SAVITRIBAI PHULE PUNE UNIVERSITY

FACULTY OF SCIENCE AND TECHNOLOGY



RULES & SYLLABUS

FIRST YEAR BACHELOR OF PHARMACY (B. Pharm.) COURSE – 2019 pattern (EFFECTIVE FROM ACADEMIC YEAR 2019-2020)

CHAPTER- I: REGULATIONS

1. Short Title and Commencement These regulations shall be called as "The Revised Regulations for the B. Pharm. Degree Program (CBCS) of the Pharmacy Council of India, New Delhi". They shall come into effect from the Academic Year 2016-17. The regulations framed are subject to modifications from time to time by Pharmacy Council of India.

2. Minimum qualification for admission

2.1 First year B. Pharm: Candidate shall have passed 10+2 examination conducted by the respective state/central government authorities recognized as equivalent to 10+2 examination by the Association of Indian Universities (AIU) with English as one of the subjects and Physics, Chemistry, Mathematics (P.C.M) and or Biology (P.C.B / P.C.M.B.) as optional subjects individually. Any other qualification approved by the Pharmacy Council of India as equivalent to any of the above examinations.

2.2. B. Pharm lateral entry (to third semester): A pass in D. Pharm. course from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act.

3. Duration of the program The course of study for B.Pharm shall extend over a period of eight semesters (four academic years) and six semesters (three academic years) for lateral entry students. The curricula and syllabi for the program shall be prescribed from time to time by Pharmacy Council of India, New Delhi.

4. Medium of instruction and examinations Medium of instruction and examination shall be in English.

5. Working days in each semester Each semester shall consist of not less than 90 working days. The odd semesters shall be conducted from the month of June/July to November/December and the even semesters shall be conducted from December/January to May/June in every calendar year.

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

7. Program/Course credit structure As per the philosophy of Credit Based Semester System, certain quantum of academic work viz. theory classes, tutorial hours, practical classes, etc. are measured in terms of credits. On satisfactory completion of the courses, a candidate earns credits.

The amount of credit associated with a course is dependent upon the number of hours of instruction per week in that course. Similarly, the credit associated with any of the other academic, co/extra-curricular activities is dependent upon the quantum of work expected to be put in for each of these activities per week.

7.1. Credit assignment

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

7.2. Minimum credit requirements The minimum credit points required for award of a B. Pharm. degree is 208. These credits are divided into Theory courses, Tutorials, Practical, Practice School and Project over the duration of eight semesters. The credits are distributed semester-wise as shown in Table IX. Courses generally progress in sequences, building competencies and their positioning indicates certain academic maturity on the part of the learners. Learners are expected to follow the semester-wise schedule of courses given in the syllabus. The lateral entry students shall get 52 credit points transferred from their D. Pharm program. Such students shall take up additional remedial courses of 'Communication Skills' (Theory and Practical) and 'Computer Applications in Pharmacy' (Theory and Practical) equivalent to 3 and 4 credit points respectively, a total of 7 credit points to attain 59 credit points, the maximum of I and II semesters.

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

9. Course of study The course of study for B. Pharm shall include Semester Wise Theory & Practical as given in Table – I to VIII. The number of hours to be devoted to each theory, tutorial and practical course in any semester shall not be less than that shown in Table – I to VIII.

Table-I: Course of study for semester I

Course code	Name of the course	No. of Hours per week/Total no of hours	Tutorial	Credit points
BP101T	Human Anatomy and Physiology I– Theory	3/45	1	4
BP102T	Pharmaceutical Analysis I – Theory	3/45	1	4
BP103T	Pharmaceutics I – Theory	3/45	1	4
BP104T	Pharmaceutical Inorganic Chemistry – Theory	3/45	1	4
BP105T	Communication skills – Theory *	2/30	-	2
BP106RBT BP106RMT	Remedial Biology/ Remedial Mathematics – Theory*	2/30	-	D
BP107P	Human Anatomy and Physiology – Practical	4/60	-	2
BP108P	Pharmaceutical Analysis I – Practical	4/60	-	2
BP109P	Pharmaceutics I – Practical	4/60	-	2
BP110P	Pharmaceutical Inorganic Chemistry – Practical	4/60	-	2
BP111P	Communication skills – Practical*	2/30	-	1
BP112RBP	Remedial Biology – Practical*	2/30	-	D
	Total	**32/34$^{\$}$/36$^{\#}$/480/510$^{\$}$/540$^{\#}$**	**4**	**27**

#Applicable ONLY for the students who have studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology (RB) course. However for Remedial biology and Mathematics no credits to be allotted only 50 % passing i.e D grade will be prerequisite.

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

* Non University Examination (NUE)

Table-II: Course of study for semester II

Course Code	Name of the course	No. of Hours per week/Total no of hours	Tutorial	Credit points
BP201T	Human Anatomy and Physiology II – Theory	3/45	1	4
BP202T	Pharmaceutical Organic Chemistry I – Theory	3/45	1	4
BP203T	Biochemistry – Theory	3/45	1	4
BP204T	Pathophysiology – Theory	3/45	1	4
BP205T	Computer Applications in Pharmacy – Theory *	3/45	-	3
BP206T	Environmental sciences – Theory *	3/45	-	3
BP207P	Human Anatomy and Physiology II – Practical	4/60	-	2
BP208P	Pharmaceutical Organic Chemistry I– Practical	4/60	-	2
BP209P	Biochemistry – Practical	4/60	-	2
BP210P	Computer Applications in Pharmacy – Practical*	4/60	-	1
	Total	**32/480**	**4**	**29**

*Non University Examination (NUE)

Table-III: Course of study for semester III

Course code	Name of the course	No. of Hours per week/Total no of hours	Tutorial	Credit points
BP301T	Pharmaceutical Organic Chemistry II – Theory	3/45	1	4
BP302T	Physical Pharmaceutics I – Theory	3/45	1	4
BP303T	Pharmaceutical Microbiology – Theory	3/45	1	4
BP304T	Pharmaceutical Engineering – Theory	3/45	1	4
BP305P	Pharmaceutical Organic Chemistry II – Practical	4/60	-	2
BP306P	Physical Pharmaceutics I – Practical	4/60	-	2
BP307P	Pharmaceutical Microbiology – Practical	4/60	-	2
BP 308P	Pharmaceutical Engineering –Practical	4/60	-	2
	Total	**28/420**	**4**	**24**

Table-IV: Course of study for semester IV

Course code	Name of the course	No. of Hours per week/Total no of hours	Tutorial	Credit points
BP401T	Pharmaceutical Organic Chemistry III– Theory	3/45	1	4
BP402T	Medicinal Chemistry I – Theory	3/45	1	4
BP403T	Physical Pharmaceutics II – Theory	3/45	1	4
BP404T	Pharmacology I – Theory	3/45	1	4
BP405T	Pharmacognosy and Phytochemistry I– Theory	3/45	1	4
BP406P	Medicinal Chemistry I – Practical	4/60	-	2
BP407P	Physical Pharmaceutics II – Practical	4/60		2
BP408P	Pharmacology I – Practical	4/60	-	2
BP409P	Pharmacognosy and Phytochemistry I – Practical	4/60	-	2
	Total	**31/465**	**5**	**28**

Table-V: Course of study for semester V

Course code	Name of the course	No. of Hours per week/Total no of hours	Tutorial	Credit points
BP501T	Medicinal Chemistry II – Theory	3/45	1	4
BP502T	Formulative Pharmacy– Theory	3/45	1	4
BP503T	Pharmacology II – Theory	3/45	1	4
BP504T	Pharmacognosy and Phytochemistry II– Theory	3/45	1	4
BP505T	Pharmaceutical Jurisprudence – Theory	3/45	1	4
BP506P	Formulative Pharmacy – Practical	4/60	-	2
BP507P	Pharmacology II – Practical	4/60	-	2
BP508P	Pharmacognosy and Phytochemistry II – Practical	4/60	-	2
	Total	**27/405**	**5**	**26**

Table-VI: Course of study for semester VI

Course code	Name of the course	No. of Hours per week/Total no of hours	Tutorial	Credit points
BP601T	Medicinal Chemistry III – Theory	3/45	1	4
BP602T	Pharmacology III – Theory	3/45	1	4
BP603T	Herbal Drug Technology – Theory	3/45	1	4
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	3/45	1	4
BP605T	Pharmaceutical Biotechnology – Theory	3/45	1	4
BP606T	Quality Assurance –Theory	3/45	1	4
BP607P	Medicinal chemistry III – Practical	4/60	-	2
BP608P	Pharmacology III – Practical	4/60	-	2
BP609P	Herbal Drug Technology – Practical	4/60	-	2
	Total	**30/450**	**6**	**30**

