PRAVARA RURAL EDUCATION SOCIETY'S
PRAVARA RURAL COLLEGE OF PHARMACY
LONI

Criteria No: 1

Metric No: 1.1 Curricular Planning and Implementation

File Name: 1.1.2 - The institution adheres to the academic calendar including for the conduct of Continuous Internal Evaluation (CIE)

Sr.no.	Content
1)	SPPU B.Pharm Syllabus
2)	SPPU Circular
3)	Institute Activity Calendar 2021-22
4)	Institute Activity Calendar 2022-23
5)	Teaching Workload
6)	Adherence to Activity Calendar
7)	Exam Policy
8)	Internal Sessional Examination schedule
9)	Re Sessional examination
10)	External Practical Examination schedule
11)	Assignment
12)	Attendance and Assessment Records

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**

06 Hours

Laplace Transform : Introduction, Definition, Properties of Laplace transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives, Application to solve Linear differential equations, **Application in solving Chemical kinetics and Pharmacokinetics equations**

Recommended Books (Latest Edition)

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

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

SAVITRIBAI PHULE PUNE UNIVERSITY

FACULTY OF SCIENCE AND TECHNOLOGY

Syllabus of Second Year B. Pharmacy

2019 PATTERN

(EFFECTIVE FROM ACADEMIC YEAR 2020-2021)

S.Y.B.PHARM SEMESTER – III

BP301T PHARMACEUTICAL ORGANIC CHEMISTRY –II (Theory) 45 Hours

Scope:

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

Objectives

Upon completion of the course the student shall be able to

1. Write the structure, name and the type of isomerism of the organic compound
2. Write the reaction, name the reaction and orientation of reactions
3. Account for reactivity/stability of compounds
4. Prepare small organic compounds

Course Content :

Note - General methods of preparation (any 05) and reactions of compounds superscripted with asterisk (*) to be explained.

UNIT-I 10 Hours

Benzene and its derivatives

Introduction to benzene, orbital picture,resonance in benzene,Huckel‟s rule Reactions of benzene - nitration, sulphonation, halogenation- reactivity, Friedel- Craft‟s alkylation-reactivity, limitations, Friedel-Craft‟s acylation. Substituents, effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction.

UNIT-II 08 Hours

Phenols* - Acidity of phenols, effect of substituents on acidity, qualitative tests for phenols, structure and uses of phenol, cresols, resorcinol, naphthols **Aromatic Amines*** - Basicity of

amines, effect of substituents on basicity, Nitrosation reaction, coupling and Sandmayer‟s reaction, Hinsberg Test, synthetic uses of aryl diazonium salts.

UNIT-III **10 Hours**

Stereo Isomerism

Optical isomerism

Elements of symmetry, chiral and achiral molecules

Optical activity,enantiomerism, diastereoisomerism, meso compounds

D & L system of nomenclature of optical isomers, sequence rules, R & S system of nomenclature of optical isomers

Geometrical isomerism

Nomenclature of geometrical isomers (Cis & Trans, E & Z, Syn& Anti systems) Methods of determination of configuration of geometrical isomers.

UNIT-IV **10 Hours**

Polynuclearhydrocarbons

Synthesis, reactions and structure and medicinal uses of naphthalene, phenanthrene, anthracene, diphenylmethane, triphenylmethane and their derivatives.

UNIT-V **05 Hours**

Cycloalkanes*

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

UNIT-VI **02 Hours**

Fats and Oils - Hydrolysis, Hydrogenation, Saponification and Rancidity of oils.

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, 2003

3. Finar, I. L., Organic Chemistry Vol. I, V(ed.), ELBS, Pearson Education, New Delhi, 2003
4. Joule and Mills, Heterocyclic Chemistry, IV (ed.), Blackwel Publishing House, Oxford, UK,2004
5. Li, J. J., Name Reactions, III (ed.), Springer, Berlin, 2006
6. Stereochemistry of Organic Compound Principles and Applications by Nasipuri, Revised Edition, New Age International Publishers.
7. Stereochemistry Conformation and Mechanism by P.S. Kalsi, 7/Ed 2008, New Age International Publishers, New Delhi.
8. Furniss, B. S., Hannaford, A. J. Smith, P. W. G., and Tatchel, A. R., "Vogel"s Textbook of Practical Organic Chemistry", V (ed.), Pearson, London, 1994
9. Finar, I. L., Organic Chemistry Vol. I, V (ed.), ELBS, Pearson Education, New Delhi, 2003
10. Mann, F. G. and Saunders, B. C., Practical Organic Chemistry, IV(ed.), Pearson, UK, 2009
11. Advanced General Organic Chemistry-A Modern Approach by Sachin Kumar Ghosh, 3/Ed. 2009, New Central Book Agency (P) Ltd

BP302T. PHYSICAL PHARMACEUTICS-I (Theory) 45Hours

Scope:

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

Objectives:

Upon the completion of the course student shall be able to

1. Investigate and apply various theories, laws and equations related to different states of matter

2. Distinguish the principles of complexation/ protein binding & to use them for calculations of drug release and stability constant.

3. Demonstrate use of physicochemical properties of drugs in the formulation development and evaluation of dosage forms.

Course Content:

UNIT-I **12 Hours**

Solubility of drugs: Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, Solubility of Solids in liquids (Binary solutions, ideal solutions with respect to their colligative properties) Raoult‟s law, real solutions. Partially miscible liquids(Phase equilibria, Phase rule, One , two and three component systems, ternary phase diagram, Critical solution temperature and applications). Distribution law, its limitations and applications

UNIT-II **10Hours**

States of Matter and properties of matter:State of matter, changes in the state of matter, latent heats, vapour pressure, sublimation critical point, eutectic mixtures, gases, Liquefaction of gases, aerosols– inhalers, relative humidity, liquid complexes, liquid crystals, glassy states, solid crystalline, amorphous(Methods of crystal analysis: X-Ray Diffraction, Bragg‟s equation.) & polymorphism (Definition, Different shapes of polymorphs, Example and its Pharmaceutical applications, Brief introduction of Detection techniques).

Physicochemical properties of drug molecules: Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications 34

UNIT-III **08 Hours** Surface and interfacial phenomenon: Liquid interface, surface & interfacial tensions, surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB Scale, solubilisation, detergency, adsorption at solid interface.

UNIT-IV **08Hours**

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

UNIT-V **07 Hours**

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

Recommended Books:

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

BP 303 T. PHARMACEUTICAL MICROBIOLOGY (Theory) 45Hours

Scope:

Study of microorganisms and its effect on pharmaceutical products

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

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

Course content:

Unit I **10 Hours**

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

Definition and examples of Probiotics and Prebiotics

Unit II **10 Hours**

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

Unit III **10 Hours**

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

Unit IV **08 Hours**

Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification. Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids. Assessment of a new antibiotic.

Unit V **07Hours**

Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage. Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations. Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures. Application of cell cultures in pharmaceutical industry and research.

Recommended Books

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
5. Rose: Industrial Microbiology.
6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan

7. Cooper and Gunn‟s: Tutorial Pharmacy, CBS Publisher and Distribution.
8. Peppler: Microbial Technology.
9. I.P., B.P., U.S.P.- latest editions.
10. Ananthnarayan : Text Book of Microbiology, Orient-Longman, Chennai
11. Edward: Fundamentals of Microbiology.
12. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
13. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company
14. "Nutrition Probiotics and prebiotics" by Pamela Mason; The Pharmaceutical Journal Vol 266 No 7132 p118-121.
15. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott Williams, New Delhi.

BP 304 T. PHARMACEUTICAL ENGINEERING (Theory) 45 Hours

Scope:

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

Objectives:

Upon completion of the course student shall be able:

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

Course content:

UNIT-I **10 Hours**

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

UNIT-II **10 Hours**

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

UNIT- III **08 Hours**

- Drying: Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles,

construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer.

- Mixing: Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier,

UNIT-IV **08 Hours**

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

UNIT- V **07 Hours**

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

Recommended Books:

1. Paradkar A. Introduction to Pharmaceutical Engineering. Eleventh Edition, Nirali Prakashan, Pune. 2007.
2. Badger WL, Banchero JT. Introduction to Chemical Engineering. International Edition, McGraw Hill Book Company. 1955.
3. Subrahmanyam CVS, Thimma Setty J, Sarasija Suresh, Kusum Devi V. Pharmaceutical Engineering Unit Operations-II. Second Edition, Vallabh Prakashan, Delhi. 2011.

4. Tekade AR, Pande VV, Shastri KV. Pharmaceutical Engineering. First Edition, TechMax Publications, Pune. 2015.

5. Sambamurthy K. Pharmaceutical Engineering. First Edition, New Age International Publishers, New Delhi. 1998.

BP305P. PHARMACEUTICAL ORGANIC CHEMISTRY - II (Practical) 4 Hours/Week

1. Experiments involving laboratory techniques — **1 Turn**

- Recrystallization
- Steam distillation

2. Experiments involving Separation of Binary mixtures — **2 Turns**

3. Determination of saponification value of oil samples (Any two) — **1 Turn**

4. Synthesis of following compounds — **11 Turns**

- Benzanilide /phenyl benzoate /acetanilide from aniline/ phenol/ aniline by benzoylation/acylation reaction
- 2, 4, 6-Tribromoaniline/para-bromo acetanilide from aniline
- p-bromo Acetanilide by halogenation (Bromination) reaction.
- 5-Nitrosalicylic /meta-dinitrobenzene from salicylic acid/ nitrobenzene by nitration reaction
- Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction.
- 1-Phenylazo-2-naphthol from aniline by diazotization and coupling reactions/ pIodobenzoic acid from P-aminobenzoic acid by replacement reaction.
- Benzil from benzoin by oxidation reaction
- Dibenzal acetone from benzaldehyde by Claisen-Schmidt reaction

Recommended Books:

1. Mann, F. G. and Saunders, B. C., Practical Organic Chemistry, IV(ed.), Pearson, UK, 2009
2. Vogel"s Text Book of Practical Organic Chemistry- Brian Furniss, AntonyHannaford, Peter Smith, Austrin (Eds), 5th edition, ELBS Publication, Singapore, 1997.
3. A Guidebook to Mechanism in Organic Chemistry by Peter Sykes Longman Scientific and Technical, Sixth Edition, 1985.
4. Advanced Organic Chemistry by Francis A. Carey, Part A: Structure and Mechanism, Springer, 2007.
5. Writing Reaction Mechanisms in Organic Chemistry by Audrey Miller, Second Edition, Elsevier Science & Technology Books, 1999.
6. Organic Reactions by Werner E. Bachmann, Volume I, John Wiley and Sons. INC, 1942.
7. Advanced Organic Chemistry Reaction Mechanisms by Reinhard Bruckner, Elsevier, 2002

BP306P. PHYSICAL PHARMACEUTICS – I (Practical) 4 Hrs/week

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

10. Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubility method

11. Determination of stability constant and donor acceptor ratio of Cupric-Glycine complex by pH titration method.

12. Determination of Refractive index of given sample.

13. Determination of thermodynamic parameters using solubility studies.

Recommended Books:

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

BP 307P.PHARMACEUTICAL MICROBIOLOGY (Practical) 4 Hours/week

1. Introduction and study of different equipments and processing, e.g., B.O.D. incubator, laminar flow or aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.

2. Sterilization of glassware, preparation and sterilization of media.

3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.

4. Staining methods- Simple, Grams staining and acid fast staining (Demonstration with practical).
5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques.
6. Microbiological assay of antibiotics by cup plate method and other methods
7. Motility determination by Hanging drop method.
8. Sterility testing of pharmaceuticals (Any two samples).
9. Bacteriological analysis of water
10. Biochemical test of any one microorganism.

Recommended Books

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
5. Rose: Industrial Microbiology.
6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
7. Cooper and Gunn‟s: Tutorial Pharmacy, CBS Publisher and Distribution.
8. Peppler: Microbial Technology.
9. I.P., B.P., U.S.P.- latest editions.
10. Ananthnarayan : Text Book of Microbiology, Orient-Longman, Chennai
11. Edward: Fundamentals of Microbiology.
12. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
13. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company
14. “Nutrition Probiotics and prebiotics” by Pamela Mason; The Pharmaceutical Journal Vol 266 No 7132 p118-121.
15. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott

Williams, New Delhi.

