics Antitumour alkaloids . Hormones (Steroids, Tamoxifan, mitotane, Dormantanolone propionate Testalactone Magestrol acetate Miscellaneous compounds (Hydroxy urea, cisplatin, Pipobroman).

g. Anthelmintical: Tetrachlorocthylene. Piperazine, Gentian Violet pyrinium pamoate. Thiabendazole, Mebendazole, Bephenium hydroxynaphthoate Diclophene Niclosamide. Levemisole hydrochloride. Tetramisole Niridazole. Biothional Antimony potassium tartarat stibiophen. Sodium stibiocaptate. Antiamoebic and antiprotozoal drugs.

Books Recommended (Latest editions unless specified):

1. Wilson & Gisvold's Text Book of Organic Medicinal and Pharmaceutical Chemistry, 10th Edition. J. B. Lippincott Co, Philadelphia, USA.
2. W.C. Foye, Principle of Medicinal Chemistry, Lea & Febiger, Philadelphia, USA
3. H. Singh and V.K. Kapoor, Medicinal and Pharmaceutical Chemistry, Vallabh Prakashan, New Delhi (Latest Edition).
4. M.E.Wolff, Ed. Burger's Medicinal Chemistry and Drug Discovery, John Wiley and Sons, New York (Latest Edition).
5. J. E. F. Reynolds, Martindale, The Extra Pharm Acepoeia. The Pharmaceutical Press, London, U. K.
6. B. G. Raben and H. A. Wittcoff, Pharmaceuticals Chemicals in Perspective John Wiley & Sons, New York, 1989.
7. The Organic Chemistry of Drug Design and Drug Action by R.B. Silverman, 2nd Edition, Academic Press, 2004.
8. Drug Design- A Series of Monographs in Medicinal Chemistry ed. E. J. Ariens, Ist Edition, Vol. 1., Vol. II., Vol. V., Vol. VIII & Vol. IX.
9. Comprehensive Medicinal Chemistry, Pcrgamon Press, 1990, Vol. 4.

BACHELOR OF PHARMACY (SEMESTER-VIII)
(Credit Based Continuous Evaluation Grading System)

PHL170: PHARM. CHEM. XV: PHARMACEUTICAL ANALYSIS

3 Credits (2-1-0)

1. **Ultraviolet and Visible Spectroscopy:** Nature of electromagnetic radiation, the absorption of energy by atoms and molecules, the emission of radient energy by atoms and molecules; Electronic excitation, Fundamental laws of photometry, deviation from Beers law, representation of spectral data, selection of wavelength and bond width chromophores photometric error, instrumentation(radiation sources, monochromators and detectors), single and double beam instruments. Woodward Fieser rules and their applications, turbidimetry, naphlometry, polarimetry.
2. **Infrared Spectrocopy:** Theory characteristics absorbance bands of organic functional groups, interpretation of infrared absorption spectra frequency range, sample handling, infrared instrumentation (light sources, monochromators, detectors, FTIR), applications. Introduction to Raman spectroscopy and its difference with Infrared.
3. **Fluorimetric Analysis:** Theory quantitative description, factors affecting fluorescence intensity, relationship of fluorescence to molecular structure instrumentation, (Cells, light source, wavelength selection, detectors), correction of spectra and applications. Brief introduction to phosphorescence, flame emission and atomic absorption spectroscopy.
4. **Nuclear Magnetic Resonance Spectroscopy:** An Introduction to the theory of NMR, magnetic properties of the hydrogen nucleus, relaxation time chemical shift, spin-spin coupling, instrumentation, quantitative analysis of drugs, analytical limitations of NMR in Pharmaceutical analysis. Exchangeable protons. A brief introduction to fourier transform NMR and ^{13}C NMR.
5. **Mass Spectroscopy:** Instrumentation (Ionization sources, electron impact ionization, Field ionization, chemical ionization and fast atom bombardment, sources). Analyzers single & double focusing, time of flight and quadrupole, mass spectra determination of molecular formulae, recognition of the molecular ion peak, fragmentation, mass spectra of some simple compounds.