Table-VII: Course of study for semester VII

Course code	Name of the course	No. of Hours per week/Total no of hours	Tutorial	Credit points
BP701T	Instrumental Methods of Analysis – Theory	3/45	1	4
BP702T	Industrial Pharmacy – Theory	3/45	1	4
BP703T	Pharmacy Practice – Theory	3/45	1	4
BP704T	Novel Drug Delivery System – Theory	3/45	1	4
BP705P	Instrumental Methods of Analysis – Practical	4/60	-	2
BP706PS	Practice School*	12/180	-	6
Total		**28/420**	**5**	**24**

***** Non University Examination (NUE)

Table-VIII: Course of study for semester VIII

Course code	Name of the course	No. of Hours per week/Total no of hours	Tutorial	Credit points
BP801T	Biostatistics and Research Methodology	3/45	1	4
BP802T	Social and Preventive Pharmacy	3/45	1	4
BP803ET	Pharmaceutical Marketing	3 + 3 = 6/90	1 + 1 = 2	4 + 4 = 8
BP804ET	Pharmaceutical Regulatory Science			
BP805ET	Pharmacovigilance			
BP806ET	Quality Control and Standardizations of Herbals			
BP807ET	Computer Aided Drug Design			
BP808ET	Cell and Molecular Biology			
BP809ET	Cosmetic Science			
BP810ET	Experimental Pharmacology			
BP811ET	Advanced Instrumentation Techniques			
BP812PW	Project Work	12/180	-	6
	Total	**24/360**	**4**	**22**

Table-IX: Semester wise credits distribution

Semester	Credit Points
I	**27**
II	29
III	26
IV	28
V	26
VI	26
VII	24
VIII	22
Extracurricular/ Co curricular activities	01*
Total credit points for the program	**209**

* The credit points assigned for extracurricular and or co-curricular activities shall be given by the Principals of the colleges and the same shall be submitted to the University. The criteria to acquire this credit point shall be defined by the colleges from time to time.

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

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

1. Program Committee

1. The B. Pharm. program shall have a Program Committee constituted by the Head of the institution in consultation with all the Heads of the departments.

2. The composition of the Program Committee shall be as follows:

   A senior teacher shall be the Chairperson; One Teacher from each department handling B.Pharm courses; and four student representatives of the program (one from each academic year), nominated by the Head of the institution.

3. Duties of the Program Committee:

   i. Periodically reviewing the progress of the classes.
   ii. Discussing the problems concerning curriculum, syllabus and the conduct of classes.
   iii. Discussing with the course teachers on the nature and scope of assessment for the course and the same shall be announced to the students at the beginning of respective semesters.
   iv. Communicating its recommendation to the Head of the institution on academic matters.
   v. The Program Committee shall meet at least thrice in a semester preferably at the end of each Sessionalexam (Internal Assessment) and before the end semester exam.

2. Examinations/Assessments

The scheme for internal assessment and end semester examinations is given in Table – X.

2.1. End semester examinations

The End Semester Examinations for each theory and practical coursethrough semesters I to VIII shall beconducted by the university except for the subjects with asterix symbol (*) in table I and II for which examinations shall be conducted by the subject experts at college level and the marks/grades shall be submitted to the university.

Tables-X: Schemes for internal assessments and end semester examinations semester wise

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 BP106RMT	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)

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

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**

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**

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	Formulative Pharmacy– 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	Formulative Pharmacy – 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**

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**

Semester VII

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP701T	Instrumental Methods of Analysis – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP702T	Industrial Pharmacy – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP703T	Pharmacy Practice – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP704T	Novel Drug Delivery System – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP705 P	Instrumental Methods of Analysis – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP706 PS	Practice School*	25	-	-	25	125	5 Hrs	150
Total		**70**	**70**	**8Hrs**	**140**	**460**	**21 Hrs**	**600**

***** The subject experts at college level shall conduct examinations

Semester VIII

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP801T	Biostatistics and Research Methodology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP802T	Social and Preventive Pharmacy – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP803ET	Pharmaceutical Marketing – Theory	10 + 10 = 20	15 + 15 = 30	1 + 1 = 2 Hrs	25 + 25 = 50	75 + 75 = 150	3 + 3 = 6 Hrs	100 + 100 = 200
BP804ET	Pharmaceutical Regulatory Science – Theory							
BP805ET	Pharmacovigilance – Theory							
BP806ET	Quality Control and Standardizations of Herbals – Theory							
BP807ET	Computer Aided Drug Design – Theory							
BP808ET	Cell and Molecular Biology – Theory							
BP809ET	Cosmetic Science – Theory							
BP810ET	Experimental Pharmacology – Theory							
BP811ET	Advanced Instrumentation Techniques – Theory							
BP812PW	Project Work	-	-	-	-	150	4 Hrs	150
	Total	**40**	**60**	**4 Hrs**	**100**	**450**	**16 Hrs**	**550**

11.2 Internal assessment: Continuous mode

The marks allocated for Continuous mode of Internal Assessment shall be awarded as per the scheme given below.

Table-XI: Scheme for awarding internal assessment: Continuous mode

Theory		
Criteria	**Maximum Marks**	
Attendance (Refer Table – XII)	4	2
Academic activities (Average of any 2 activities e.g. quiz, assignment, open book test, field work, group discussion and seminar)	4	03
Student – Teacher interaction	2	
Total	**10**	**5**
Practical		
Attendance (Refer Table – XII)	2	
Based on Practical Records, Regular viva voce, etc.	3	
Total	**5**	

Table- XII: Guidelines for the allotment of marks for attendance

Percentage of Attendance	Theory	Practical
95 – 100	4	2
90 – 94	3	1.5
85 – 89	2	1
80 – 84	1	0.5
Less than 80	0	0

11.2.1. Sessional Exams

Two Sessional exams shall be conducted for each theory / practical course as per the schedule fixed by the college(s). The scheme of question paper for theory and practical Sessional examinations is given below. The average marks of two Sessional exams shall be computed for internal assessment as per the requirements given in tables – X.

Sessional exam shall be conducted for 30 marks for theory and shall be computed for 15 marks. Similarly Sessional exam for practical shall be conducted for 40 marks and shall be computed for 10 marks. The duration for the conduct of the exam is as below

Exam Type	Marks allotted	Duration
Theory	30	1.5 Hr
Practical	40	04 Hr

Question paper pattern for theory Sessional

For subjects having University exams

I. Objective Type Questions (Answer 05 out of 7)	=5 x 2 = 10
II. Long Answers (Answer 1 out of 2)	=1 x 10 = 10
III. 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**

12 . Promotion and award of grades

A student shall be declared PASS and eligible for getting grade in a course of B.Pharm.program if he/she secures at least 50% marks in that particular course including internal assessment. For example, to be declared as PASS and to get grade, the student has to secure a minimum of 50 marks for the total of 100 including continuous mode of assessment and end semester theory examination and has to secure a minimum of 25 marks for the total 50 including internal assessment and end semester practical examination.

13. Carry forward of marks

In case a student fails to secure the minimum 50% in any Theory or Practical course as specified in 12,then he/she shall reappear for the end semester examination of that course. However his/her marks of the Internal Assessment shall be carried over and he/she shall be entitled for grade obtained by him/her on passing.

14. Improvement of internal assessment

A student shall have the opportunity to improve his/her performance in the Sessional exam component of the internal assessment. The re-conduct of the Sessional exam shall be completed before the commencement of next end semester theory examinations.

15. Re-examination of end semester examinations

Reexamination ofend semester examinationshall be conducted as per the schedule given in table XIII. The exact dates of examinations shall be notified from time to time.

Table-XIII: Tentative schedule of end semester examinations

Semester	For Regular Candidates	For Failed Candidates
I, III, V and VII	November / December	May / June
II, IV, VI and VIII	May / June	November / December

Question paper pattern for end semester theory examinations

For 75 marks paper

I. Objective Type Questions (Answer 5 out of 7)	=5x 3= 15
II. Long Answers (Answer 2 out of 4)	= 2 x 10 = 20
III. Short Answers (Answer 8 out of 10)	= 8 x 5 = 40
Total	**= 75marks**

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 1out 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	= 05
II. Experiments	= 25
III. Viva voce	= 05
Total	**= 35marks**

16. Academic Progression:

No student shall be admitted to any examination unless he/she fulfills the norms given in 6. Academic progression rules are applicable as follows:

A student shall be eligible to carry forward all the courses of I, II and III semesters till the IV semester examinations. However, he/she shall not be eligible to attend the courses of V semester until all the courses of I and II semesters are successfully completed.