BP308 P - PHARMACEUTICAL ENGINEERING (PRACTICAL) 4 Hours/week

I. Determination of radiation constant of any one of – brass/ iron/unpainted and painted glass.

II. Steam distillation- To calculate the efficiency of steam distillation.

III. To determine the overall heat transfer coefficient by heat exchanger.

IV. Construction of drying curves (for calcium carbonate and starch)

V. Determination of moisture content and loss on drying.

VI. Determination of humidity of air - i) From wet and dry bulb temperatures -use of Dew point method

VII. Description of Construction, working and application of any two Pharmaceutical Machinery such as Rotary tablet Machine, capsule filling machine, tablet coating machine, autoclave, oven and dehumidifier.

VIII. Size analysis by sieving -To evaluate size distribution of tablet granulations – Construction of various size frequency curves including arithmetic and logarithmic probability plots.

IX. Size reduction: To verify the laws of size reduction using ball mill and and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill.

X. Demonstration of any two equipments such as colloid mill, planetary mixer, fluidized bed dryer, Spray dryer Laminar Air Flow, Ball Mill and such other major equipments.

XI. Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration and Thickness/ viscosity).

XII. To study the effect of time on the Rate of Crystallization.

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

Recommended Books:

1. Paradkar A. Introduction to Pharmaceutical Engineering. Eleventh Edition, Nirali Prakashan, Pune. 2007.

2. Badger WL, Banchero JT. Introduction to Chemical Engineering. International Edition, McGraw Hill Book Company. 1955.

3. Subrahmanyam CVS, Thimma Setty J, Sarasija Suresh, Kusum Devi V. Pharmaceutical Engineering Unit Operations-II. Second Edition, Vallabh Prakashan, Delhi. 2011.

4. Tekade AR, Pande VV, Shastri KV. Pharmaceutical Engineering. First Edition, TechMax Publications, Pune. 2015.

5. Sambamurthy K. Pharmaceutical Engineering. First Edition, New Age International Publishers, New Delhi. 1998

S.Y.B.PHARM SEMESTER - IV

BP401T PHARMACEUTICAL ORGANIC CHEMISTRY –III (Theory) 45 Hours

Scope :

The subject imparts knowledge on stereo chemical aspects of organic compounds and organic reactions, important name reactions, chemistry of important heterocyclic compounds. It also emphasizes on medicinal and other uses of organic compounds.

Objectives :

Upon completion of the course the student shall be able to

1. Understand the methods of preparation and properties of organic compounds.
2. Explain the stereochemical aspects of organic compounds and stereo chemical reactions.
3. Know the medicinal uses and other applications of organic compounds

COURSE CONTENT

UNIT-I **07 Hours**

Stereo isomerism

Reactions of Chiral molecules

Racemic modification and resolution of racemic mixture.

Introduction to Asymmetric synthesis with suitable examples.

UNIT-II **06Hours**

Geometrical isomerism

Conformational isomerism in n-Butane and cyclohexane.

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

Stereospecific and stereo selective reactions.

UNIT-III **08 Hours**

Heterocyclic compounds

Nomenclature and classification of heterocyclic compounds in to classes: Oxygen containing five & six membered rings, Nitrogen containing five & six membered rings, sulphur containing five & six member rings; Oxygen & nitrogen containing five & six membered rings, oxygen & sulphur containing five & six membered rings, and sulphur and nitrogen containing five & six membered rings; benzo-fused heterocyclic compounds as benzimidazole, benzthiazole, benzopyran

Chemistry, Synthesis (any one), reactions and medicinal uses of following compounds

- Pyrrole, Furan, and Thiophene and their derivatives (any one from each class)

UNIT-IV **12 Hours**

Chemistry, Synthesis (any one), reactions and medicinal uses of following compounds and their derivatives (any one from each class)

- Pyrazole, Imidazole, Oxazole and Thiazole.
- Pyridine, Quinoline, Isoquinoline, Acridine and Indole

Synthesis (any one) and medicinal uses of following compounds Pyrimidine, Purine, Azepines and their derivatives (any one from each class)

UNIT-V **12 Hours**

Name Reactions of synthetic importance

Pinacol-Pinacolone, Hofmann, Baeyer-Villiger oxidation, Benzilic acid rearrangement reaction, Beckmann‟s rearrangement and Schmidt rearrangement, Claisen-Schmidt condensation, Clemmensen reduction, Wolff rearrangement, Oppenauer-oxidation and Dakin reaction, and Birch reduction.

Recommended Books

1. Morrison, R. T. & Boyd, R. D., Textbook of Organic Chemistry, VI (ed.) ELBS, London, 1996
2. Advanced General Organic Chemistry-A Modern Approach by Sachin Kumar Ghosh, 3/Ed. 2009, New Central Book Agency (P) Ltd.
3. Pine, S. H, Organic Chemistry, V, Tata McGraw Hill, New Delhi, 2003 4. Finar, I. L., Organic Chemistry Vol. I, V (ed.), ELBS, Pearson Education, New Delhi, 2003
4. Joule and Mills, Heterocyclic Chemistry, IV (ed.), Blackwell Publishing House, Oxford, UK, 2004
5. Li, J. J., Name Reactions, III (ed.), Springer, Berlin, 2006
6. Stereochemistry of Organic Compound Principles and Applications by Nasipuri, Revised Edition, New Age International Publishers.
7. Stereochemistry Conformation and Mechanism by P.S. Kalsi, 7/Ed 2008, New Age International Publishers, New Delhi.
8. Stereochemistry of Organic Compound Principles and Applications by Nasipuri, Revised Edition, New Age International Publishers.

BP402T. MEDICINAL CHEMISTRY – I (Theory) 45 hours

Scope:

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

Objectives:

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

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

COURSE CONTENT:

Note: Study of the development of the following classes of drugs, classification, mechanism of action, Structure activity relationship, uses of drugs mentioned in the course. The synthesis of drugs mentioned in bracket [ ] only needs to be covered.

UNIT-I **06 hours**

Introduction to Medicinal Chemistry:

a) History and development of medicinal chemistry

b) Physicochemical properties in relation to biological action Ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein binding, Chelation, Bioisosterism, Optical and Geometrical isomerism.

c) Drug metabolism

Drug metabolism principles - Phase I and Phase II.

Factors affecting drug metabolism.

UNIT-II

Drugs acting on Autonomic Nervous System **10 hours**

a) Adrenergic Neurotransmitters: Biosynthesis and catabolism of catecholamine. Adrenergic receptors (Alpha & Beta) and their distribution.

b) Sympathomimetic agents: SAR of Sympathomimetic agents Directacting: Nor-epinephrine,Epinephrine,Dopamine,Phenylephrine,Methyldopa,Clonidine, Dobutamine,Isoproterenol,Terbutaline,Salbutamol,Oxymetazolineand Xylometazoline

- Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine
- Agents with mixed mechanism: Ephedrine, Amphetamine.

c) Adrenergic Antagonists:

- **Alpha adrenergic blockers:** Tolazoline, Phentolamine, Phenoxybenzamine,Prazosin.
- **Beta adrenergic blockers:** SAR of beta blockers, Propranolol, Atenolol,Labetolol, Carvedilol.

[Phenylephrine, Salbutamol, Tolazoline, Propranolol]

UNIT-III **10 hours**

a) Cholinergic neurotransmitters : Biosynthesis and catabolism ofacetylcholine.Cholinergic receptors (Muscarinic & Nicotinic) and their distribution.

b) Parasympathomimetic agents : SAR of Parasympathomimetic agents Direct acting agents : Acetylcholine**,** Carbachol, Bethanechol, Pilocarpine.

Indirect acting/ Cholinesterase inhibitors (Reversible & Irreversible) : Physostigmine, Neostigmine, Edrophonium chloride, Donepezil, Tacrinehydrochloride, Parathion, Malathion.

Cholinesterase reactivator : Pralidoxime chloride.

c) Cholinergic Blocking agents: SAR of cholinolyticagents :Solanaceous alkaloidsand analogues : Atropine sulphate, Scopolamine hydrobromide, Ipratropium bromide

Synthetic cholinergic blocking agents : Tropicamide, Cyclopentolatehydrochloride, Dicyclomine, Glycopyrrolate, Propantheline bromide

[Neostigmine, Dicyclomine hydrochloride]

UNIT-IV **10 hours**

Drugs acting on Central Nervous System

a) Sedatives and Hypnotics :

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

Barbiturtes : SAR of barbiturates, Barbital, Amobarbital, Butabarbital,Pentobarbital, Secobarbital **Miscelleneous :** Amides& imides Alcohol & theircarbamate derivatives Aldehyde & their derivatives

b) Antipsychotics

Phenothiazeines : SAR of Phenothiazines– Chlorpromazinehydrochloride, Triflupromazine, Thioridazine hydrochloride, Trifluoperazinehydrochloride

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

Flurobuterophenones : Haloperidol, Droperidol, Risperidone.

Benzamides: Sulpiride.

c) Anticonvulsants : SAR of Anticonvulsants**,** mechanism of anticonvulsantaction

Barbiturates : Phenobarbitone, Mephobarbital

Hydantoins : Phenytoin, Mephenytoin

Oxazolidinediones : Trimethadione

Succinimides : Phensuximide, Methsuximide

Urea and monoacylureas : Phenacemide, Carbamazepine

Benzodiazepines : Clonazepam

Miscellaneous : Levetiracetam, Valproic acid , Gabapentin ,Felbamate

d) General anesthetics :

Inhalation anesthetics : Halothane, Enflurane

Ultra-short acting barbitutrates : Methohexital sodium, Thiopental sodium.

Dissociative anesthetics : Ketamine hydrochloride.

[Diazepam, Chlorpromazine hydrochloride, Carbamazepine, Halothane, Ketamine hydrochloride]

UNIT-V **09 hours**

Centrally Acting analgesics

a) Narcotic and non-narcotic analgesics Morphine and related drugs : SAR of Morphine analogues, Codeine, Meperidine hydrochloride, Loperamide hydrochloride, Fentanyl citrate, Methadone hydrochloride, Propoxyphene hydrochloride, Pentazocine.

Introduction to Narcotic antagonists

b) Anti-inflammatory agents : Sodium salicylate, Aspirin, Mefenamic acid, Indomethacin, Sulindac, Diclofenac, Ketorolac, Ibuprofen, Piroxicam, Acetaminophen, Phenylbutazone.

[Fentanyl citrate, Mefenamic acid, Diclofenac, Ibuprofen]

Recommended Books (Latest Editions)

1. John Marlowe Beale, Wilson and Giswold‟s Organic medicinal and PharmaceuticalChemistry. 11th E/d,
2. Thomas L. Lemke, David A. Williams, Victoria F. Roche, Foye‟s Principles of MedicinalChemistry.
3. Burger‟s Medicinal Chemistry, Vol I to IV, 6th E/d, M. E. Wolff. John Wiley & Sons,New York. 1997.
4. Smith and Williams, Introduction to principles of drug design, CRC Press; 4 edition.
5. John E. Hoover, Remington‟s Pharmaceutical Sciences, Mack Publishing Company; 13thedition (1965).

6. Sean C. Sweetman, Martindale‟s extra pharmacopoeia, Pharmaceutical Society of GreatBritain.
7. Organic Chemistry by I.L. Finar, Vol. II, Longmans Green & Co., 3rd E/d.
8. Daniel Lednicer, Lester A. Mitscher, The Organic Chemistry of Drug Synthesis, JohnWiley & Sons, Inc, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.
11. An Introduction to Medicinal chemistry, Graham Patrick

BP 403 T. PHYSICAL PHARMACEUTICS-II (Theory) 45 Hours

Scope:

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

Objectives:

Upon the completion of the course student shall be able to

1. Relate various physicochemical properties of drug and excipient molecules in designing the dosage forms
2. Distinguish the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations
3. Demonstrate the behavior and mechanism of drugs and excipients in the formulation development and evaluation of dosage forms.

Course Content:

UNIT-I 07 Hours

Colloidal dispersions: Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles, classification of colloids & comparative account of their general

properties. Optical, kinetic & electrical properties. Effect of electrolytes, coacervation, peptization& protective action.

UNIT-II **10 Hours**

Rheology: Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling sphere, rotational viscometers,Visco elasticity Deformation of solids: Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus

UNIT-III **10 Hours**

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

UNIT-IV **08 Hours**

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

UNIT-V **10 Hours**

Drug stability: Reaction kinetics: zero, pseudo-zero, first & second order (complex reaction:reversible, parallel and side reactions), units of basic rate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific & general acid base catalysis,Simple numerical problems.Stabilization of medicinal agents against

common reactions like hydrolysis & oxidation.Accelerated stability testing in expiration dating of pharmaceutical dosage forms.Photolytic degradation and its prevention.

Recommended Books:

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

BP 404 T. PHARMACOLOGY-I (Theory) 45Hours

Scope:

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

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

1. Understand the pharmacological actions of different categories of drugs.
2. Explain the mechanism of action at organ system/sub cellular/macromolecular levels.
3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
4. Observe the effects of drugs on animal by simulated experiments.