Books Recommended (Latest editions):

1. Principles of Instrumental Analysis by D. A. Skoog and J. J Leary, Saunders Publishing Co.
2. H. H. Willard. L. L. Merritt, Jr, and J. A. Dean,. Instrumental Methods of Analysis, Van Nostrand Reinhold, New York.
3. J. W. Robinson, Undergraduate Instrumental Analysis, Marcel Dekker, Inc, New York, 1970.
4. A. H. Beckett and J. B. Stenlake, Practical Pharmaceutical chemistry, Vol. I and II, The Athene Press of the University of London.
5. L. G. Chatten, A Textbook of Pharmaceutical Chemistry, Vol. I and II, Marcel Dekker, New York.

BACHELOR OF PHARMACY (SEMESTER-VIII)
(Credit Based Continuous Evaluation Grading System)

PHL166: Pharmacology (Clinical Pharmacology and Toxicology)

Credits (2-1-0)

1. **Basics Concept:** Definition scope and development of clinical pharmacy and clinical pharmacology.
2. **Drug Discovery and Development:** Concept of pharmacogenology, preclinical evaluation, safety and clinical evaluation, post marketing surveillance and drug regulatory affairs.
3. **Basic and General Principles of Drug Therapy:**
   - 3.1 **Monitoring of Drug Therapy:** Therapeutic, pharmacokinetic and pharmacodynamic monitoring of drug therapy
   - 3.2 **Adverse Reactions to Drugs:** Incidence, classification and surveillance methods of adverse reactions to drugs.
   - 3.3 **Pharmacogenetics:** Pharmacokinetic and pharmacodynamic aspects of pharmacogenetics.
   - 3.4 **Drug Interactions:** Incidence, pharmacokinetics and pharmacodynamic drug interactions.
   - 3.5 **Patient Compliance:** Factors which affect compliance. Methods of measuring and improving drug compliance.
   - 3.6 **Pharmacology of Placebos:** Mode of action, uses and abuses, adverse effects and factors which influence the response of placebos.Drug therapy in special populations: Drug therapy in children, elderly (geriatric pharmacology) and pregnant and lactating mothers.
4. **Drug Information:** Sources of drug information and counseling of patients.
5. **Prescription Writing:** The principles of prescription writing and practical prescribing.
6. **Clinical Toxicology:** Principles and management of different types of poisoning and toxicity reactions.

Recommended Books (Latest editions unless specified):

1. D.G. Grahame-Smith and J.K. Aronson, The Oxford Text Book of Clinical Pharmacology and Drug Therapy. Oxford University Press, Oxford, U.K.
2. T.M. Speight (Ed.), Avery's Drug Treatment: Principles and Practics of Clinical Pharmacology and Therapautics, 3rd edition, ADIS press, Aucland
3. J.T. Dipiro, R.L. Telbert, P.E. Hayer, G.C. Yee and L.M. Posey (Eds), Pharmacotherapy : A Pathophysiologic Approch, 5th Edition, Elsevier Science Publishing Co. Inc., New York, U.S.A.

BACHELOR OF PHARMACY (SEMESTER-VIII)
(Credit Based Continuous Evaluation Grading System)

PHL167: Pharmacognosy

Credits (2-1-0)

1. Recent developments in natural products with two examples each from anticancer, antimicrobial, antihepatotoxic, antiviral, antioxidants, antiprotozoals and CNS active plants.
2. Chemical standardization of plant drug material: Through marker analysis and fingerprint profiling.
3. Introduction to plant growth regulators and their physiological role.
4. Historical development of plant tissue culture, types of cultures, nutritional requirements, growth and their maintenance. Applications of plant tissue culture in pharmacognosy.
5. Plant derived insecticide.
6. Marine pharmacognosy, novel medicinal agents from marine sources.
7. Natural allergens and photosensitizing agents and fungal toxins.
8. Herbs and health foods and neutraceuticals and introduction to registration aspects of herbal products for marketing. Agencies controlling regulatory aspects for herbal products at national and international level. (WHO, EMEA etc).
9. Herbal cosmetics.