A student shall be eligible to carry forward all the courses of III, IV and V semesters till the VI semester examinations. However, he/she shall not be eligible to attend the courses of VII semester until all the courses of I, II, III and IV semesters are successfully completed.

A student shall be eligible to carry forward all the courses of V, VI and VII semesters till the VIII semester examinations. However, he/she shall not be eligible to get the course completion certificate until all the courses of I, II, III, IV, V and VI semesters are successfully completed.

A student shall be eligible to get his/her CGPA upon successful completion of the courses of I to VIII semesters within the stipulated time period as per the norms specified in 26.

A lateral entry student shall be eligible to carry forward all the courses of III, IV and V semesters till the VI semester examinations. However, he/she shall not be eligible to attend the courses of VII semester until all the courses of III and IV semesters are successfully completed.

A lateral entry student shall be eligible to carry forward all the courses of V, VI and VII semesters till the VIII semester examinations. However, he/she shall not be eligible to get the course completion certificate until all the courses of III, IV, V and VI semesters are successfully completed.

A lateral entry student shall be eligible to get his/her CGPA upon successful completion of the courses of III to VIII semesters within the stipulated time period as per the norms

specified in 26.

Any student who has given more than 4 chances for successful completion of I / III semester courses and more than 3 chances for successful completion of II / IV semester courses shall be permitted to attend V / VII semester classes ONLY during the subsequent academic year as the case may be. In simpler terms there shall NOT be any ODD BATCH for any semester.

Note: Grade AB should be considered as failed and treated as one head for deciding academic progression. Such rules are also applicable for those students who fail to register for examination(s) of any course in any semester.

Rules for Carry Forward:

The curriculum (including regulations, structure and syllabi) is in force from academic year 2018-19 and onwards for First Year B. Pharm, for academic year 2019- 20 onwards for Second Year B. Pharm., for academic year 2020-21 and onwards for Third Year B. Pharm., and for academic year 2021-22 and onwards for Final Year B. Pharm.

The learners who were admitted to First Year B. Pharm. of 2015 pattern during the academic year 2017-18 or before & failed in the First Year B.Pharm. of 2015 pattern examination will have to take admission to Semester-III of Second Year B. Pharm. of 2018 pattern in academic year 2019-20 or onwards, provided that

a. Their result of F. Y. B. Pharm of 2015 pattern is either pass or fails with A. T. K. T. The said students will have to take up additional remedial courses as follows.

b) The learners who were admitted to S.Y B. Pharm. of 2015 pattern during the academic year 2018-19 or before and fail in the S.Y B.Pharm. of 2015 pattern examination will have to take admission to Semester-V of Third Year B. Pharm. of 2018 pattern in academic year 2020-21 or onwards, provided that Their result of S. Y. B. Pharm of 2015 pattern is either pass or fails with A. T. K. T. The said students will have to take up additional remedial course as follows.

Sr. No	**Remedial courses for admission to S.Y.B.Pharm in Academic Year 2019-20 (Cleared F.Y. B. Pharm as per 2015 Pattern)**		
	(Non University Examination)	**Semester**	**Passing Criteria**
1.	Biochemistry – Theory/Practicals	Semester III	Minimum 50% marks with D grade
2.	Pathophysiology- Theory		Minimum 50% marks with D grade
3.	Computer Applications in	Semester IV	Minimum 50% marks with D

	Pharmacy – Theory/Practicals		grade
4.	Environmental sciences – Theory		Minimum 50% marks with D grade

Sr. No	Remedial courses for admission to T.Y. B.Pharm in Academic Year 2020-21 (Cleared S. Y.B. Pharm as per 2015 Pattern)		
	(Non University Examination with 50% passing.)	**Semester**	**Passing Criteria**
1.	Medicinal Chemistry I – Theory/ Practical	Semester V	Minimum 50% marks with D grade

17. Grading of performances

17.1. Letter grades and grade points allocations:

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

Table – XII: Letter grades and grade points equivalent to Percentage of marks and performances

Percentage of Marks Obtained	Letter Grade	Grade Point	Performance
90.00 – 100	O	10	Outstanding
80.00 – 89.99	A	9	Excellent
70.00 – 79.99	B	8	Good
60.00 – 69.99	C	7	Fair
50.00 – 59.99	D	6	Average
Less than 50	F	0	Fail
Absent	AB	0	Fail

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

18. The Semester grade point average (SGPA)

The performance of a student in a semester is indicated by a number called ‘Semester

Grade Point Average' (SGPA). The SGPA is the weighted average of the grade points obtained in all the courses by the student during the semester. For example, if a student takes five courses(Theory/Practical) in a semester with credits C1, C2, C3, C4 and C5 and the student's grade points in these courses are G1, G2, G3, G4 and G5, respectively, and then students' SGPA is equal to:

$$SGPA = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4G_4 + C_5G_5}{C1 + C2 + C3 + C4 + C5}$$

The SGPA is calculated to two decimal points.It should be noted that, the SGPA for any semester shall take into consideration the F and ABS grade awarded in that semester. For example if a learner has a F or ABS grade in course 4, the SGPA shall then be computed as:

$$SGPA = \frac{C1G1 + C2G2 + C3G3 + C4 * ZERO + C5G5}{C1 + C2 + C3 + C4 + C5}$$

19. Cumulative Grade Point Average (CGPA)

The CGPA is calculated with the SGPA of all the VIII semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all VIII semesters and their courses. The CGPA shall reflect the failed statusin case of F grade(s),till the course(s) is/are passed. When the course(s)is/are passedby obtaining a pass grade on subsequent examination(s) theCGPA shall only reflect the new grade and not the fail grades earned earlier.The CGPA is calculated as:

$$CGPA = \frac{C1S1 + C2S2 + C3S3 + C4S4 + C5S5 + C6S6 + C7S7 + C8S8}{C1 + C2 + C3 + C4 + C5 + C6 + C7 + C8}$$

where $C_1, C_2, C_3, \ldots$ is the total number of credits for semester I,II,III,…. and $S_1, S_2, S_3, \ldots$ is the SGPA of semester I,II,III,…. .

20. Declaration of class

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

First Class with Distinction	= CGPA of. 7.50 and above
First Class	= CGPA of. 6.00 to 7.49
Second Class	= CGPA of. 5.00 to 5.99

21. Project work

All the students shall undertake a project under the supervision of a teacher and submit a report. The area of the project shall directly relate any one of the elective subject opted by the student in semester VIII. The project shall be carried out in group not exceeding 5 in number. The project report shall be submitted in triplicate (typed & bound copy not less than 25 pages).

The internal and external examiner appointed by the University shall evaluate the project at the time of the Practical examinations of other semester(s). Students shall be evaluated in groups for four hours (i.e., about half an hour for a group of five students). The projects shall be evaluated as per the criteria given below

Evaluation of Dissertation Book:

Objective(s) of the work done	15 Marks
Methodology adopted	20 Marks
Results and Discussions	20 Marks
Conclusions and Outcomes	20 Marks
Total	**75 Marks**

Evaluation of Presentation:

Presentation of work	25 Marks
Communication skills	20 Marks
Question and answer skills	30 Marks
Total	**75 Marks**

Explanation: The 75 marks assigned to the dissertation book shall be same for all the students in a group. However, the 75 marks assigned for presentation shall be awarded based on the performance of individual students in the given criteria.

22. Industrial training (Desirable)

Every candidate shall be required to work for at least 150 hours spread over four weeks in a Pharmaceutical Industry/Hospital. It includes Production unit, Quality Control department, Quality Assurance department, Analytical laboratory, Chemical manufacturing unit, Pharmaceutical R&D, Hospital (Clinical Pharmacy), Clinical Research Organization, Community Pharmacy, etc. After the Semester – VI and before the commencement of Semester – VII, and shall submit satisfactory report of such work and certificate duly signed by the authority of training organization to the head of the institute.