5. Appreciate correlation of pharmacology with other bio medical sciences.

Course Content:

Unit-I

General Pharmacology: **06 Hrs**

Introduction to Pharmacology 03 Hrs

Definition, Historical landmarks and scope of pharmacology, Nature and source of drugs, Essential drugs concept and Routes of drug administration.

Dose response relationship, Therapeutic index, Agonists, Antagonists (competitive and non-competitive), Combined effects of drugs.

Factors modifying drug action.

Pharmacokinetics 03 Hrs

Membrane transport, Absorption, Distribution, Metabolism and Excretion of drugs. Enzyme induction, Enzyme inhibition, Introduction to kinetics of elimination.

Unit-II

General Pharmacology **12 Hrs**

Pharmacodynamics: 07

Principles and mechanisms of drug action.

Receptor theories and classification of receptors, regulation of receptors. Drug receptors interactions, Signal transduction mechanisms, G-protein–coupled receptors, Ion channel receptors

Introduction to transmembrane enzyme linked receptors, JAK-STAT binding receptors and receptors that regulate transcription factors, Spare receptors.

Adverse drug reactions: 02

Addiction, Tolerance, Dependence, Tachyphylaxis, Idiosyncrasy, Allergy (explain with suitable examples).

Drug interactions: 03

Pharmacokinetic and pharmacodynamic drug interactions.

Drug discovery and clinical evaluation of new drugs:

Introduction to drug discovery, Preclinical evaluation and Clinical trials.

Introduction to Pharmacovigilance

Unit III

Pharmacology of drugs acting on Peripheral Nervous System	**08 Hrs**
Introduction to Autonomic Nervous System, Parasympathomimetics, Parasympatholytics, Sympathomimetics and Sympatholytics.	**01**
Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).	**02**
Local anaesthetic agents.	**03**
Drugs used in myasthenia gravis and glaucoma	02

Unit-IV

Pharmacology of drugs acting on central nervous system	**10Hrs**
Neurohumoral transmission in the C.N.S.- Special emphasis to be given on importance of various neurotransmitters like with GABA, Glutamate, Glycine, Serotonin, Dopamine.	01
General anaesthetics and pre-anaesthetics	02
Sedatives, Hypnotics and Centrally acting muscle relaxants	03
Anti-epileptics	02
Alcohol and Disulfiram	02

Unit-V

Pharmacology of drugs acting on Central Nervous System	**09Hrs**
Psychopharmacological agents: Antipsychotics, Antidepressants, Anti-anxiety agents, anti-manics and Hallucinogens	**03**
Drugs used in Parkinson‟s disease and Alzheimer‟s disease	**02**
CNS stimulants and Nootropics	02
Opioid analgesics and antagonists (including addiction, abuse, tolerance and dependence)	02

REFERENCES:

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale‟s Pharmacology,. Churchil Livingstone Elsevier.
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman‟s, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams &Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott‟s Illustrated Reviews-Pharmacology
6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R. Craig & Robert,
9. Barar, F.S.K., Essentials of Pharmacotherapeutics; S. Chand and Company, New Delhi.
10. Das, M. M. and Dutta S. K. : R. Ghosh,s Modern Concepts on pharmacology and Therapeutics, (HILTON and Co. Calcutta)
11. Satoskar , R.S. and Bhandarkar S.D. Pharmacology and Pharmacotherapeutics (PopularPrakashan, Bombay).
12. Harrison‟s Principle and Practice of Medicine, 18th Edition, Churchill, Livingston, .London.
13. Roger and Walker. Clinical Pharmacy and Therapeutics, Churchill, Livingston, London.
14. Dipiro Joseph L. A pathphysiological Approach, Elsevier.
15. Davidson‟s Principle of Internal Medicine, McGraw-Hill companies.
16. Chatterjee, C.C., Human Physiology. Medical Allied Agency, Kolkata.
17. Ganong, W.F., Review of Medical Physiology. Prentice-Hall International, London.

BP 405 T.PHARMACOGNOSY AND PHYTOCHEMISTRY I (Theory) - 45 Hours

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

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

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

Course Content:

UNIT-I **10 Hours**

Introduction to Pharmacognosy:

(a) Definition, history, scope and development of Pharmacognosy

(b) Sources of Drugs – Plants, Animals, Marine & Tissue culture

(c) Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins).

Classification of drugs:

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

Quality control of Drugs of Natural Origin:

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

UNIT-II **10 Hours**

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

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

Conservation of medicinal plants

UNIT-III **07 Hours**

Plant tissue culture:

- Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance.
- Applications of plant tissue culture in pharmacognosy.
- Edible vaccines

UNIT-IV **10 Hours**

Plant description, morphology and anatomy:

Leaves, Roots, Barks, Wood, Flowers, Fruits, Seeds, subterranean organs

Introduction to secondary metabolites:

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

UNIT-V **08 Hours**

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

Plant Products:

- Fibers - Cotton, Jute, Hemp
- Hallucinogens, Teratogens, Natural allergens

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

Carbohydrates: Acacia, Agar, Tragacanth, Honey

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

Lipids (Waxes, fats, fixed oils): General methods of extraction of lipids.

Castor oil, Chaulmoogra oil, Shark liver oil and Cod liver oil, Wool Fat, Bees Wax

Marine Drugs:

Novel medicinal agents from marine sources a) Cardiovascular agents and b) Anti cancer agents

BP406P. MEDICINAL CHEMISTRY – I (Practical) 4Hrs/week

Synthesis of following medicinally important compounds / drug intermediates with Recrystallization of compound and monitoring reactions with TLC

Preparation of drugs/ intermediates (any six) 10 turns

- 1,3-pyrazole
- 1,3-oxazole
- Benzimidazole
- Benztriazole
- 2,3- diphenyl quinoxaline
- Benzocaine
- Phenytoin
- Phenothiazine
- Barbiturate

Purification of above synthesized compounds by Column chromatography **01turn (any one)**

Determination of Partition coefficient and Ionization constants **04 turns**

(any two compounds).

Recommended Books (Latest Editions)

1. John E. Hoover, Remington‟s Pharmaceutical Sciences, Mack Publishing Company; 13thedition (1965).
2. Sean C. Sweetman, Martindale‟s extra pharmacopoeia, Pharmaceutical Society of GreatBritain.
3. Organic Chemistry by I.L. Finar, Vol. II, Longmans Green & Co., 3rd E/d.
4. Daniel Lednicer, Lester A. Mitscher, The Organic Chemistry of Drug Synthesis, JohnWiley & Sons, Inc, Vol. 1-5.
5. Indian Pharmacopoeia.
6. Text book of practical organic chemistry- A.I.Vogel.
7. Medicinal Chemistry By Ashutosh Kar

BP 407P. PHYSICAL PHARMACEUTICS- II (Practical) 4 Hours/week

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

13. Determination of effect of salts on stability of hydrophobic sols

Recommended Books:

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

BP 408 P. PHARMACOLOGY-I (Practical) 4Hrs/Week

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

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

REFERENCES:

1. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
2. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.
3. Burn JH. Practical Pharmacology Blackwell Scientific, Oxford London.
4. Jaju BP. Pharmacology: A Practice Exercise Book, Jaypee Brothers, New Delhi.
5. Sheth UK, Dadkar NK and Kamat UG. selected topics in experimental pharmacology,(Kothari Book Depot, Mumbai)
6. Perry W.L.M. Pharmacological Experiments on Isolated Preparation, E&S Livingstone,London.
7. Goyal R. K., Practicals in Pharmacology, B. S. Shah Prakashan, Ahemadabad.

BP409 P. PHARMACOGNOSY AND PHYTOCHEMISTRY I (Practical): 4 Hours/Week

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

SAVITRIBAI PHULE PUNE UNIVERSITY

FACULTY OF SCIENCE AND TECHNOLOGY

Syllabus of Third Year B. Pharmacy

2019 PATTERN (Revised)

(EFFECTIVE FROM ACADEMIC YEAR 2021-2022)

T.Y.B.PHARM SEMESTER – V

BP501T. MEDICINAL CHEMISTRY – II (Theory) 45 Hours

Scope:

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

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

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

Course Content:

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs mentioned in bracket []only to be covered.

UNIT- I 10 Hours

Antihistaminic agents and autacoids

a) **Antihistaminic agents:** Histamine, receptors and their distribution in the human body
b) **H1-antagonists:** Diphenhydramine hydrochloride, Dimenhydrinate, Doxylamine ssuccinate, Clemastine fumarate, Tripelenamine hydrochloride, Chlorcyclizine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride, Phenindamine tartarate, Promethazine hydrochloride, Trimeprazine tartrate, Fexofenadine, Astemizole, Loratadine, Cetirizine, Cromolyn sodium
c) **H_2-antagonists:** Cimetidine, Famotidine, Ranitidine
d) **Gastric Proton pump inhibitors:** Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole

e) **Autacoids:** Prostaglandins, Prostanoids, Leucotriene antagonists

[Diphenhydramine hydrochloride, Cetirizine, Promethazine hydrochloride, Ranitidine]

UNIT – II **10 Hours**

Drugs acting on Cardiovascular system

a) **Anti-anginals**:

Vasodilators: Amyl nitrite, Nitroglycerin, Pentaerythritol tetranitrate, Isosorbide dinitrite, Dipyridamole.

Calcium channel blockers: Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine.

b) **Diuretics:**

Carbonic anhydrase inhibitors: Acetazolamide, Methazolamide, Dichlorphenamide.

Thiazides: Chlorthiazide, Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide

Loop diuretics: Furosemide, Bumetanide, Ethacrynic acid.

Potassium sparing Diuretics: Spironolactone, Triamterene, Amiloride.

Osmotic Diuretics: Mannitol

c) **Anti-hypertensive Agents**:

α blockers- Prazosin, Terazosin

β blockers- Propanolol, Timolol, Atenolol

ACE inhibitors- Captopril, Lisinopril, Enalapril, Quinapril hydrochloride

Angiotensin II receptor antagonists- Losartan, Telmisartan, Valsartan

Misc.class- Methyldopate hydrochloride, Clonidine hydrochloride, Guanethidine monosulphate, Reserpine, Hydralazine hydrochloride.

[Isosorbide dinitrite, Nifedipine, Chlorthiazide, Furosemide, Lisinopril, Atenolol]

UNIT-III **10 Hours**

Drugs acting on cardiovascular system (Continued)

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

b) **Anti-hyperlipidemic agents**

HMG Co-A reductase inhibitors: Lovastatin, Simvastatin, Atorvastatin

Misc. class-Ezetimibe, Clofibrate

c) **Coagulant & Anticoagulants**: Menadione, Warfarin, Clopidogrel

d) **Drugs used in Congestive Heart Failure:** Digoxin, Digitoxin, Nesiritide, Bosentan

[Amiodarone, Atorvastatin]

UNIT-IV **08 Hours**

Drugs acting on Endocrine system

a) **Chemistry, Nomenclature, Stereochemistry and metabolism of steroids**

b) **Sex hormones**: Testosterone, Nandralone, Progestrones, Oestriol, Oestradiol, Oestrione, Diethyl stilbestrol.

c) **Drugs for erectile dysfunction:** Sildenafil, Tadalafil.

d) **Oral contraceptives:** Mifepristone, Norgestril, Levonorgestrol

e) **Corticosteroids:** Cortisone, Hydrocortisone, Prednisolone, Betamethasone,Dexamethasone

f) **Thyroid and antithyroid drugs**: L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.

UNIT – V **07 Hours**

Antidiabetic agents and Local anaesthetics

a) **Antidiabetic agents:**

Insulin and its preparations

Sulfonyl ureas: Tolbutamide, Chlorpropamide, Glipizide, Glimepiride.

Biguanides: Metformin.

Meglitinides: Repaglinide, Nateglinide.

Glucosidase inhibitors: Acrabose, Voglibose.

DPP IV inhibitors -Sitagliptin, Teneligliptin

SGLT2 inhibitors – Empagliflozin, Canagliflozin

b) Local Anesthetics: SAR of Local anesthetics

Benzoic Acid derivatives; Meprylcaine, Cyclomethycaine, Piperocaine.