Books Recommended (Latest editions unless specified):

1. Atal, C.K. and Kapur, B.M. Cultivation & Utilization of Medicinal Plants, R.R. Jammu.
2. Kalia, A.N. Textbook of Industrial Pharmacognosy, CBS Publishers & Distributors, New Delhi.
3. Ansari, S.H. Essentials of Pharmacognosy. Third Edition 2009, Birla Publication Pvt. Ltd., Delhi.
4. Remington. The Science and Practice of Pharmacy, Vol. I & II, Mack Publishing Company, Pennsylvania.
5. Wagner, H. and Bladt, S. Plant Drug Analysis–A Thin Layer Chromatography Atlas, Second Edition, Springer India Pvt. Ltd., New Delhi.

BACHELOR OF PHARMACY (SEMESTER-VIII)
(Credit Based Continuous Evaluation Grading System)

PHL168: Pharmaceutical Jurisprudance

3 Credits (2-1-0)

1 Definition and scope of Forensic Pharmacy, Pharmacist's role in drug treatment, drug usage and pharmacist as a member of health care team.

2 Pharmaceutical legislation in India: Historical development of Pharmaceutical education in India and its present status, Professional ethics in Pharmacy practice, legal and ethical responsibilities of Pharmacists.

3 Study of drugs and Cosmetics Act 1940 and Rules made there under; with special reference to application for import of drugs, licensing formalities for whole sale, retail sale, manufacturing test license for drugs and cosmetics, DPCO, Special emphasis on schedules C, C1, G, H, M, P, U, W, X and Y. Emphasis on labeling of various classes of drugs, recent amendments in Drugs and Cosmetics Act.

4 Pharmacy Act 1948.

5 Medicinal and Toilet Preparations (excise duties) Act and rules made there under.

6 Drugs and Magic Remedies (objectionable Advertisements) Act.

7 The Shops Act of Punjab State.

8 The Medical Termination of Pregnancy Act.

9 Intellectual Property Rights (IPR): introduction, types and Procedure of filling patent (National & International).

10 Forensic Toxicology

Books Recommended (Latest editions unless specified):

1. Drugs and Cosemetics Act, 1940 and All Amendments, Govt of India.
2. B. M. Mithal, Text Book of Forensic Pharmacy, National Book Centre,
3. Dr. Sundari Mohan Avenue, Calcutta, 700014.
4. Relevant Acts & Rules Published by the Government of India.
5. Bansal P. IPR Handbook for Pharma Students and Researchers, Pharma Book Syndicate, Hyderabad, 2008

BACHELOR OF PHARMACY (SEMESTER-VIII)
(Credit Based Continuous Evaluation Grading System)

PHL169: Pharmacokinetics & Biopharmaceutics

3 Credits (2-1-0)

1. Introduction to Pharmacokinetics and Biopharmaceutics, Various terms used, Absorption, distribution, metabolism and excretion of drugs. Biological half life, Apparent volume of distribution
2. Fluid compartments, Circulatory system and protein binding.
3. Compartment models
   - 3.1 One Compartment Open Model: Pharmacokinetics of single dose administration as applied to intravenous (rapid) and oral administration, Intravenous transfusion, Multiple intravenous and oral administration.
   - 3.2 Two Compartment Open Model: Pharmacokinetics of single and multiple dose administration, Intravenous transfusion.
4. Curve fitting- area under blood level curves
5. Urinary excretion studies, Sigma minus plot
6. Pharmacokinetic basis of sustained release formulations
7. Clinical Pharmacokinetics
   - 7.1 Hepatic elimination of drugs, Drug metabolism and its kinetics using one compartment and two compartment models. Liver extraction ratio and its relationship with absolute availability, Relationship between blood flow, Intrinsic clearance and hepatic clearance.
   - 7.2 Dosing of drugs in infants, elderly and obese patients.
   - 7.3 Dosage regimen adjustment in patients with and without renal failure. Dosage adjustments in uremic patients

8. Bioavailability and Bioequivalence: Definitions, Terminology, Clinical significance and factors affecting biological performance of drugs. Methods of determination of bioavailability using blood level and urinary excretion data, Parameters used to evaluate bioequivalence.
9. Non linear Pharmacokinetics: Concepts, Reasons for non-linear behavior and methods to ascertain non-linear kinetics.