AND/OR

Every candidate shall be required to undergo any one of the Skill development modules mentioned below**(Duration – Min. 04 weeks)**

a) Hands on Training (Central instrumentation lab/Machine room etc)

b) UGC/AICTE recognized online courses (SWAYAM/NPTEL etc)

After the successful completion of the module the candidate shall submit satisfactory report and certificate duly signed by the authority of training organization/Head of the institute

23. Practice School

In the VII semester, every candidate shall undergo practice school for a period of 150 hours evenly distributed throughout the semester. The student shall opt any one of the domains for practice school declared by the program committee from time to time.

At the end of the practice school, every student shall submit a printed report (in triplicate) on the practice school he/she attended (not more than 25 pages). Along with the exams of semester VII, the report submitted by the student, knowledge and skills acquired by the student through practice school shall be evaluated by the subject experts at college level and grade point shall be awarded.

24. Award of Ranks

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

25. Award of degree

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

26. Duration for completion of the program of study

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

27. Re-admission after break of study

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

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

Chapter-II: Syllabus

Semester-I

BP101T. HUMAN ANATOMY AND PHYSIOLOGY-I (Theory) 45 Hours

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 various experiments related to special senses and nervous system.
5. Appreciate coordinated working pattern of different organs of each system

Course Content:

Unit-I **10 hours**

a) Introduction to human body 3 hours

Definition and scope of anatomy and physiology, levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminology.

b) Cellular level of organization 3 hours

Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, intracellular signalling pathway activation by extracellular signal

molecule, Forms of intracellular signalling: a) Contact-dependent b) Paracrine c) Synaptic d) Endocrine

c) Tissue level of organization 4 hours

Classification of tissues, structure, location and functions of epithelial,

muscular and nervous and connective tissues.

Unit -II **10 hours**

a) Integumentary system 4 hours

Structure and functions of skin

b) Skeletal system 4 hours

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.

c) Joints 2 hours

Structural and functional classification, types of joints movements and its articulation

Unit-III **10 hours**

a) Body fluids and blood 7 hours

Body fluids, composition and functions of blood, blood cells, hemopoeisis, formation of hemoglobin, anaemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood, Reticulo endothelial system.

b) Lymphatic system 3hours

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

Unit-IV **08 hours**

a) Peripheral nervous system: 3 Hours

Classification of peripheral nervous system: Structure and functions of sympathetic and parasympathetic nervous system. Origin and functions of spinal and cranial nerves.

b) Special senses 5 Hours

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

Unit-V **07 hours**

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.

Recommended Books:

1. Chatterjee, C.C., Human Physiology. Medical Allied Agency, Kolkata.
2. Ganong, W.F., Review of Medical Physiology. Prentice-Hall International, London.
3. Guyton, A.C., Textbook of Medical Physiology. W. B. Saunders Co., Philadelphia, USA.
4. Tortora, G.J. and Grabowski, S.R., 2005. Principals of Anatomy and Physiology. Harper Collins College Publishers, New York.
5. Vander, A.J., Sherman, J.H. and Luciano, D.S., Human Physiology. McGraw-Hill Publishing Co., USA.
6. Waugh, A. and Grant, A., Ross and Wilson's Anatomy and Physiology in Health and Illness. Churchill-Livingstone, London.
7. West, J.B., Best and Taylor's Physiological Basis of Medical Practice. Williams and Wilkins,Baltimore, USA.
8. Warwick, R. and Williams, P., Gray's Anatomy. Longman, London.
9. Chaudhari S K. Concise Medical Physiology. New Central Book Agency (P) Ltd., Calcutta.
10. Godkar P.B and Godkar D.P., Textbook of Medical Laboratory Technology. Bhalani Publishing House, Mumbai.
11. Joshi V.D. Practical Physiology. Vora Medical Publications, Mumbai.
12. DiFiore-Mariano S.H., Atlas of Human Histology. Lea and Febiger, Philadelphia.
13. Garg K., Bahel I. and Kaul M., A Textbook of Histology. CBS Publishers and Distributors, New Delhi.
14. Goyal, R.K., Patel, N.M. and Shah, S.A., Practical Anatomy, Physiology and Biochemistry. B. S. Shah Prakashan, Ahmedabad.
15. Ranade, V.G., Joshi, P.N. and Pradhan, S., Textbook of Practical Physiology. Pune Vidyarthi Griha Prakashan, Pune.
16. Singh, I., BD., Chaurasia's Human Anatomy. CBS Publisher and Distributors, New Delhi.
17. Singh, I., Textbook of Human Histology. Jaypee brothers Medical Publishers, New Delhi.
18. Mukherjee, K.L., Medical Laboratory Technology. Tata McGraw Hill Publishing Company Ltd. New Delhi.
19. Beck, W.S., Human Desigh: Molecular, Cellular and Systemic Physiology. Harcourt Brace Jovanovich Inc. New York.
20. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee Brothers medical publishers, New Delhi.
21. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
22. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
23. Textbook of Human Histology by Inderbir Singh, Jaypee brother’s medical publishers, New Delhi.
24. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother’s medical publishers, New Delhi.

BP107P. HUMAN ANATOMY AND PHYSIOLOGY (Practical)

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. 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 haemocytometer.

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 haemoglobin 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.

16. Visit to Blood bank.

Recommended Books:

1. Godkar P.B and Godkar D.P., Textbook of Medical Laboratory Technology. Bhalani Publishing House, Mumbai.
2. Joshi V.D. Practical Physiology. Vora Medical Publications, Mumbai.
3. DiFiore-Mariano S.H., Atlas of Human Histology. Lea and Febiger, Philadelphia.

4. Mukherjee, K.L., Medical Laboratory Technology. Tata McGraw Hill Publishing Company Ltd. New Delhi.
5. Beck, W.S., Human Desigh: Molecular, Cellular and Systemic Physiology. Harcourt Brace Jovanovich Inc. New York.
6. Chatterjee, C.C., Human Physiology. Medical Allied Agency, Kolkata.
7. Ganong, W.F., Review of Medical Physiology. Prentice-Hall International, London.
8. Guyton, A.C., Textbook of Medical Physiology. W. B. Saunders Co., Philadelphia, USA.
9. Tortora, G.J. and Grabowski, S.R., 2005.
10. Principals of Anatomy and Physiology. Harper Collins College Publishers, New York.
11. Vander, A.J., Sherman, J.H. and Luciano, D.S., Human Physiology. McGraw-Hill Publishing Co., USA.
12. Garg K., Bahel I. and Kaul M., A Textbook of Histology. CBS Publishers and Distributors, New Delhi.
13. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee Brother's medical publishers, New Delhi.

BP102T. PHARMACEUTICAL ANALYSIS (Theory) 45 hours

Scope

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

Objectives

Upon completion of the course a student shall be able to understand -

- The principles of volumetric and electrochemical analysis.
- Carry out various volumetric and electrochemical titrations.
- Develop analytical skills.

COURSE CONTENT

UNIT-1

a) **Pharmaceutical analysis -** Definition and scope
   i. Different techniques of analysis
   ii. Methods of expressing concentration **05 hours**
   iii. Primary and Secondary standards.

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

UNIT-II

a) 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. Preparation and standardization of sodium hydroxide, hydrochloric acid, sulphuric acid, Estimation of ammonium chloride **10 hours**

b) Non aqueous titration: Solvents, acidimetry and alkalimetry titrations, and estimation of sodium benzoate.

UNIT-III

a) Precipitation titrations: Mohr's method, Volhard's method, Modified Volhard's method, Fajans method, and estimation of Sodium Chloride I.P.

b) Complexometric titration: Classification, metal ion indicators, masking and demasking reagents, and estimation of Calcium gluconate I.P. **12 hours**

c) Gravimetry: Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, and estimation of Barium sulphate I. P.

UNIT-IV

Redox titrations

i. Concepts of oxidation and reduction
ii. Preparation and standardization of Potassium Permanganate I. P., Ceric Ammonium Sulphate I. P./B. P. and Sodium Thiosulphate I. P./B. P. **08 Hours**
iii. Types of redox titrations (Principles and applications) : Permaganometry,

Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titrations with Potassium Iodate I. P.

UNIT-V

a) Electrochemical methods of analysis

i. **Conductometry** - Introduction, Conductivity cell, Conductometric titrations, applications.

ii. **Potentiometry** - Electrochemical cell, construction and working of reference (Standard Hydrogen Electrode, Silver Chloride Electrode and Calomel Electrode) and Indicator Eectrodes (Metal electrodes and Glass Electrode), methods to determine end point of potentiometric titration and applications.

iii. **Polarography** - Principle and llkovik Equation.

b) Refractometry - Introduction, refractive index, specific and molar refraction, measurement of RI, Abbe's refractometer and applications.