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

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

Miscellaneous: Phenacaine

[Tolbutamide, Benzocaine]

Recommended Books (Latest Editions)

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

BP 502 T. Industrial Pharmacy I (Theory) 45 Hours

Scope:

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

Objectives:

Upon completion of the course the student shall be able to

1. illustrate various pharmaceutical dosage forms and their manufacturing techniques.
2. describe various factors to be considered in development of pharmaceutical dosage forms
3. Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

Course content: **3 hours/ week**

UNIT-I **03 Hours**

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

UNIT-II **14 Hours**

Tablets:

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

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

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

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

UNIT-III **08 Hours**

Capsules:

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

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

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

UNIT-IV **10 Hours**

Parenteral Products:

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

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

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

d. Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests of parenteral products. Ophthalmic Preparations: Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations

UNIT-V **10 Hours**

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

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

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

Recommended Books: (Latest Editions)

1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman &J.B.Schwartz

2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman

3. Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman

4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition

5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)

6. Theory and Practice of Industrial Pharmacy by Liberman & Lachman

7. Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchill livingstone, Latest edition

8. Introduction to Pharmaceutical Dosage Forms by H. C.Ansel, Lea &Febiger,Philadelphia, 5thedition, 2005

9. Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition,Marcel Dekker Series, Vol 107.

BP503.T. PHARMACOLOGY-II (Theory) 45 Hours

Scope:

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

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

1. Understand the mechanism of drug action and its relevance in the treatment of different diseases

2. Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments
3. Demonstrate the various receptor actions using isolated tissue preparation
4. Appreciate correlation of pharmacology with related medical sciences

Course Content:

UNIT-I **10hr**

Pharmacology of drugs acting on cardiovascular system

a. Introduction to hemodynamic and electrophysiology of heart.

b. Drugs used in congestive heart failure

c. Anti-hypertensive drugs.

d. Anti-anginal drugs.

e. Anti-arrhythmic drugs.

f. Anti-hyperlipidemic drugs.

UNIT-II

Pharmacology of drugs acting on cardiovascular system **10hr**

a. Drug used in the therapy of shock.

b. Hematinics, coagulants and anticoagulants.

c. Fibrinolytics and anti-platelet drugs

d. Plasma volume expanders

Pharmacology of drugs acting on urinary system

a. Diuretics

b. Anti-diuretics.

UNIT-III

Autocoids and related drugs **10hr**

a. Introduction to autacoids and classification

b. Histamine, 5-HT and their antagonists.

c. Prostaglandins, Thromboxanes and Leucotrienes

d. Angiotensin, Bradykinin and Substance P.

e. Non-steroidal anti-inflammatory agents

f. Anti-gout drugs

g. Antirheumatic drugs

UNIT-IV

Pharmacology of drugs acting on endocrine system **08hr**

a. Basic concepts in endocrine pharmacology.

b. Anterior Pituitary hormones- analogues and their inhibitors.

c. Thyroid hormones- analogues and their inhibitors.

d. Hormones regulating plasma calcium level- Parathormone, Calcitonin and Vitamin-D.

d. Insulin, Oral Hypoglycemic agents and glucagon.

e. ACTH and corticosteroids.

UNIT-V

Pharmacology of drugs acting on endocrine system **07hr**

a. Androgens and Anabolic steroids.

b. Estrogens, progesterone and oral contraceptives.

c. Drugs acting on the uterus.

Bioassay

a. Principles, applications and types of bioassay.

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

Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale‟s Pharmacology, Churchil Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata McGraw-Hill
3. Goodman and Gilman‟s, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A.K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs. The Point Lippincott Williams &Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott‟s Illustrated Reviews-Pharmacology
6. K. D. Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher

8. Modern Pharmacology with clinical Applications, by Charles R. Craig& Robert,

BP504 T PHARMACOGNOSY AND PHYTOCHEMISTRY-II (Theory) 45 Hours

Scope:

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

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

1. To know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents
2. To understand the production of of Phytoconstituents /herbal formulation.
3. To understand the metabolic pathways in formation of secondary metabolites and application of biogenetic studies.
4. To carryout isolation and identification of phytoconstituents

Course Content:

UNIT-I 7 Hours

Metabolic pathways in higher plants and their determination

a) Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways- Shikimic acid pathway, Acetate pathways and Amino acid pathway.
b) Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.

UNIT-II 14 Hours

General introduction, composition, chemistry & chemical classes, bio sources, **methods of extraction**, therapeutic uses and commercial applications of following secondary metabolites:

Alkaloids: Vinca, Rauwolfia, Belladonna, Opium,

Phenylpropanoids and Flavonoids: Lignans, Tea, Ruta

Steroids, Cardiac Glycosides & Triterpenoids: Liquorice, Dioscorea, Digitalis

Volatile oils: Mentha, Clove, Cinnamon, Fennel, Coriander,

Tannins: Catechu, Pterocarpus

Resins: Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony

Glycosides: Senna, Aloes, Bitter Almond

Iridoids, Other terpenoids & Naphthaquinones: Gentian, Artemisia, taxus, carotenoids

UNIT-III **06 Hours**

Isolation, Identification and Analysis of Phytoconstituents

a) Terpenoids: Menthol, Citral, Artemisin

b) Glycosides: Glycyrhetinic acid & Rutin

c) Alkaloids: Atropine,Quinine,Reserpine,Caffeine

d) Resins: Podophyllotoxin, Curcumin

UNIT-IV **06 Hours**

Industrial production, estimation and utilization of the following phytoconstituents:

Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastine

UNIT V **12 Hours**

Basics of Phytochemistry

Methods of extraction (Soxhlet, Maceration, Percolation , Supercritical fluid extraction, Microwave assisted extraction, Ultrasound assisted extraction , Solid Phase Extraction)

Application of latest techniques like Spectroscopy, Chromatography and electrophoresis in the isolation, purification and identification of crude drugs

Non-chromatographic separation techniques: Fractional distillation, fractional liberation, sublimation, chemical derivatization, fractional crystallization, centrifugation, Froth floatation technique.

BP 505 T. PHARMACEUTICAL JURISPRUDENCE (Theory) 45 Hours

Scope:

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

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

1. The Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals.

2. Various Indian pharmaceutical Acts and Laws

3. The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals

4. The code of ethics during the pharmaceutical practice

Course Content:

UNIT-I **10 Hours**

Drugs and Cosmetics Act, 1940 and its rules 1945:

Objectives, Definitions, Legal definitions of schedules to the Act and Rules Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties. Manufacture of drugs – Prohibition of manufacture and sale of certain drugs,

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

UNIT-II **10 Hours**

Drugs and Cosmetics Act, 1940 and its rules 1945.

Detailed study of Schedule G, H, M, N, P, T, U, V, X, Y, Part XII B, Sch F & DMR (OA) Sale of Drugs – Wholesale, Retail sale and restricted license. Offences and penalties Labeling & packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties.

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

UNIT-III **10 Hours**

Pharmacy Act –1948: Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of Pharmacists, Offences and 122 Penalties

Medicinal and Toilet Preparation Act –1955: Objectives, Definitions, Licensing, Manufacture In bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations. Offences and Penalties.

Narcotic Drugs and Psychotropic substances Act-1985 and Rules: Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties

UNIT-IV **08 Hours**

Study of Salient Features of Drugs and Magic Remedies Act and its rules: Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties

Prevention of Cruelty to animals Act-1960: Objectives, Definitions, Institutional Animal Ethics Committee, CPCSEA guidelines for Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties

National Pharmaceutical Pricing Authority: Drugs Price Control Order (DPCO)- 2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of Essential Medicines (NLEM)

UNIT-V **07 Hours**

Pharmaceutical Legislations – A brief review, Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee

Code of Pharmaceutical ethics Definition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist‟s oath

Medical Termination of Pregnancy Act

Right to Information Act

Introduction to Intellectual Property Rights (IPR)

Recommended books: (Latest Edition)

1. Forensic Pharmacy by B. Suresh
2. Text book of Forensic Pharmacy by B.M. Mithal
3. Hand book of drug law-byM.L. Mehra
4. A text book of Forensic Pharmacy by N.K. Jain
5. Drugs and Cosmetics Act/Rules by Govt. of India publications.
6. Medicinal and Toilet preparations act 1955 by Govt. of India publications.
7. Narcotic drugs and psychotropic substances act by Govt. of India publications
8. Drugs and Magic Remedies act by Govt. of India publication
9.Bare Acts of the said laws published by Government. Reference books (Theory) 124

BP 506 P. Industrial PharmacyI (Practical) **4 Hours/week**

1. Preformulation studies on paracetamol/asparin/or any other drug
2. Preparation and evaluation of Paracetamol tablets
3. Preparation and evaluation of Aspirin tablets
4. Coating of tablets- film coating of tables/granules
5. Preparation and evaluation of Tetracycline capsules

6. Preparation of Calcium Gluconate injection
7. Preparation of Ascorbic Acid injection
8. Qulaity control test of (as per IP) marketed tablets and capsules
9. Preparation of Eye drops/ and Eye ointments
10. Preparation of Creams (cold / vanishing cream)
11. Evaluation of Glass containers (as per IP)

Recommended Books: (Latest Editions)

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

BP 507 P. PHARMACOLOGY-II (Practical) 4Hrs/Week

Sr. No	Experiment
1.	Introduction to in-vitro pharmacology and physiological salt solutions.
2.	Effect of drugs on isolated frog heart.
3.	Effect of drugs on blood pressure and heart rate of dog.
4.	Study of diuretic activity of drugs using rats/mice.
5.	DRC of acetylcholine using frog rectus abdominis muscle.
6.	Effect of physostigmine and atropine on DRC of acetylcholine using frog rectus

abdominis muscle and rat ileum respectively.

7. Bioassay of histamine using guinea pig ileum by matching method.
8. Bioassay of oxytocin using rat uterine horn by interpolation method.
9. Dose calculation in pharmacological experiments
10. Bioassay of acetylcholine using rat ileum/colon by four point bioassay.
11. Determination of PA_2 value of prazosin using rat anococcygeus muscle (by Schilds plot method).
12. Determination of PD_2 value using guinea pig ileum.
13. Effect of spasmogens and spasmolytics using rabbit jejunum.
14. Anti-inflammatory activity of drugs using carrageenan induced paw-edema model.
15. Analgesic activity using hotplate method
16. Antiallergic activity by mast cell stabilization assay
17. Clinical Case study

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

Recommended Books (Latest Editions)

1. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
2. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.
3. Goyal RK. Practicals in Pharmacology, BS Shaha Prakashan.
4. Kasture SB. A handbook of experiments in pre-clinical pharmacology, Career Publications.
5. Bikas Medhi, Ajay Prakash. Practical Manual of Experimental and Clinical Pharmacology. Jaypee Publications.

BP 508 P. PHARMACOGNOSY AND PHYTOCHEMISTRY II (Practical) 4 Hours/Week

1. Morphology, histology and powder characteristics & extraction & detection of:

Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander

2. Exercise involving isolation & detection of active principles

a. Caffeine - from tea dust.

b. Diosgenin from Dioscorea

c. Atropine from Belladonna

d. Sennosides from Senna

3. Separation of sugars by Paper chromatography

4. TLC of herbal extract

5. Distillation of volatile oils and detection of phytoconstitutents by TLC

6. Analysis of crude drugs by chemical tests: **(**i) Asafoetida (ii) Benzoin (iii) Colophony (iv) Aloes (v) Myrrh

Recommended Books: (Latest Editions)

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009.

2. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.

3. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.

4. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.

5. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007

6. Herbal Cosmetics by H.Pande, Asia Pacific Business press, Inc, New Delhi.

7. A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.

8. R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994.

9. Pharmacognosy & Pharmacobiotechnology. James Bobbers, Marilyn KS, VE Tylor.

10. The formulation and preparation of cosmetic, fragrances and flavours.

11. Remington‟s Pharmaceutical sciences.

12. Text Book of Biotechnology by Vyas and Dixit.

13. Text Book of Biotechnology by R.C. Dubey.

T.Y.B.PHARM SEMESTER - VI

BP601T. MEDICINAL CHEMISTRY – III (Theory) 45 Hours

Scope :

This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject also discusses the concept of quantitative structure activity relationship (QSAR) in drug design. The subject also emphasizes on the chemistry, mechanism of action, metabolism, adverse effects, Structure Activity Relationships (SAR), therapeutic uses and synthesis of important drugs.

Objectives:

Upon completion of the course student shall be able to

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

Course Content:

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs mentioned in bracket []only to be covered

UNIT - I 10 Hours

Antibiotics

Historical background, Nomenclature, Stereochemistry,Structure activity relationship, Chemical degradation classification and important products of the following classes.

a) **β-Lactam antibiotics:** Penicillins, Cepholosporins, β-Lactamase inhibitors, Monobactams
b) **Aminoglycosides:** Streptomycin, Neomycin, Kanamycin

c) **Tetracyclines:** Tetracycline, Oxytetracycline, Chlortetracycline, Minocycline, Doxycycline

UNIT – II **07 Hours**

a) **Antibiotics**

Macrolide: Erythromycin, Clarithromycin, Azithromycin.