Books Recommended (Latest editions unless specified):

1) M. Gibaldi and D. Perrier (Eds), Pharmacokinetics, 2nd Edition, Marcel Dekker Inc., New York, U.S.A.
2) L.Shargel and A.B.C.Yu. (Eds) Applied Biopharmaceutics and Pharmacokinetics, 5th Edition, Prentice Hall International, London, U.K.
3) R, E.Notari (Ed) Biopharmaceutics and Clinical Pharmacokinetics: an Introduction, 4th Edition, Marcel Dekker Inc., New York, USA, 2005 (Indian Reprint).

BACHELOR OF PHARMACY (SEMESTER-VIII)
(Credit Based Continuous Evaluation Grading System)

PHP170: Pharmacology

1.5 Credits (0-0-1.5)

1 **Prescription Evaluation:** Exercises on clinical problems related to topic covered in theory.
2 Pharmacoepidemological studies using data collected from university Health Centre.
3 Calculation of LD50 Values and therapeutic index (startistical approach).
4 Experimental methods related to Biochemical Pharmacology using simulated samples and clinical samples collected from university Health Centre.
5 **Bioassays Designs:** Quantal and graded bioassays, matching and bracketing bioassays, 4 point bioassays.

Animal studies will be supplemented with simulated experiments with softwares wherever available.

Books Recommended (Latest editions unless specified):

1 M.N. Ghosh, Fundamentals of Experimental Pharmacology, 2nd Edition, Scientific Books Agency, Calcutta, India.
2 U.K.Sheth, N.K. Dadkar and U.G. Kamath, Selected Topics in Experimental Pharmacology, Kothari Book Depot, Bombay, India.
3 Edinburgh University Pharmacology Staff (Ed.), Pharmacological Experiments on Isolated Preparations; Livingstone, London, U.K.

BACHELOR OF PHARMACY (SEMESTER-VIII)
(Credit Based Continuous Evaluation Grading System)

PHP171: Pharmacokinetics & Biopharmaceutics

1.5 Credits (0-0-1.5)

1. Establishment of a standard curve of a drug substance.
2. Influence of vehicle on drug availability from topical dosage forms in vitro.
3. Comparative in vitro release rate studies of marketed formulations.
4. Determination of bioavailability of marketed formulations by plasma concentration method.
5. Determination of bioavailability of marketed formulations by urinary excretion method.
6. Bioequivalence studies on marketed solid oral products.
7. Correlation between urinary and salivary excretion kinetics.
8. Determination of bioavailability by AUC, Counting square and Gravimetric methods.
9. Determination of acid neutralizing capacity of different brands of antacids.
10. Verification of Noyes Whitney Equation.
11. Protein binding studies using egg albumin as protein moiety.

BACHELOR OF PHARMACY (SEMESTER-VIII)
(Credit Based Continuous Evaluation Grading System)

PHP 172: Pharmacognosy

1.5 Credits (0-0-1.5)

Pharmacognosy Practical

1. Isolation of some selected phytoconstituents studied in theory.
2. Extraction of volatile oils and their chromatographic profiles.
3. Some experiments in plant tissue culture.

Books Recommended (Latest editions unless specified):

1. Atal, C.K. and Kapur, B.M. Cultivation & Utilization of Medicinal Plants, R.R. Jammu.
2. Kalia, A.N., Textbook of Industrial Pharmacognosy, CBS Publishers & Distributors, New Delhi.
3. Ansari, S.H., Essentials of Pharmacognosy, Third Edition, 2009, Birla Publication Pvt. Ltd., Delhi.
4. Remington, The Science and Practice of Pharmacy, Vol. I & II, Mack Publishing Company, Pennsylvania.
5. Wagner, H. and Bladt, S. Plant Drug Analysis–A Thin Layer Chromatography Atlas, Second Edition, Springer India Pvt. Ltd., New Delhi.