10 hours

BP108P. PHARMACEUTICAL ANALYSIS (Practical)

4 Hours/week

I. Preparation and standardization of

(1) Aq. Sodium Hydroxide I. P.

(2) Aq. Sulphuric Acid I. P./ Aq. Hydrochloric Acid I. P.

(3) Aq. Sodium Thiosulfate I. P.

(4) Aq. Potassium Permanganate I. P.

(5) Aq. Ceric Ammonium Sulphate I. P.

3 turns

II. Assay of the following compounds along with Standardization of Titrant

(1) Ammonium chloride by acid-base titration

(2) Sodium benzoate I. P. by non-aqueous titration

(3) Sodium chloride I. P. by precipitation titration

(4) Calcium gluconate I. P. by complexometry

(5) Hydrogen peroxide I. P./B. P. by Permanganometry

(6) Ferrous sulphate I. P. by cerimetry

(7) Copper sulphate I. P. by iodometry

8 turns

III. Determination of Normality by electro-analytical methods

(1) Conductometric titrations 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 (Using Sigmoidal and First order derivative plot)

3 turns

IV. Measurement of refractive index of some samples

(Glycerol, Water, Rectified Spirit, Castor Oil I. P.)

1 turn

Recommended Books

1. Indian Pharmacopoeia, Ministry of Health and Family Welfare, Controller of Publications Edition, New Delhi.
2. British Pharmacopoeia, British Pharmacopoeia Commission, London, 2015.
3. Beckett, A.H. and Stenlake J. B., Practical Pharmaceutical Chemistry, Vol I, Stahlome Press, University of London.
4. Vogel, A. I., A Textbook of Quantitative Chemical Analysis, Thames Polytechnic, London, Longman Group, UK Ltd.
5. Connors K. A., A Textbook of Pharmaceutical Analysis, Third Edition, John Wiley and Sons.
6. Christian G. D., Analytical Chemistry, 6/Ed, John Wiley & Sons.
7. Mahadik K. R., Wadodkar S.G., More H. N, Pharmaceutical Analysis, Vol. I and II, Nirali Prakashan.
8. Kar Ashutosh, Pharmaceutical Drug Analysis, Minerva Press, New Delhi.
9. Day R. A. & Underwood A. L. Quantitative Analysis. 5/Ed., Prentice Hall of India Pvt.Ltd. New Delhi.
10. Skoog, A. D. West, D. M. et al. Fundamentals of Analytical Chemistry. 8/ Ed. Thomson Brookslcole.
11. Willard Merit. Dean Settle, Instrumental Methods of Analysis, 7/Ed, CBS Publisher & Distributor.
12. Sharma, B. K. Instrumental Methods of Chemical Analysis, Goel Publishing House.

BP103T. PHARMACEUTICS- I (Theory) 45 Hours

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:

- Know the history of profession of pharmacy
- Understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations
- Understand the professional way of handling the prescription
- Preparation of various conventional dosage forms

Course Content:

UNIT – I **10 Hours**

- **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.
- **Dosage forms:** Introduction to dosage forms, classification and definitions
- **Prescription:** Definition, Parts of prescription, handling of Prescription and Errors in prescription.
- **Posology:** Definition, Factors affecting posology. Pediatric dose calculations based on age, body weight and body surface area.

UNIT – II **10 Hours**

- **Pharmaceutical calculations**: Weights and measures – Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point and molecular weight.
- **Powders:** Definition, classification, advantages and disadvantages,Simple & compound powders – official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions.
- **Liquid dosage forms:** Advantages and disadvantages of liquid dosage forms. Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques

UNIT – III **10 Hours**

- **Monophasic liquids:** Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments and Lotions.
- **Biphasic liquids:**
  Suspensions: Definition, advantages and disadvantages, classifications, Preparation of suspensions; Flocculated and Deflocculated suspension & stability problems and methods to overcome.

  Emulsions: Definition, classification, emulsifying agent, test for the identification of type of Emulsion, Methods of preparation & stability problems and methods to overcome.

UNIT – IV **08 Hours**

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

UNIV – V **07 Hours**

- **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)

4 Hours / week

1 . Syrups

a) Syrup IP'66

b) Compound syrup of Ferrous Phosphate BPC'68

2. Elixirs a) Piperazine citrate elixir

b) Paracetamol pediatric elixir

3.Linctus a) Terpin Hydrate Linctus IP'66

b) Iodine Throat Paint (Mandles Paint)

4. Solutions

a) Strong solution of ammonium acetate

b) Cresol with soap solution

c) LugOL'S SOLUTion

5. Suspensions (Any two experiments)

a) Calamine lotion

b) Magnesium Hydroxide mixture

c) Aluminimum Hydroxide gel

6. Emulsions a) Turpentine Liniment

b) Liquid paraffin emulsion

7. Powders and Granules (Any three experiments)

a) ORS powder (WHO)

b) Effervescent granules

c) Dusting powder

d) Divided powders

8. Suppositories (Any two experiments)

a) Glycero gelatin suppository

b) Coca butter suppository

c) Zinc Oxide suppository

8. Semisolids (Any two experiments)

a) Sulphur ointment

b) Non staining-iodine ointment with methyl salicylate

c) Carbopol gel

9. Gargles and Mouthwashes

a) Iodine gargle

b) Chlorhexidine mouthwash

Recommended Books:

1. H.C. Ansel et al., Pharmaceutical Dosage Form and Drug Delivery System, Lippincott Williams and Walkins, New Delhi.
2. Carter S.J., Cooper and Gunn's-Dispensing for Pharmaceutical Students, CBS publishers, New Delhi.
3. M.E. Aulton, Pharmaceutics, The Science& Dosage Form Design, Churchill Livingstone, Edinburgh.
4. Indian pharmacopoeia.
5. British pharmacopoeia.
6. Lachmann. Theory and Practice of Industrial Pharmacy,Lea& Febiger Publisher, The University of Michigan.
7. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott Williams, New Delhi.
8. 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.

BP104T. PHARMACEUTICAL INORGANIC CHEMISTRY (Theory) 45 Hours

Scope

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

Objectives

Upon completion of course student shall be able to

- Know the sources of impurities and methods to determine the impurities in drugs and pharmaceuticals
- Understand the medicinal and pharmaceutical importance of inorganic compounds

COURSE CONTENT

UNIT I

a) **Impurities in pharmaceutical substances**: History of pharmacopoeia, sources and types of impurities, principle, reaction and procedure involved in the limit test for chloride, sulphate, iron, arsenic, lead and heavy metals, modified limit test for chloride and sulphate. **10 hours**

b) **Water:** Different official waters and official control test for water.

General methods of preparation and assay for compounds superscripted with asterisk (*). Properties and Medicinal uses of Inorganic Compounds belonging to the following classes

UNIT II

a) **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.

b) **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. **10 hours**

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

UNIT III

a) **Gastrointestinal agents**
   i. **Acidifiers:** Ammonium chloride* and Dil. HCl
   ii. **Antacid:** Ideal properties of antacids, combinations of antacids, Sodium
   iii. Bicarbonate*, Aluminum hydroxide gel, Magnesium hydroxide mixture **10 hours**
   iv. **Cathartics:** Magnesium sulphate, Sodium orthophosphate,

b) **Protectives and Adsorbents**: Kaolin and Bentonite

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

UNIT IV

Miscellaneous Compounds

08 hours

a) **Expectorants**: Potassium iodide, Ammonium chloride
b) **Emetics**: Copper sulphate* , Sodium potassium tartarate
c) **Haematinics**: Ferrous sulphate*, Ferrous gluconate
d) **Poison and Antidote**: Sodium thiosulphate*, Activated charcoal, Sodium nitrite
e) **Astringents:** Zinc Sulphate, Potash Alum

UNIT V

07 hours

Radiopharmaceuticals: Radio activity, measurement of radioactivity, properties of α, β, γ radiations, half-life, radio isotopes and study of radio isotopes - Sodium iodide^{131} , · Indium^{111}, Calcium^{47} , Chromium ^{51}, Erbium^{169}, Gallium^{68}, Technetium^{99m} , Storage conditions, precautions & pharmaceutical applications of radioactive substances.