Polypeptide antibiotics-Vancomycin, Bacitracin

Miscellaneous: Chloramphenicol, Clindamycin, Linzolide

b) **Antimalarials:** Etiology of malaria.

Quinolines: SAR, Quinine sulphate, Chloroquine, Amodiaquine, Primaquine phosphate, Pamaquine, Quinacrine hydrochloride, Mefloquine.

Biguanides and dihydrotriazines: Cycloguanil pamoate, Proguanil.

Miscellaneous: Pyrimethamine, Artesunete, Artemether, Atovoquone, Halofantrine, Lumefantrine.

[Chloramphenicol, Chloroquine]

UNIT – III **08 Hours**

Antimycobacterial and Antiviral agents

a) **Anti-tubercular Agents**

Synthetic anti tubercular agents: Isoniazid, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid

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

b) **Antileprosy agents:** Clofazimine, Dapsone, Rifamycin

c) **Antiviral agents:**

DNA virus inhibitors-Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine trifluoridine, Acyclovir, Gancyclovir.

RNA virus inhibitors

Anti-HIV agents- Zidovudine, Didanosine, Zalcitabine, Lamivudine, Loviride, Delavirdine , Ribavirin, Saquinavir, Indinavir, Ritonavir.

[Isoniazid, Ethambutol, Acyclovir]

UNIT – IV **10 Hours**

a) **Antifungal agents**

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

Synthetic Antifungal agents: Clotrimazole, Oxiconazole,Tioconozole, Miconazole, Ketoconazole, Itraconazole, Fluconazole, Tolnaftate.

b) **Anti-protozoal Agents:** Metronidazole, Tinidazole, Ornidazole, Diloxanide, Iodoquinol, Atovaquone, Eflornithine.

c) **Anthelmintics:** Diethylcarbamazine citrate, Thiabendazole, Mebendazole, Albendazole, Niclosamide, Oxamniquine, Praziquantel, Ivermectin.

d) **Synthetic anti-infective agents :**

Sulphonamides: Historical development, chemistry and drug resistance

Sulfacetamide, Sulphapyridine, Sulfamethoxazole, Sulphadiazine, Sulfasalazine.

Folate reductase inhibitors: Trimethoprim

Quinolones: Nalidixic Acid, Norfloxacin, Ciprofloxacin, Ofloxacin, Lomefloxacin, Gatifloxacin, Moxifloxacin

Miscellaneous: Furazolidine, Nitrofurantoin, Methanamine.

[Fluconazole, Metronidazole, Mebendazole, Sulfamethoxazole, Trimethoprim , Ciprofloxacin]

UNIT – V **07 Hours**

Anti-neoplastic agents:

Alkylating agents: Meclorethamine, Cyclophosphamide, Melphalan,

Chlorambucil, Busulfan, Thiotepa

Antimetabolites: Mercaptopurine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate

Antibiotics: Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin

Plant products: Etoposide, Vinblastin sulphate, Vincristin sulphate

Kinase inhibitors: Gefitinib, Imatinib, Erlotinib

Monoclonal antibodies-Bedvacizumab, Cetuximab

Miscellaneous: Cisplatin, Mitotane.

[Chlorambucil, Mercaptopurine, Methotrexate)

UNIT – VI **03 Hours**

Introduction to Drug Design

Various approaches used in drug design.

Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient, Hammet‟s electronic parameter, Tafts steric parameter and Hansch analysis, Ferguson principle.

Recommended Books (Latest Editions)

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

BP602 T. PHARMACOLOGY-III (Theory) **45 Hours**

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

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

1. Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases
2. Comprehend the principles of toxicology and treatment of various poisonings and appreciate correlation of pharmacology with related medical sciences.

Course Content:

UNIT-I **10hr**

Pharmacology of drugs acting on Respiratory system

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

Pharmacology of drugs acting on the Gastrointestinal Tract

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

UNIT-II

Chemotherapy **10hr**

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

UNIT-III

Chemotherapy **10hr**

a. Antitubercular agents
b. Antileprotic agents

c. Antifungal agents
d. Antiviral drugs
a. Anthelmintics
e. Antimalarial drugs
f. Antiamoebic agents

UNIT-IV

Chemotherapy **08hr**

a. Urinary tract infections and sexually transmitted diseases.

b. Chemotherapy of malignancy.

Immunopharmacology

a. Immunostimulants
b. Immunosuppressant

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

UNIT-V

Principles of toxicology **07hr**

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

Chronopharmacology

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

Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale‟s Pharmacology, Churchil Livingstone Elsevier

2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata McGraw-Hill
3. Goodman and Gilman‟s, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A.K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs. The Point LippincottWilliams &Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott‟s Illustrated Reviews-Pharmacology
6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers MedicalPublishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert,
9. N.Udupa and P.D. Gupta, Concepts in Chronopharmacology.

BP 603 T. HERBAL DRUG TECHNOLOGY (Theory)

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

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

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

Course content:

UNIT-I **11 Hours**

Herbs as raw materials

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

Biodynamic Agriculture

Good agricultural practices in cultivation of medicinal plants including Organic farming.

Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides.

Indian Systems of Medicine

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

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

Pharmacognosy in various systems of medicine:

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

UNIT-II **7 Hours**

Nutraceuticals

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

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

Study of Omega-3-polyunsaturated fatty acids, Dietary fibers, Carotenoids, proanthocyanidins, and Resveratrol

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

UNIT-III **10 Hours**

Herbal Cosmetics

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

Herbal excipients:

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

Herbal formulations :

Market overview, Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes

UNIT- IV **12 Hours**

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

Patenting and Regulatory requirements of natural products:

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

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

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

Other issues related to export of natural products (such as CITES Certificate, DGFT Notification, Negative list of herbs, TRAFFIC)

UNIT-V **05Hours**

General Introduction to Herbal Industry

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

S**chedule T – GoodManufacturing Practice of Indian systems of medicine**

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

BP 604 T. BIOPHARMACEUTICS AND PHARMACOKINETICS (Theory) 45 Hours

Scope: This subject is designed to impart knowledge and skills of Biopharmaceutics and pharmacokinetics and their applications in pharmaceutical dosage form development.

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

- Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance.
- Use plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.
- Understand the concepts of bioavailability and bioequivalence of drug products and their significance.
- Understand the concept of dissolution and application of in vitro in vivo correlation in drug product development.

Course Content:

UNIT-I 10 Hours

Introduction to Biopharmaceutics

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

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

UNIT- II 10 Hours

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

Biopharmaceutical classification system, theories of dissolution, dissolution test apparatus, dissolution models, *in-vitro-in-vivo* correlations

UNIT- III **10 Hours**

Bioavailability and Bioequivalence: Definition and Objectives of bioavailability, absolute and relative bioavailability, measurement of bioavailability, bioequivalence studies and study designs, Review of regulatory requirements for conducting bioequivalence study, bio-waivers, methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.

UNIT- IV **10 Hours**

Pharmacokinetics: Definition and introduction to Pharmacokinetics, Compartment models, Non compartment models, physiological models, One compartment open model (a) Intravenous Injection (Bolus) (b) Intravenous infusion and (c) Extra vascular administrations. Pharmacokinetics parameters - K_E, $t_{1/2}$, Vd, AUC, Ka, CL_T and CL_R- definitions methods of eliminations, understanding of their significance and application. Introduction to multi-compartment model.

UNIT- V **05 Hours**

Nonlinear Pharmacokinetics: Introduction, Factors causing Non-linearity, Michaelis-menten equation, Determination of V_{max} and K_m. Significance of nonlinear pharmacokinetics, Explanation with example of drugs.

Recommended Books: (Latest Editions)

1. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi.
2. Biopharmaceutics and Pharmacokinetics; By Robert F Notari
3. Applied biopharmaceutics and pharmacokinetics, Leon Shargel and Andrew B.C.YU 4th edition, Prentice-Hall Inernational edition.USA

4. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B.Jaiswal,Vallabh Prakashan Pitampura, Delhi
5. Pharmacokinetics: By Milo Glbaldi Donald, R. Mercel Dekker Inc.
6. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.
7. Biopharmaceutics; By Swarbrick
8. Clinical Pharmacokinetics, Concepts and Applications: By Rowland M, Tozer T, Ed 4, WolterKluwers – Lippincott,Williams and Wilkins.
9. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company,Pennsylvania 1989.
10. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Rebort F Notari Marcel Dekker Inn, New York and Basel, 1987.
Remington‟s Pharmaceutical Sciences, ByMack Publishing Company, Pennsylvnia.

BP 605 T. PHARMACEUTICAL BIOTECHNOLOGY(Theory) 45 Hours

- Biotechnology has a long promise to revolutionize the biological sciences and technology.
- Scientific application of biotechnology in the field of genetic engineering, medicine and fermentation technologymakes the subjectinteresting.
- Biotechnology is leading to new biological revolutions in diagnosis, prevention and cure of diseases, new and cheaper pharmaceuticaldrugs.
- Biotechnology has already produced transgenic crops and animals and thefuture promises lot more.
- It is basically a research-basedsubject.

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

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

Unit I 10 Hours

Brief introduction to Biotechnology with reference to Pharmaceutical Sciences.

Enzyme Biotechnology- Methods of enzyme immobilization and applications.

Biosensors- Working and applications of biosensors in Pharmaceutical Industries.

Brief introduction to Protein Engineering.

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

Basic principles of genetic engineering.

Unit II **10 Hours**

Study of cloning vectors, restriction endonucleases and DNAligase.

Recombinant DNA technology. Application of genetic engineering inmedicine.

Application of r DNA technology and genetic engineering in the productionof:

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

Brief introduction toPCR139

Unit III **10 Hours**

Types of immunity- humoral immunity, cellular immunity

Structure of Immunoglobulins

Structure and Function of MHC

Hypersensitivity reactions, Immune stimulation and Immune suppressions.

General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity.

Storage conditions and stability of official vaccines

Hybridoma technology- Production, Purification and Applications

Unit IV **08Hours**

Immuno blotting techniques- ELISA, Western blotting, Southern blotting.

Microbial genetics including transformation, transduction, conjugation, plasmidsand transposons.

Introduction to Microbial biotransformation andapplications.

Mutation: Types of mutation/mutants.

Unit V **07 Hours**

Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process,stirring.

Large scale production fermenter design and its variouscontrols.

Study of the production of - penicillins, Vitamin B12, Glutamicacid,

Blood Products: Collection, Processing and Storage of whole human blood,dried human plasma, plasmaSubstituties.

Recommended Books (Latest edition):

1. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles andApplications of Recombinant DNA: ASM Press WashingtonD.C.
2. RA Goldshyet. al., :KubyImmunology.
3. J.W. Goding: MonoclonalAntibodies.
4. J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology byRoyal Society ofChemistry.
5. Zaborsky: Immobilized Enzymes, CRC Press, Degraland,Ohio.

6. S.B. Primrose: Molecular Biotechnology (Second Edition) BlackwellScientific Publication.

7. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentationtechnology, 2nd edition, Aditya books Ltd., NewDelhi.

BP 606T PHARMACEUTICAL QUALITY ASSURANCE (Theory) 45 Hours

Scope:

This course deals with the various aspects of quality control and qualityassurance aspects of pharmaceutical industries. It deals with the important aspects likecGMP, QC tests, documentation, quality certifications and regulatory affairs.

Objectives:

Upon completion of the course student shall be able to:

1. Understand the cGMP aspects in a pharmaceutical industry
2. Appreciate the importance of documentation
3. Understand the scope of quality certifications applicable to pharmaceutical industries
4. Understand the responsibilities of QA & QC departments

COURSE CONTENT

UNIT – I **10 Hours**

Quality Assurance and Quality Management concepts: Definition and concept of Quality control, Quality assurance and GMP, Introduction to Regulatory agencies like CDSCO, USFDA, WHO, PIC/S.

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

ICH Guidelines: Brief overview of QSEM, ICH stability testing guidelines

Quality by design (QbD): Definition, Overview, Elements of QbD program

ISO 9000 & ISO14000: Overview, Benefits and Elements

NABL accreditation : Principles and procedures

UNIT - II **10 Hours**

Organization and personnel: Personnel responsibilities, training, hygiene and personal records.

Premises: Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination.

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

UNIT – III **10 Hours**

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

Good Laboratory Practices &Role of CPCSEA

UNIT – IV **08 Hours**

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

Document maintenance in pharmaceutical industry in brief: Batch Formula Record, Master Formula Record, SOP, distribution records.