BP110P. PHARMACEUTICAL INORGANIC CHEMISTRY (Practical)
4 Hours/Week

I.	**Limit Test of the following:** (1) Chloride (2) Sulphate (3) Iron (4) Arsenic (5) Lead (6) Heavy metals	**6 turns**
II.	**Identification test** (1) Magnesium hydroxide (2) Ferrous sulphate (3) Sodium bicarbonate (4) Calcium gluconate (5) Copper sulphate	**3 turns**
III.	**Test for purity** (1) Swelling power of Bentonite (2) Neutralizing capacity of Aluminum hydroxide gel (3) Determination of Potassium iodate and iodine in Potassium Iodide	**3 turns**
IV.	**Preparation of Inorganic Pharmaceuticals** (1) Boric acid (2) Potash alum (3) Ferrous sulphate	**3 turns**

Recommended Books

1. Beckett, A.H. and Stenlake, J. B. 1970, Practical Pharmaceutical Chemistry, Vol I & II, 4th edn, Stahlone Press of University of London.
2. Jeffery, G. H., Bassett, J., Mendham, J. and Cdenney, R., Vogel's Textbook of Quantitative Chemical Analysis, 5th edn, Thames Polytechnic, Longman Group, UK Ltd, London.
3. Gundu Rao, P. 2008, Pharmaceutical and Medicinal Inorganic Chemistry, Vallabh Prakashan.
4. Bentley, A.O., Driver, J.E. and Atherden, L.M. 1969, Bentley and Driver's Textbook of Pharmaceutical Chemistry, Oxford University Press, London.
5. Anand, S.K. and Chatwal, G.R. 2017, Inorganic Pharmaceutical Chemistry, Himalaya Publishing House Pvt Ltd.
6. Block, J.H., Roche, E.B., Soine, T.O and Wilson, C.O. 1974, Inorganic Medicinal and Pharmaceutical Chemistry, Philadelphia, PA.
7. Indian Pharmacopoeia, Ministry of Health and Family Welfare, Controller of Publications Edition, New Delhi.

BP105T.COMMUNICATION SKILLS (Theory) 30hours

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. Effectivelymanage the team as a team player
4. Develop interview skills
5. Develop Leadership qualities and essentials

COURSE CONTENT

UNIT – I

- **Communication Skills:** Introduction, Definition, The Importance of Communication,
The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context
- **Barriers to communication:** Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological
Barriers, Emotional barriers **07 Hours**
- **Perspectives in Communication:** Introduction, Visual Perception, Language, Other
factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment

UNIT – II

- **Elements of Communication:** Introduction, Face to Face Communication - Tone of
Voice, Body Language (Non-verbal communication), Verbal Communication, Physical
Communication **07 Hours**
- **Communication Styles:** Introduction, The Communication Styles Matrix with example
for each -Direct Communication Style, Spirited Communication Style, Systematic
    c) Communication Style, Considerate Communication Style

UNIT – III

- **Basic Listening Skills:** Introduction, Self-Awareness, Active Listening, Becoming an
Active Listener, Listening in Difficult Situations **07 Hours**
- **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

- **Writing Effectively:** Subject Lines, Put the Main Point First, Know Your Audience,

d) Organization of the Message

UNIT – IV

- **Interview Skills:** Purpose of an interview, Do's and Dont's of an interview
- **Giving Presentations:** Dealing with Fears, Planning your Presentation, Structuring Your

05 Hours

iv. Presentation, Delivering Your Presentation, Techniques of Delivery

UNIT – V

- **Group Discussion:** Introduction, Communication skills in group discussion, Do's and

04 Hours

c) Dont's of group discussion.

BP111P.COMMUNICATION SKILLS (Practical)
2 Hours / week

The following learning modules are to be conducted using wordsworth® 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, 2013

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

BP 106RBT.REMEDIAL BIOLOGY (Theory) 30 hours

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

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

COURSE CONTENT

UNIT I

Living world:

- Definition and characters of living organisms
- Diversity in the living world
- Binomial nomenclature
- Five kingdoms of life and basis of classification. Salient features of Monera, Potista, Fungi, Animalia and Plantae, Virus, **07 Hours**

Morphology of Flowering plants

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

UNIT II

Body fluids and circulation

- Composition of blood, blood groups, coagulation of blood
- Composition and functions of lymph
- Human circulatory system
- Structure of human heart and blood vessels
- Cardiac cycle, cardiac output and ECG

Digestion and Absorption **07 Hours**

- Human alimentary canal and digestive glands
- Role of digestive enzymes
- Digestion, absorption and assimilation of digested food

Breathing and respiration

- Human respiratory system
- Mechanism of breathing and its regulation
- Exchange of gases, transport of gases and regulation of respiration
- Respiratory volumes

UNIT III

Excretory products and their elimination **07 Hours**

- Modes of excretion

- Human excretory system- structure and function
- Urine formation
- Rennin angiotensin system

Neural control and coordination

- Definition and classification of nervous system
- Structure of a neuron
- Generation and conduction of nerve impulse
- Structure of brain and spinal cord
- Functions of cerebrum, cerebellum, hypothalamus and medulla oblongata

Chemical coordination and regulation

- Endocrine glands and their secretions
- Functions of hormones secreted by endocrine glands

Human reproduction

- Parts of female reproductive system
- Parts of male reproductive system
- Spermatogenesis and Oogenesis
- Menstrual cycle

UNIT IV

Plants and mineral nutrition:

- Essential mineral, macro and micronutrients
- Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation **05 Hours**

Photosynthesis

- Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis

UNIT V

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

Plant growth and development

- Phases and rate of plant growth, Condition of growth,Introduction to plant growth regulators **04 Hours**

Cell - The unit of life

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

Tissues

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 byM. Ekambaranatha ayyer and T. N. Ananthakrishnan.
5. A manual for pharmaceutical biology practical by S.B. Gokhale and C. K. Kokate

BP112RBP.REMEDIAL BIOLOGY (Practical)
2 Hours/week

1. Introduction to experiments in biology

a) Study of Microscope

b) Section cutting techniques

c) Mounting and staining

d) Permanent slide preparation

2. Study of cell and its inclusions

3. Study of Stem, Root, Leaf, seed, fruit, flower and their modifications

4. Detailed study of frog by using computer models

5. Microscopic study and identification of tissues pertinent to Stem, Root

Leaf, seed, fruit and flower

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

BP 106 RMT.REMEDIAL MATHEMATICS (Theory) 30 hours

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

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.

Logarithms

Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems. **06 Hours**

Function*:*

Real Valued function, Classification of real valued functions

Limits and continuity :

Introduction , Limit of a function, Definition of limit of a function ($\in$ - δ $_{nn}$ definition) ,

$$\lim \frac{x^n - a^n}{} = na^{n-1} , \qquad \lim \frac{\sin\theta}{\theta} = 1,$$

UNIT –II

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 equationsRespiratory volumes **06 Hours**

UNIT – III

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 **06 Hours**

(Quotient formula) – **Without Proof**, Derivative of *xn w.r.t*x,where *n* is any rational number, Derivative of *ex,*, Derivative of loge *x* , Derivative of *ax* ,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

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

06 Hours

Integration:

Introduction, Definition, Standard formulae, Rules of integration , Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application

UNIT-V

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**

06 Hours

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

Semester- II

BP 201T. HUMAN ANATOMY AND PHYSIOLOGY-II (Theory) **45 Hours**

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 **Nervous system** **10 hours**

Organization of nervous system, neuron, neuroglia, classification and properties of nerve fiber, 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 **Digestive system** **08hours**

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 **6 hours**

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 **4 hours**

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 **08 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 **07 Hours**

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 **02 hours**

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

Recommended Books

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 and John.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.

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

BP 207 P. HUMAN ANATOMY AND PHYSIOLOGY (Practical)

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 determine the Platelet count.
3. To perform the differential leukocyte count (DLC).
4. To determine the Arneth index.
5. Determination of osmotic fragility of RBCs.
6. To study the nervous system using specimen, models, etc.,
7. To study the endocrine system using specimen, models, etc
8. To demonstrate the general neurological examination
9. To demonstrate the function of olfactory nerve
10. To examine the different types of taste.
11. To demonstrate the visual acuity
12. To demonstrate the reflex activity
13. Recording of body temperature
14. To demonstrate positive and negative feedback mechanism.
15. Determination of tidal volume and vital capacity.
16. Study of Digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens.
17. Recording of basal mass index.
18. Study of familyplanning devices and pregnancy diagnosis test.

19. Demonstration of total blood count by cell analyzer.
20. Permanent slides of vital organs and gonads.
21. Visit to Hospital/ Pathology Laboratory.