UNIT – V **07 Hours**

Calibration and Validation: Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, type of validation.

General principles of Analytical method Validation.

Warehousing: Good warehousing practice, materials management

Recommended Books: (Latest Edition)

1. Quality Assurance Guide by organization of Pharmaceutical Products of India.
2. Good Laboratory Practice Regulations, 2nd Edition, SandyWeinberg Vol. 69.
3. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Relatedmaterials Vol IWHO Publications.
4. A guide to Total QualityManagement- Kushik Maitra and Sedhan K Ghosh

5. How to Practice GMP‟s – P P Sharma.
6. ISO 9000 and Total QualityManagement – Sadhank G Ghosh
7. The International Pharmacopoeia – Vol I, II, III, IV- General Methods of Analysisand Quality specification for Pharmaceutical Substances, Excipients and Dosageforms
8. Good laboratory Practices – Marcel Deckker Series
9. ICH guidelines, ISO 9000 and 14000 guidelines142
10. Pharmaceutical Quality Assurance – Sohan Chitlange, Sanjeevani Deshkar, Rupali Kale and Bhupesh Patil

BP607P. MEDICINAL CHEMISTRY-III (Practical) 4 Hours / week

I Preparation of drugs and intermediates (Any six) 10 turns

1. Sulphanilamide
2. 7-Hydroxy, 4-methyl coumarin
3. Chlorobutanol
4. Triphenyl imidazole
5. Tolbutamide
6. Hexamine
7 Paracetamol
8. Methyl salicylate
9. Caprolactum

II Preparation of medicinally important compounds or intermediates by Microwave synthesis (any two) **02 turns**

III Drawing structures and reactions using Chem draw® **01 turn**

IV Determination of physicochemical properties such as logP, clogP, MR, Molecular weight **01 turn**

V Hydrogen bond donors and acceptors for class of drugs using drug design software Drug likeliness screening (Lipinskies RO5) **01 turn**

Recommended Books (Latest Editions)

1. Martindale‟s extra pharmacopoeia.
2. Organic Chemistry by I. L. Finar Vol II

3. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1to 5.
4. Indian Pharmacopoeia.
5. Text book of practical organic chemistry-A.I.Vogel.
6. Medicinal Chemistry By Ashutosh Kar
7. Practical Pharmaceutical Chemistry: Part II Fourth Edition, A. H. Beckett, J. B. Stenlake.

BP 608 P. PHARMACOLOGY-III (Practical)

4Hrs/Week

Sr. No	Experiment
1.	Study of anti-ulcer activity of a drug using pylorus ligand (SHAY) rat model and NSAIDS induced ulcer model.
2.	Study of effect of drugs on gastrointestinal motility
3.	Effect of agonist and antagonists on guinea pig ileum
4.	Estimation of serum biochemical parameters by using semi- autoanalyser
5.	Effect of saline purgative on frog intestine
6.	Hypoglycemic effect of insulin in rabbit
7.	Test for pyrogens (rabbit method)
8.	Determination of acute oral toxicity (LD50) of a drug from a given data
9.	Determination of acute skin irritation / corrosion of a test substance
10.	Determination of acute eye irritation / corrosion of a test substance
11.	Calculation of pharmacokinetic parameters from a given data
12.	Biostatistics methods in experimental pharmacology(student‟s t test, ANOVA)
13.	Biostatistics methods in experimental pharmacology (Chi square test, Wilcoxon Signed Rank test)
14.	Bioassay of serotonin using rat fundus strip by three point bioassay.
15.	Bioassay of acetylcholine using rat ileum/colon by four point bioassay.
16.	Study of mydriatic and miotic effects on rabbit eye.

*Experiments are demonstrated by simulated experiments/videos

Recommended Books (Latest Editions)

1. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
2. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.
3. Goyal RK. Practicals in Pharmacology, BS Shaha Prakashan.
4. Kasture SB. A handbook of experiments in pre-clinical pharmacology, Career Publications.
5. Bikas Medhi, Ajay Prakash. Practical Manual of Experimental and Clinical Pharmacology. Jaypee Publications.

BP 609 P. HERBAL DRUG TECHNOLOGY (Practical) 4 hours/ week

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

Recommended Books: (Latest Editions)

1. Textbook of Pharmacognosy by Trease & Evans.
2. Textbook of Pharmacognosy by Tyler, Brady & Robber.
3. Pharmacognosy by Kokate, Purohit and Gokhale
4. Essential of Pharmacognosy by Dr.S.H.Ansari
5. Pharmacognosy & Phytochemistry by V.D.Rangari
6. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in

Indian Medicine & Homeopathy)
7. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.
8. B.A.Baviskar, S.L.Deore, Dr.S.S.Khadbadi : Experimental Phytopharmacognosy, Nirali Publication

SAVITRIBAI PHULE PUNE UNIVERSITY

FACULTY OF
SCIENCE AND TECHNOLOGY

COURSE STRUCTURE AND SYLLABUS

FINAL YEAR BACHELOR OF PHARMACY (B. Pharm.) 2019PATTERN
(EFFECTIVE FROM ACADEMIC YEAR 2022 – 2023)

FINAL YEAR B. PHARM SEMESTER – VII

BP701T	INSTRUMENTAL METHODS OF ANALYSIS (Theory)	45 Hours

Scope:

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

Objectives:

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

1. Upon completion of the course the student shall be ableto
2. Illustrate the interaction of matter with electromagnetic radiations and justify its applications in drug analysis
3. Classifythechromatographicseparationmethodsandchooseappropriatetechniquefor analysis of drugs.
4. Design methods for performing quantitative & qualitative analysis of drugs using various analytical instruments.

Course Content:

UNIT - I **UV Visible spectroscopy** Introduction to spectroscopy, Electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra, Beer and Lambert's law, Derivation and deviations. Instrumentation - Sources of radiation, wavelength selectors, sample cells, detectors- Photo tube, Photomultiplier tube, Photo voltaic cell, Silicon Photodiode. Applications - Spectrophotometric titrations, Single component and multi component Analysis **Fluorimetry** Theory, Concepts of singlet, doublet and triplet electronic states, internal and external conversions, factors affecting fluorescence, quenching, instrumentation and applications	**10 Hours**

UNIT –II **FTIR spectroscopy** Introduction, fundamental modes of vibrations in poly atomic molecules, sample handling, factors affecting vibrations Instrumentation - Sources of radiation, wavelength selectors, detectors - Golay cell, Bolometer, Thermocouple, Thermister, Pyroelectric detector, FTIR instrument, sample handling attachments –DRS and ATR and applications **Flame Photometry** Principle, interferences, instrumentation and applications **Atomic absorption spectroscopy** Principle, interferences, instrumentation and Applications **Nepheloturbidimetry** Introduction	**10 Hours**
UNIT –III **Introduction to chromatography -** **Adsorption and partition column chromatography:** Methodology, advantages, disadvantages and applications. **Paper chromatography:** Introduction, methodology, development techniques, advantages, disadvantages and applications **Thin layer chromatography:** Introduction, Principle, Methodology, Rf values, advantages, disadvantages and applications. **HPTLC:** Introduction, Instrumentation and applications	**10 Hours**
UNIT –IV **Theory of Chromatography** Plate theory, Rate theory, System suitability parameters **Gas chromatography** Introduction, theory, instrumentation, temperatureprogramming,advantages, disadvantages andapplications **High performance liquid chromatography (HPLC)** Introduction, theory, instrumentation, advantages and applications.	**08 Hours**

UNIT –V **Ion exchange chromatography-** Introduction, classification, ion exchange resins, properties, mechanism of ion exchange process, factors affecting ion exchange, methodology and applications **Gel chromatography-** Introduction, theory, instrumentation and applications Affinity chromatography- Introduction	**07 Hours**
Recommended Books (Latest Editions): 1. Instrumental Methods of Chemical Analysis by B.K Sharma 2. Organic spectroscopy by Y.RSharma 3. Text book of Pharmaceutical Analysis by Kenneth A.Connors 4. Vogel's Text book of Quantitative Chemical Analysis by A.I.Vogel 5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B.Stenlake 6. Organic Chemistry by I. L.Finar 7. Organic spectroscopy by WilliamKemp 8. Quantitative Analysis of Drugs by D. C.Garrett 9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D.Sethi 10. Spectrophotometric identification of Organic Compounds bySilverstein.	

BP702T	INDUSTRIAL PHARMACY -II (Theory)	45 Hours

Scope:

This course is designed to impart fundamental knowledge on pharmaceutical product development and translation from laboratory to market.

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

1. Know the process of pilot plant and scale up of pharmaceutical dosage forms
2. Understand the process of technology transfer from lab scale to commercial batch
3. Know different Laws and Acts that regulate pharmaceutical industry
4. Understand the approval process and regulatory requirements for drug products

Course Content:

UNIT-I **Pilot plant scale up techniques:** General considerations - including significance of personnel requirements, space requirements, raw materials, Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation, SUPAC guidelines, Introduction to platform technology.	**10 Hours**
UNIT-II **Technology development and transfer:** WHO guidelines for Technology Transfer (TT): Terminology, Technology transfer protocol, Quality risk management, Transfer from R & D to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packaging materials) Documentation, Premises and equipments, qualification and validation, quality control, analytical method transfer, Approved regulatory bodies and agencies,Commercialization-practicalaspectsandproblems(casestudies),TTagencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE / SIDBI; TT related documentation - confidentiality agreement, licensing, MoU's, legal issues	**10 Hours**

UNIT-III **Regulatory affairs:** Introduction, Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals **Regulatory requirements for drug approval:** Drug Development Teams, Non-Clinical Drug Development, Pharmacology, Drug MetabolismandToxicology,GeneralconsiderationsofInvestigationalNewDrug(IND) Application,Investigator'sBrochure(IB)andNewDrugApplication(NDA),Clinical research / BE studies, Clinical Research Protocols, Biostatistics in Pharmaceutical Product Development, Data Presentation for FDA Submissions, Management of Clinical Studies.	**10 Hours**
UNIT-IV **Indian Regulatory Requirements:** Central Drug Standard Control Organization (CDSCO) and State Licensing Authority: Organization, Responsibilities, Certificate of Pharmaceutical Product (COPP), Regulatory requirements and approval procedures for New Drugs.	**07 Hours**
UNIT-V **Quality management systems:** Quality management & Certifications: Concept of Quality, Total Quality Management, Quality by Design (QbD), Six Sigma concept, Out of Specifications (OOS), Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP	**08 Hours**
Recommended Books: (Latest Editions) 1. Regulatory Affairs from Wikipedia, the free encyclopedia modified on 7th April available at http,//en.wikipedia.org/wiki/Regulatory_Affairs. 2. International Regulatory Affairs Updates, 2005.available athttp://www.iraup.com/about.php 3. Douglas J Pisano and David S. Mantus. Text book of FDA Regulatory Affairsa Guide for Prescription Drugs, Medical Devices, and Biologics' Second Edition. 4. Regulatory Affairs brought by learning plus,inc. available at http.//www.cgmp.com/ra.htm.	

BP703T	PHARMACY PRACTICE (Theory)	45 Hours

Scope:

In the changing scenario of pharmacy practice in India,for successful practice of Hospital Pharmacy, the students are required to learn various skills like drug distribution, drug information, and therapeutic drug monitoring for improved patient care. In community pharmacy,students will be learning various skills such and dispensing of drugs, responding to minor ailments by providing suitable safe medication, patient counseling for improved patient care in the community setup.

Objectives:

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

1. Know various drug distribution methods in a hospital
2. Appreciate the pharmacy stores management and inventory control
3. Monitor drug therapy of patient through medication chart review and clinical review.
4. Obtain medication history interview and counsel the patients
5. Identify drug related problems
6. Detect and assess adverse drug reactions
7. Interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states
8. Know pharmaceutical care services
9. Do patient counseling in community pharmacy;
10. Appreciate the concept of rational drug therapy.