Recommended Books:

1. Godkar P.B and Godkar D.P., Textbook of Medical Laboratory Technology. Bhalani Publishing House, Mumbai.
2. Joshi V.D. Practical Physiology. Vora Medical Publications, Mumbai.
3. DiFiore-Mariano S.H., Atlas of Human Histology. Lea and Febiger, Philadelphia.
4. Mukherjee, K.L., Medical Laboratory Technology. Tata McGraw Hill Publishing Company Ltd. New Delhi.
5. Beck, W.S., Human Desigh: Molecular, Cellular and Systemic Physiology. Harcourt Brace Jovanovich Inc. New York.
6. Chatterjee, C.C., Human Physiology. Medical Allied Agency, Kolkata.
7. Ganong, W.F., Review of Medical Physiology. Prentice-Hall International, London.
8. Guyton, A.C., Textbook of Medical Physiology. W. B. Saunders Co., Philadelphia, USA.
9. Tortora, G.J. and Grabowski, S.R., 2005.
10. Principals of Anatomy and Physiology. Harper Collins College Publishers, New York.
11. Vander, A.J., Sherman, J.H. and Luciano, D.S., Human Physiology. McGraw-Hill Publishing Co., USA.
12. Garg K., Bahel I. and Kaul M., A Textbook of Histology. CBS Publishers and Distributors, New Delhi.
13. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee Brother's medical publishers, New Delhi.

BP202T. PHARMACEUTICAL ORGANIC CHEMISTRY – I (Theory) 45 hours

Scope

This subject deals with classification and nomenclature of simple organic compounds, isomerism, intermediates formed 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

- Write the structure, name and the type of isomerism of the organic compound
- Write the reaction, name the reaction and orientation of reactions
- Account for reactivity/stability of compounds
- Identify/confirm the identification of organic compounds

COURSE CONTENT

Note:

1. **General methods of preparation (any 05) and reactions of class of compounds superscripted with asterisk (*) to be explained.**
2. **To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences.**

UNIT 1

Basic Principles of Organic Chemistry

Hybridization of atomic orbitals of carbon, nitrogen and oxygen to form molecular orbitals. Types of bonds, bond fission, intermolecular forces, inductive effect, steric effect, electromeric, mesomeric effect and resonance, hyperconjugation, concept of tautomerism. **04 hours**

UNIT II

Classification, Nomenclature and Isomerism

a) Classification of organic compounds

i. Compounds containing carbon and hydrogen atoms only : hydrocarbons (alkanes, alkenes alkynes, aromatic hydrocarbons, polynuclear aromatic hydrocarbons, aryl-alkyl hydrocarbons, alicyclic hydrocarbons)
ii. Compounds containing carbon, hydrogen and oxygen atoms only (alcohols, phenols, ethers and epoxides, carbonyl compounds, carboxylic acids, esters, anhydrides)
iii. Compounds containing carbon, hydrogen and nitrogen atoms only
iv. (amines and imine, nitriles, hydrazines, nitro compounds)
v. Compounds containing carbon, hydrogen, and halogens with oxygen (alkyl halides, aryl halides, acyl halides)
vi. Compounds containing carbon, hydrogen, oxygen and nitrogen atoms only (amides , imides, aldoxime and ketoxime)
vii. Compounds containing carbon, hydrogen and sulphur with/without nitrogen, oxygen and halogen. Sulphonic acids, sulphonylhalides.
(At least five mono-functional examples of each class including aromatic

08 hours

and aliphatic compounds should be covered with their common names.)

b) Common and IUPAC systems of nomenclature of organic compounds
IUPAC nomenclature of all classes of compounds: nomenclature of mono-substituted and poly-substituted compounds should be covered.

c) Structural isomerism in organic compounds

UNIT-II

Alkanes*, Alkenes* and Conjugated dienes*

i. Halogenation of alkanes, uses of paraffins.
ii. Stabilities of alkenes, E1 and E2 reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeff's orientation, Hofmann orientation and evidences. Factors affecting E1 and E2 reactions.
iii. Chemical Reactions: Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation
iv. Stability of conjugated dienes, Diel's-Alder, 1,2 and 1,4- electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement names.

10 hours

UNIT-III

a) Alkyl halides*

i. S_N1 and S_N2 reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations. S_N1 versus S_N2 reactions, factors affecting S_N1 and S_N2 reactions.
ii. b.Structure and uses of ethylchloride, chloroform, trichloroethylene, dichloromethane, tetrachloromethane and iodoform.

08 hours

b) Alcohols* - Qualitative tests, structure and uses of ethyl alcohol, chlorobutanol, cetosteryl alcohol, benzyl alcohol, glycerol, and propylene glycol.

UNIT-IV

Carbonyl compounds* (Aldehydes and ketones)

i. Nucleophilic addition, Electromeric effect, Aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, and Perkin condensation.
ii. Qualitative tests, structure and uses of formaldehyde, paraldehyde, acetone, chloral hydrate, benzaldehyde, vanillin, and cinnamaldehyde.

08 Hours

UNIT V

a) Carboxylic acids*

i. Acidity of carboxylic acids, effect of substituent/s on acidity, qualitative tests for carboxylic acids, amide and ester. Reactions of interconversion of carboxylic acids, amides and esters.
ii. Structure and uses of acetic acid, lactic acid, tartaric acid/s, citric acid, succinic acid, oxalic acid, salicylic acid, benzoic acid, benzyl benzoate, dimethyl phthalate, methyl salicylate and acetyl salicylic acid.

07 Hours

b) Aliphatic amines* - Basicity, effect of substituent on basicity, qualitative test, structure and uses of ethanolamine, ethylenediamine

BP208P. PHARMACEUTICAL ORGANIC CHEMISTRY – I (Practical)

4 Hours/Week

I. Safety measures in an organic laboratory. **1 turn**

II. Introduction to laboratory techniques: Calibration of thermometer, melting point, boiling point, distillation, and crystallization. **3 turns**

III. Systematic qualitative analysis of unknown organic compounds (min 05) **8 turns**

1. Preliminary test: color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc.
2. Detection of elements like nitrogen, sulphur and halogen by Lassaigne's test.
3. Solubility test
4. Functional group test like phenols, amides, carbohydrates, amines, carboxylic acids, aldehydes and ketones, alcohols, esters, aromatic and halogenated hydrocarbons, nitro compounds and anilides.
5. Melting point/Boiling point of organic compounds.
6. Identification of the unknown compound from the literature using melting point/ boiling point.

IV. Preparation of suitable solid derivatives from organic compounds **2 turns**

V. Building of molecular models of structures containing various functional groups **1 turns**

Recommended Books

1. Morrison, R. T. & Boyd, R. D., Textbook of Organic Chemistry, VI (ed.) ELBS, London, 1996
2. Pine, S. H, Organic Chemistry, V, Tata McGraw Hill, New Delhi, 2007
3. Finar, I. L., Organic Chemistry Vol. I, V (ed.), ELBS, Pearson Education, New Delhi, 2003
4. Finar, I. L., Organic Chemistry Vol. II, V (ed.), ELBS, Pearson Education, New Delhi, 2003
5. Eliel, E. L., "Stereochemistry of Carbon Compounds", Wiley-Interscience, 1994.

BP203 T. BIOCHEMISTRY (Theory) 45 hours

Scope

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

Objectives

Upon completion of course the students shall able to

- Understand the catalytic role of enzymes and importance of enzyme in biochemical process.
- Understand the metabolism of nutrient molecules in physiological and pathological conditions.
- Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

COURSE CONTENT

UNIT –I

a) Biomolecules

Introduction, classification, chemical nature and biological role of carbohydrates, lipids, nucleic acids, amino acids and proteins.

b) Carbohydrate metabolism

i. Glycolysis – Pathway, energetics and significance.
ii. Citric acid cycle- Pathway, energetics and significance. **10 hours**
iii. HMP shunt and its significance; Glucose-6-Phosphate ehydrogenase (G6PD) deficiency.
iv. Glycogen metabolism Pathways and glycogen storage diseases (GSD).
v. Gluconeogenesis- Pathway and its significance.
vi. Hormonal regulation of blood glucose level and Diabetes mellitus.

UNIT-1I

a) Biological oxidation

i. Electron transport chain (ETC) and its mechanism.
ii. Oxidative phosphorylation & its mechanism and substrate level. Phosphorylation Inhibitor
iii. ETC and oxidative phosphorylation / uncouplers. **08 hours**

b) Bioenergetics

i. Concept of free energy, endergonic and exergonic reaction, relationship between free energy, enthalpy and entropy.
ii. Energy rich compounds; classification; biological significances of ATP and cyclic AMP.