Course Content:

UNIT-I **Hospital and it's organization** Definition, Classification of hospital- Primary, Secondary and Tertiary hospitals, Classification based on clinical and non- clinical basis, Organization Structure of a Hospital, and Medical staffs involved in the hospital and their functions. **Hospital pharmacy and its organization** Definition, functions of hospital pharmacy, Organization structure, Location, Layout and staff requirements, and Responsibilities and functions of hospital pharmacists. **Adverse drug reaction** Classifications - Excessive pharmacological effects, secondary pharmacological effects, idiosyncrasy, allergic drug reactions, genetically determined toxicity, toxicity following sudden withdrawal of drugs, Drug interaction- beneficial interactions, adverse interactions, and pharmacokinetic drug interactions, Methods for detecting drug interactions ,spontaneous case reports and record linkage	**10 Hours**

studies,and Adverse drug reaction reporting and management.	
Community Pharmacy Organization and structure of retail and wholesale drug store, types and design, Legal requirementsforestablishmentandmaintenanceofadrugstore,Dispensingofproprietary products, maintenance of records of retail and wholesale drugstore.	
UNIT-II **Drug distribution system in a hospital** Dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labelling, dispensing of drugs to ambulatory patients ,and Dispensing of controlled drugs. **Hospital formulary** Definition,contents of hospital formulary ,Differentiation of hospital formulary and Drug list, preparation and revision, and addition and deletion of drug from hospital formulary. **Therapeutic drug monitoring** Need for Therapeutic Drug Monitoring, Factors to be considered during the Therapeutic Drug Monitoring, and Indian scenario for Therapeutic Drug Monitoring. **Medication adherence** Causes of medication non-adherence, pharmacist role in the medication adherence, and monitoring of patient medication adherence. **Patient medication history interview** Need for the patient medication history interview, medication interview forms. **Community pharmacy management** Financial, materials, staff, and infrastructure requirements.	**10 Hours**
UNIT-III **Pharmacy and therapeutic committee** Organization, functions, Policies of the pharmacy and therapeutic committee in including drugs into formulary, inpatient and outpatient prescription, automatic stop order, and emergency drug list preparation. **Drug information services** Drug and Poison information centre, Sources ofdrug information, Computerized services, and storage and retrieval of information. **Patient counseling** Definition of patient counseling; steps involved in patient counseling, and Special cases that require the pharmacist **Education and training program in the hospital** Role of pharmacist in the education and training program, Internal and external training program, Services to the nursing homes/clinics, Code of ethics for community pharmacy, and Role of pharmacist in the interdepartmental communication and community health education. **Prescribed medication order and communication skills** Prescribed medication order- interpretation and legal requirements, and Communication skills- communication with prescribers and patients.	**10 Hours**

UNIT-IV **Budget preparation and implementation Budget preparation and implementation Clinical Pharmacy** Introduction to Clinical Pharmacy, Concept of clinical pharmacy, functions and responsibilities of clinical pharmacist ,Drug therapy monitoring-medication chart review, clinical review, pharmacist intervention, Ward round participation, Medication history and Pharmaceutical care. Dosing pattern and drug therapy based on Pharmacokinetic & disease pattern. **Over the counter (OTC) sales** Introduction and sale of over the counter, and Rational use of common over the counter medications.	**08 Hours**
UNIT-V **Drug store management and inventory control** Organization of drug store, types of materials stocked and storage conditions, Purchase and inventory control: principles, purchase procedure, purchase order, procurement and stocking, Economic order quantity, Reorder quantity level, and Methods used for the analysis of the drug expenditure. **Investigational use of drugs** Description,principals involved, classification, control, identification, role of hospital pharmacist, advisory committee. **Interpretation of Clinical Laboratory Tests** Blood chemistry, hematology, and urinalysis	**07 Hours**
Recommended Books (Latest Edition): 1. Merchant S.H. and Dr. J. S. Quadry. A textbook of hospital pharmacy, 4th ed. Ahmadabad: B.S. Shah Prakakshan;2001. 2. Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. A textbook of Clinical Pharmacy Practice- essential concepts and skills, 1st ed. Chennai: Orient Longman Private Limited;2004. 3. William E. Hassan. Hospital pharmacy, 5th ed. Philadelphia: Lea &Febiger;1986. 4. Tipnis Bajaj. Hospital Pharmacy, 1st ed. Maharashtra: Career Publications;2008. 5. Scott LT. Basic skills in interpreting laboratory data, 4thed. American Society of Health System Pharmacists Inc;2009. 6. Parmar N.S. Health Education and Community Pharmacy, 18th ed. India:	

CBS Publishers & Distributers;2008.

Journals:

1. Therapeutic drug monitoring. ISSN:0163-4356
2. Journal of pharmacy practice. ISSN:0974-8326
3. American journal of health system pharmacy. ISSN: 1535-2900(online)
4. Pharmacy times (Monthly magazine)

BP704T	NOVEL DRUG DELIVERY SYSTEM (Theory)	45 Hours

Scope:

This subject is designed to impart basic knowledge on the area of novel drug delivery systems.

Objectives:

Upon completion of the course student shall be able

1. To understand various approaches for development of novel drug delivery systems.
2. To understand the criteria for selection of drugs and polymers for the development of novel drug delivery systems, their formulation and evaluation.

Course Content:

UNIT-I **Controlled drug delivery systems**: Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design controlled release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations **Polymers:** Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug delivery systems.	**10 Hours**
UNIT-II **Microencapsulation:** Definition, advantages and disadvantages, microspheres /microcapsules, microparticles, methods of microencapsulation, applications **Mucosal Drug Delivery system:** Introduction, Principles of bioadhesion / mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems **Implantable Drug Delivery Systems:** Introduction, advantages and disadvantages, concept of implants and osmotic pump.	**10 Hours**

UNIT-III **Transdermal Drug Delivery Systems:** Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches. **Gastroretentive drug delivery systems:** Introduction, advantages, disadvantages, approaches for GRDDS – Floating, high density systems, inflatable and gastro adhesive systems and their applications **Nasopulmonary drug delivery system:** Introduction to Nasal and Pulmonary routes of drug delivery ,Formulation of Inhalers(dry powder and metered dose), nasal sprays,nebulizers.	**10 Hours**
UNIT-IV **Targeted drug Delivery:** Concepts and approaches advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications.	**08 Hours**
UNIT-V **Ocular Drug Delivery Systems:** Introduction, intra ocular barriers and methods to overcome –Preliminary study, ocular formulations and ocuserts **Intrauterine Drug Delivery Systems:** Introduction, advantages and disadvantages, development of intra uterine devices (IUDs) and applications	**07 Hours**
Recommended Books: (Latest Editions) 1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992. 2. Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker,Inc., New York,1992. 3. Encyclopedia of Controlled Delivery. Edith Mathiowitz, Published by Wiley Interscience Publication, John Wiley and Sons, Inc, New York.Chichester/Weinheim 4. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers &Distributors, New Delhi, First edition 1997 (reprint in 2001). 5. S.P. Vyas and R.K. Khar, Controlled Drug Delivery -concepts and advances,VallabhPrakashan, New Delhi, First edition2002.	

Journals

1. Indian Journal of Pharmaceutical Sciences(IPA)
2. Indian Drugs(IDMA)
3. Journal of Controlled Release (Elsevier Sciences)
4. Drug Development and Industrial Pharmacy (Marcel &Decker)

International Journal of Pharmaceutics (Elsevier Sciences)

BP705P	INSTRUMENTAL METHODS OF ANALYSIS (Practical)	04 Hours/ Week

1. Weights and measures and pharmacopoeia inanalysis
2. Determination of absorption maxima and effect of solvent on absorption maxima of organiccompounds
3. Assay of Drug product as per IP (Assay of Paracetamol tablet by UV-Spectrophotometry)
4. Assay of Drug product by Calibration curvemethod
5. Assay of any drug/drug product bycolorimetry.
6. Simultaneous estimation of multicomponent formulation by UV spectroscopy(SE/Q analysis)
7. Estimation of drug by fluorimetry
8. Study of quenching of fluorescence
9. Determination of sodium and potassium by flame photometry
10. Separation of amino acids by paper chromatography
11. Separation of sugars by thin layer chromatography
12. Separation of plant pigments by columnchromatography
13. Demonstration of HPLC instrument
14. Demonstration of FTIRinstrument
15. Interpretation of spectra of organic compounds by IR spectroscopy asper pharmacopoeia

Recommended Books (Latest Editions)

1. Instrumental Methods of Chemical Analysis by B.KSharma
2. Organic spectroscopy by Y.RSharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I.Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B.Stenlake
6. Organic Chemistry by I. L.Finar
7. Organic spectroscopy by WilliamKemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. HPLC by P.D.Sethi
11. HPTLC by P.D. Sethi
12. Spectrophotometric identification of Organic Compounds bySilverstein

BP706PS	**PRACTICE SCHOOL***	**150 Hours**

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.

SEMESTER – VIII

BP801T	BIOSTATISTICS AND RESEARCH METHODOLOGY (Theory)	45 Hours

Scope:

To understand the applications of Biostatics in Pharmacy. This subject deals with descriptive statistics, Graphics, Correlation, Regression, logistic regression Probability theory, Sampling technique, Parametric tests, Non Parametric tests, ANOVA, Introduction to Design of Experiments, Phases of Clinical trials and Observational and Experimental studies, SPSS, R and MINITAB statistical software's, analyzing the statistical data using Excel**.**

Objectives:

Upon completion of the course the student shall be able to

1. Know the operation of M.S. Excel, SPSS, R and MINITAB®, DoE (Design of Experiment)
2. Know the various statistical techniques to solve statistical problems
3. Appreciate statistical techniques in solving the problems**.**

Course content:

UNIT-I **Introduction:** Statistics, Biostatistics, Frequency distribution **Measures of central tendency**: Mean, Median, Mode- Pharmaceutical examples **Measures of dispersion**: Dispersion, Range, standard deviation, Pharmaceutical problems **Correlation**: Definition,KarlPearson'scoefficientofcorrelation,Multiplecorrelation-Pharmaceuticals examples	**10 Hours**
UNIT-II **Regression:** Curve fitting by the method of least squares, fitting the lines y= a + bx and x = a + by, Multiple regression, standard error of regression– Pharmaceutical Examples **Probability:** Definition of probability, Binomial distribution, Normal distribution, Poisson's distribution,properties–problems,Sample,Population,largesample,smallsample,Null hypothesis,alternativehypothesis,sampling,essenceofsampling,typesofsampling, Error-I type, Error-II type, Standard error of mean (SEM) - Pharmaceutical examples **Parametric test**: t-test(Sample, Pooled or Unpaired and Paired),ANOVA,(Oneway and Two way),Least Significance difference	**10 Hours**

UNIT-III **Non Parametric tests:** Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallis test, Friedman Test **Introduction to Research:** Need for research, Need for design of Experiments, Experiential Design Technique, plagiarism **Graphs:** Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph **Designing the methodology:** Sample size determination and Power of a study, Report writing and presentation ofdata, Protocol,Cohortsstudies, Observational studies,Experimental studies,Designingclinical trial, various phases.	**10 Hours**
UNIT-IV Blocking and confounding system for Two-level factorials **Regression modeling:** Hypothesis testing in Simple and Multiple regression nmodels **Introduction to Practical components of Industrial and Clinical Trials Problems**: Statistical Analysis Using Excel, SPSS, MINITAB®, DESIGN OF EXPERIMENTS, R - Online Statistical Software's to Industrial and Clinical trial approach	**08 Hours**
UNIT-V **Design and Analysis of experiments:** **Factorial Design:** Definition, 2^2, 2^3 design. Advantage of factorial design **Response Surface methodology**: Central composite design, Historical design, Optimization Techniques	**07 Hours**
Recommended Books (Latest edition): 1. Pharmaceutical statistics- Practical and clinical applications, Sanford Bolton, publisher Marcel Dekker Inc. NewYork. 2. Fundamental of Statistics – Himalaya Publishing House-S.C.Guptha 3. Design and Analysis of Experiments –PHI Learning Private Limited, R. Pannerselvam, 4. Design and Analysis of Experiments – Wiley Students Edition, Douglas andC.Montgomery	

BP802T	SOCIAL AND PREVENTIVE PHARMACY (Theory)	45 Hours

Scope:

The purpose of this course is to introduce to students a number of health issues and their challenges. This course also introduced a number of national health programmes. The roles of the pharmacist in these contexts are also discussed.

Objectives:

After the successful completion of this course, the student shall be able to:

1. Acquire high consciousness/realization of current issues related to health and pharmaceutical problems within the country andworldwide.
2. Develop a critical way of thinking based on current health care development.
3. Evaluate alternative ways of solving problems related to health and pharmaceutical issues.