UNIT-III **10 hours**

a) Lipid metabolism

i. β-Oxidation of saturated fatty acid (Palmitic acid).
ii. Formation and utilization of ketone bodies; ketoacidosis.
iii. *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.

b) Amino acid metabolism

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

UNIT-IV

Nucleic acid metabolism and genetic information transfer

i. Biosynthesis of purine and pyrimidine nucleotides.
ii. Catabolism of purine nucleotides and hyperuricemia and gout disease.
iii. Organization of mammalian genome. **10 hours**
iv. Structure of DNA and RNA and their functions.
v. DNA replication (semi conservative model)
vi. Transcription or RNA synthesis.
vii. Genetic code, Translation or Protein synthesis and inhibitors.

UNIT-V

Enzymes

i. Introduction, properties, nomenclature and IUB classification of enzymes.
ii. Enzyme kinetics (Michaelis plot, Line Weaver Burke plot).
iii. Enzyme inhibitors with examples. **07 hours**
iv. Regulation of enzymes: enzyme induction and repression, allosteric enzyme-regulation.
v. Therapeutic and diagnostic applications of enzymes and isoenzymes.
vi. Coenzymes–Structure and biochemical functions; Co-factors.

BP 209 P. BIOCHEMISTRY (Practical)

4 Hours / week

1.	Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and Starch)	**3 turns**
2.	Identification tests for amino acids (any one aromatic and one aliphatic)	**1 turn**
3.	Identification tests for proteins (albumin and casein)	**1 turn**
4.	Qualitative analysis of urine for abnormal constituents (at least four abnormal constituents)	**2 turns**
5.	Determination of blood creatinine	**1 turn**
6.	Determination of blood sugar by Folin-Wu method/Glucose-oxidase method	**1 turn**
7.	Determination of serum total cholesterol.	**1 turn**
8.	Preparation of buffer solution and measurement of pH (any two).	**1 turn**
9.	Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method).	**1 turn**
10.	Determination of salivary amylase activity.	**1 turn**
11.	Study the effect of temperature on salivary amylase activity.	**1 turn**
12.	Study the effect of substrate concentration on salivary amylase activity.	**1 turn**

Recommended Books

1. David Nelson and Cox M. M., Lehninger's Principles of Biochemistry, 4/Ed., Palgrave Macmillon.
2. Robert K. Murry, Daryl K., Granner and Victor W. Rodwell, Harper's Biochemistry, 27/Ed, McGraw Hill.
3. Lubert Stryer, W.H., Freeman & Company, Biochemistry, New York
4. U. Satyanarayana & U. Chakrapani, Biochemistry, 3/Ed., Books & Allied (P) Ltd.
5. Rao, A. V. S. S. Rama Rao, Textbook of Biochemistry, first edition, UBS Publishers' Distributors Pvt. Ltd.
6. Deb, A. C. Viva & Practical Biochemistry, 3/Ed., New Central Book Agency (P) Ltd.
7. Conn Eric. E. and Stumpf, Paul K. et al., Outlines of Biochemistry, Wiley student edition.
8. Gupta R. C. and Bhargavan, S. Practical Biochemistry, 5/Ed, CBS publishers and distributors.
9. David T. Plummer, Introduction of Practical Biochemistry. 3/Ed, Tata McGraw-Hill Education Pvt. Ltd.
10. Rajagopal and Ramakrishna, Practical Biochemistry for Medical students, Orient BlackSwan (1983)
11. Harold Varley, Varley's Practical Clinical Biochemistry, 6/Ed., CBS Publishers, New Delhi.
12. David T. Plummer, Introduction to Practical Biochemistry, III (ed.), McGraw-Hill Publishing Co., New York, 1987.
13. Alan H. Gowenlock, Varley's Practical Clinical Biochemistry, VI (ed.), Butterworth-Heinemann Ltd., UK & CBS Publication, New Delhi, 2002.

BP 204T. PATHOPHYSIOLOGY (THEORY) 45Hours

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. Pharmacotherapy of drugs is particularly not to be considered as a part of this subject from examination point of view as the subject deals with pathophysiological aspects of the diseases.

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

1. Describe the etiology and pathogenesis of the selected diseasestates;
2. Name the signs and symptoms of the diseases

Unit-I **Basic principles of Cell injury and Adaptation** **10 Hrs**

Introduction& definitions

Causes of cellular injury**,**Pathogenesis (Cellmembrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage)**,**

Morphology of cell injury – Adaptive changes(Atrophy, Hypertrophy, Hyperplasia, Metaplasia, Dysplasia)**,**Cellswelling, Intracellular accumulation, Calcification, Enzyme leakageand cell death, acidosis and alkalosis, Electrolyte imbalance

Basic mechanism involved in the process of inflammation andrepair

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

Unit -II. **CardiovascularSystem:** **10 Hrs**

Hypertension, Congestive heart failure, Ischemic heart diseases (angina,myocardial infarction, atherosclerosis and arteriosclerosis)

Respiratory system:

Asthma, Chronic obstructive airwaysdiseases

Renal system:

Acute and chronicrenalfailure

Unit-III **HaematologicalDiseases:** **12 Hrs**

Iron deficiencyanaemia, Megaloblasticanaemia (Vit B12 and folic acid), Sickle cell anemia, Thalassemia, Hereditary acquired anemia, Hemophilia

Endocrine system:

Diabetes, Thyroid diseases(Hypothyroidism, hyperthyroidism, Goitre)Disorders of sexhormones(Amenorrhoea, polycystic ovarian syndrome, hypogonadism)

Nervous system:

Epilepsy, Parkinson's disease, Stroke, Psychiatricdisorders: Depression, Schizophrenia and Alzheimer'sdisease

Gastrointestinal system:

PepticUlcer, Inflammatory Bowel Diseases, Jaundice, Hepatitis (A,B,C,D,E,F), Alcoholicliver disease

Unit-IV **Diseases of bones and joints** **06 Hrs**

Rheumatoid Arthritis,Osteoporosis,Gout

Cancer: Classification, etiology and pathogenesis ofcancer

Unit-V **Infectiousdiseases** **07 Hrs**

Tuberculosis, Leprosy, Malaria, Dengue, Meningitis,Typhoid, Urinary tractinfections

Sexually transmitted diseases

AIDS, Syphilis,Gonorrhea

REFERENCES:

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; unitedstates.
5. William and Wilkins, Baltimore;1991 [1990printing].
6. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston;Davidson's Principles andPractice 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; Pharmacotherapy: A Pathophysiological Approach; 9th edition; London; McGraw-Hill Medical; 2014.
9. V. Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6th edition; Philadelphia; WB Saunders Company;1997.
10. 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.

BP205 T. COMPUTER APPLICATIONS IN PHARMACY (Theory) 30 Hrs

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

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 **06 hours**

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

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 **06 hours**

UNIT – IV

Bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery. **06 hours**

UNIT-V

Computers as data analysis in Preclinical development: Chromatographic dada analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMS) **06 hours**

BP210P. COMPUTER APPLICATIONS IN PHARMACY (Practical)

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 :

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

BP 206 T. ENVIRONMENTAL SCIENCES (Theory) 30 hours

Scope: Environmental Sciences is the scientific study of the environmental system and the status of its inherent or induced changes on organisms. It includes not only the study of physical and biological characters of the environment but also the social and cultural factors and the impact of man on environment.

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

1. Create the awareness about environmental problems among learners.
2. Impart basic knowledge about the environment and its allied problems.
3. Develop an attitude of concern for the environment.
4. Motivate learner to participate in environment protection and environment improvement.
5. Acquire skills to help the concerned individuals in identifying and solving environmental problems.
6. Strive to attain harmony with Nature.

COURSE CONTENT

Unit-I

The Multidisciplinary nature of environmental studies Natural Resources Renewable and non-renewable resources:

10hours

Natural resources and associated problems

a) Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources

Unit-II

Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.

10hours

- Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit- III

10 hours

Environmental Pollution: Air pollution; Water pollution; Soil pollution

Recommended Books:

1. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers, Bangalore
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Bharucha Erach, The Biodiversity of India, Mapin Pu blishing Pvt. Ltd., Ahmedabad – 380 013, India,
4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
5. Clark R.S., Marine Pollution, Clanderson Press Oxford
6. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p
7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
8. Down of Earth, Centre for Science and Environment