Course Content:

UNIT-I **Concept of health and disease:** Definition, concepts and evaluation of public health. Understanding the concept of prevention and control of disease, social causes of diseases and social problems of the sick. **Sociology and health** Socio cultural factors related to health and disease, Impact of urbanization on health and disease, Poverty and health **Hygiene and health** Personal hygiene and health care; avoidable habits.	**10 Hours**
UNIT-II **Preventive medicine** General principles of prevention and control of diseases such as cholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse	**10 Hours**
UNIT-III **National health programs, its objectives, functioning and outcome of the following:** HIV AND AIDS control programme, TB, Integrated disease surveillance program (IDSP), National leprosy control programme, National mental health program, National programme for prevention and control of deafness, Universal immunization programme,National programme for control of blindness, Pulse polio programme.	**10 Hours**
UNIT-IV National health intervention programme for mother and child, National family welfare programme, National tobacco control programme, National Malaria PreventionProgram, National programme for the health care for the elderly, Social health programme; role of WHO in Indian national program	**08 Hours**

UNIT-V Community services in rural, urban and school health: Functions of PHC, Improvement in rural sanitation, national urban health mission, Health promotion and education in school.	**07 Hours**
Recommended Books (Latest edition): 1. ShortTextbookofPreventiveandSocialMedicine,PrabhakaraGN,2nd Edition,2010, ISBN: 9789380704104, JAYPEE Publications 2. Textbook of Preventive and Social Medicine (Mahajan and Gupta), Edited by Roy RabindraNath, Saha Indranil, 4th Edition, 2013, ISBN: 9789350901878, JAYPEE Publications 3. Review of Preventive and Social Medicine (Including Biostatistics), Jain Vivek, 6thEdition, 2014, ISBN: 9789351522331, JAYPEEPublications 4. Essentials of Community Medicine: A Practical Approach, Hiremath Lalita D, HiremathDhananjaya A, 2nd Edition, 2012, ISBN: 9789350250440, JAYPEE Publications 5. Park Textbook of Preventive and Social Medicine, K Park, 21st Edition, 2011, ISBN- 14: 9788190128285, BANARSIDAS BHANOTPUBLISHERS. 6. Community Pharmacy Practice, Ramesh Adepu, BSP publishers,Hyderabad **Recommended Journals:** 1. Research in Social and Administrative Pharmacy, Elsevier, Ireland	

BP803ET	PHARMACEUTICAL MARKETING (Theory)	45 Hours

Scope:

The pharmaceutical industry not only needs highly qualified researchers, chemists and, technical people, but also requires skilled managers who can take the industry forward by managing and taking the complex decisions which are imperative for the growth of the industry. The Knowledge and Know-how of marketing management groom the people for taking a challenging role in Sales and Product management.

Objective:

The course aims to provide an understanding of marketing concepts and techniques and their applications in the pharmaceutical industry.

Course Content:

UNIT-I **Marketing:** Definition, general concepts and scope of marketing; Distinction between marketing & selling; Marketing environment; Industry and competitive analysis; Analyzing consumer buying behavior; industrial buying behavior. **Pharmaceutical market:** Quantitative and qualitative aspects; size and composition of the market; demographic descriptions and socio-psychological characteristics of the consumer; market segmentation & targeting. Consumer profile; Motivation and prescribing habits of the physician; patients 'choice of physician and retail pharmacist. Analyzing the Market; Role of market research.	**10 Hours**
UNIT-II **Product decision:** Classification, product line and product mix decisions, product life cycle, product portfolio analysis; product positioning; New product decisions; Product branding, packaging and labelling decisions, Product management in pharmaceutical industry.	**10 Hours**
UNIT-III **Promotion:** Methods, determinants of promotional mix, promotional budget; An overview of personal selling, advertising, direct mail, journals, sampling, retailing, medical exhibition, public relations, online promotional techniques for OTC Products.	**10 Hours**

UNIT-IV **Pharmaceutical marketing channels:** Designing channel, channel members, selecting the appropriate channel, conflict in channels, physical distribution management: Strategic importance, tasks inphysical distributionmanagement. **Professional sales representative (PSR):** Duties of PSR, purpose of detailing, selection and training, supervising, norms for customer calls, motivating, evaluating, compensation and future prospects of the PSR.	**08 Hours**
UNIT-V **Pricing:** Meaning, importance, objectives, determinants of price; pricing methods and strategies, issues in price management in pharmaceutical industry. An overview of DPCO (Drug Price Control Order) and NPPA (National Pharmaceutical Pricing Authority). **Emerging concepts in marketing:** Vertical & Horizontal Marketing; Rural Marketing; Consumerism; Industrial Marketing; Global Marketing.	**07 Hours**
Recommended Books: (Latest Editions) 1. Philip Kotler and Kevin Lane Keller: Marketing Management, Prentice Hall ofIndia, NewDelhi 2. Walker, Boyd and Larreche : Marketing Strategy- Planning and Implementation, Tata MC GrawHill, New Delhi. 3. Dhruv Grewal and Michael Levy: Marketing, Tata MC GrawHill 4. Arun Kumar and N Menakshi: Marketing Management, Vikas Publishing,India 5. RajanSaxena: Marketing Management; Tata MC Graw-Hill (IndiaEdition) 6. Ramaswamy,U.S&Nanakamari,S:MarketingManagemnt:GlobalPerspective,Indian Context, Macmilan India, NewDelhi. 7. Shanker, Ravi: Service Marketing, Excell Books, NewDelhi 8. Subba Rao Changanti, Pharmaceutical Marketing in India (GIFT – Excel series)Excel Publications.	

BP804ET	PHARMACEUTICAL REGULATORY SCIENCE (Theory)	45 Hours

Scope:

This course is designed to impart the fundamental knowledge on the regulatory requirements for approval of new drugs, and drug products in regulated markets of India & other countries like US, EU, Japan, Australia, UK etc. It prepares the students to learn in detail on the regulatory requirements, documentation requirements, and registration procedures for marketing the drug products.

Objectives:

Upon completion of the subject student shall be able to;

1. Know about the process of drug discovery and development
2. Know the regulatory authorities and agencies governing the manufacture andsale of pharmaceuticals
3. Know the regulatory approval process and their registration in Indian andinternational markets.

Course content:

UNIT-I **New Drug Discovery and development** Stages of drug discovery, Drug development process, pre-clinical studies, non-clinical activities, clinical studies, Innovator and generics, Concept of generics, Generic drug product development.	**10 Hours**
UNIT-II **Regulatory Approval Process** Approval processes and timelines involved in Investigational New Drug (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA). Changes to an approved NDA / ANDA. **Regulatory authorities and agencies** Overview of regulatory authorities of India, United States, European Union, Australia, Japan, Canada (Organization structure and types of applications)	**10 Hours**
UNIT-III **Registration of Indian drug product in overseas market** Procedure for export of pharmaceutical products, Technical documentation, Drug Master Files (DMF), Common Technical Document (CTD), electronic Common Technical Document (eCTD), ASEAN Common Technical Document (ACTD) research.	**10 Hours**

UNIT-IV **Clinical trials** Developing clinical trial protocols, Institutional Review Board / Independent Ethics committee - formation and working procedures, Informed consent process and procedures, GCP obligations of Investigators, sponsors & Monitors, Managing and Monitoring clinical trials, Pharmacovigilance -safety monitoring in clinical trials	**08 Hours**
UNIT-V **Regulatory Concepts** Basic terminology, guidance, guidelines, regulations, Laws and Acts, Orange book, Federal Register, Code of Federal Regulatory, Purple book	**07 Hours**
Recommended books (Latest edition): • Drug Regulatory Affairs by SachinItkar, Dr. N.S. Vyawahare, NiraliPrakashan. • The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P. Martin, Drugs and the Pharmaceutical Sciences, Vol.185. InformaHealth carepublishers. • New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino,MD,5th edition, Drugsand the Pharmaceutical Sciences, Vol.190. • Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley &Sons. Inc. • FDA Regulatory Affairs: a guide for prescription drugs, medical devices, andbiologics • /edited by Douglas J. Pisano, David Mantus. • Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargeland IsaderKaufer, Marcel Dekker series,Vol.143 • Clinical Trials and Human Research: A Practical Guide to RegulatoryCompliance By Fay A. Rozovsky and Rodney K.Adams • Principles and Practices of Clinical Research, Second Edition Edited by JohnI. Gallin and Frederick P.Ognibene • Drugs: From Discovery to Approval, Second Edition By RickNg	

BP805ET	PHARMACOVIGILANCE (Theory)	45 Hours

Scope:

This paper will provide an opportunity for the student to learn about development of pharmacovigilance as a science, basic terminologies used in pharmacovigilance, global scenario of Pharmacovigilance, train students on establishing pharmacovigilance programme in an organization, various methods that can be used to generate safety data andsignaldetection.Thispaperalsodevelopstheskillsofclassifyingdrugs,diseasesand adverse drugreactions

Objectives:

- At completion of this paper it is expected that students will be able to (know, do, and appreciate):
- Understand importance of drug safetymonitoring.
- Explain History, development, National and international scenario of pharmacovigilance & comprehend dictionaries, coding and terminologies used in pharmacovigilance
- Understand detection and assessment of new adverse drug reactions, Adverse drug reaction reporting systems and communication in pharmacovigilance, Pharmacovigilance Program of India (PvPI) requirement for ADR reporting in India ICH guidelines for ICSR, PSUR, expedited reporting, pharmacovigilance planning. CIOMS requirements for ADRreporting
- Comprehend methods of safety data during pre-clinical, clinical andpost approval phases of drugs' lifecycle.
- Write case narratives of adverse events and their quality.

Course Content:

UNIT-I **Introduction to Pharmacovigilance** History and development of Pharmacovigilance, Importance of safety monitoring of Medicine, WHO international drug monitoring programme, Pharmacovigilance Program of India (PvPI) **Introduction to adverse drug reactions** Definitions and classification of ADRs, Detection and reporting, Methods in Causality assessment, Severity and seriousness assessment, Predictability and preventability assessment, Management of adverse drug reactions **Basic terminologies used in pharmacovigilance** Terminologies of adverse medication related events, Regulatory terminologies	**10 Hours**

UNIT-II **Drug and disease classification** Anatomical, therapeutic and chemical classification of drugs, International classification of diseases, Daily defined doses, International Nonproprietary Names for drugs **Drug dictionaries and coding in pharmacovigilance** WHO adverse reaction terminologies, MedDRA and Standardized MedDRA queries, WHO drug dictionary, Eudravigilance medicinal product dictionary **Information resources in pharmacovigilance** Basic drug information resources, Specialized resources for ADRs **Establishing pharmacovigilance programme** Establishing in a hospital, Establishment & operation of drug safety department in industry, Contract Research Organizations (CROs), Establishing a national programme.	**10 Hours**
UNIT-III **Vaccine safety surveillance** Vaccine Pharmacovigilance, Vaccination failure, Adverse events following immunization **Pharmacovigilance methods** Passive surveillance – Spontaneous reports and case series, Stimulated reporting, Active surveillance – Sentinel sites, drug event monitoring and registries, Comparative observational studies – Cross sectional study, case control study and cohort study, Targeted clinical investigations **Communication in pharmacovigilance** Effective communication in Pharmacovigilance**,** Communication in Drug Safety Crisis management**,** Communicating with Regulatory Agencies, Business Partners, Healthcare facilities & Media	**10 Hours**
UNIT-IV **Safety data generation** Pre-clinical phase, Clinical phase, Post approval phase (PMS) **ICH Guidelines for Pharmacovigilance** Organization and objectives of ICH, Expedited reporting, Individual case safety reports, Periodic safety update reports, Post approval expedited reporting, Pharmacovigilance planning, Good clinical practice in pharmacovigilance studies	**08 Hours**

UNIT-V **Pharmacogenomics of adverse drug reaction** Genetics related ADR with example focusing PK parameters. **CIOMS** CIOMSWorking Groups, CIOMS Form **CDSCO (India) and Pharmaco - vigilance** D&C Act and Schedule Y Differences in Indian and global pharmacovigilance requirements	**07 Hours**

Recommended Books (Latest edition):

1. Textbook of Pharmacovigilance: S K Gupta, Jaypee Brothers, MedicalPublishers.
2. Practical Drug Safety from A to Z By Barton Cobert, Pierre Biron, Jones and Bartlett Publishers.
3. Mann's Pharmacovigilance: Elizabeth B. Andrews, Nicholas, WileyPublishers.
4. Stephens' Detection of New Adverse Drug Reactions: John Talbot, PatrickWalle, WileyPublishers.
5. An Introduction to Pharmacovigilance: Patrick Waller,Wiley Publishers.
6. Cobert's Manual of Drug Safety and Pharmacovigilance: Barton Cobert,Jones& BartlettPublishers.
7. Textbook of Pharmacoepidemiolog edited by Brian L. Strom, Stephen E Kimmel, Sean Hennessy, WileyPublishers.
8. A Textbook of Clinical Pharmacy Practice -Essential Concepts and Skills:G. Parthasarathi, Karin NyfortHansen, Milap C.Nahata
9. National Formulary ofIndia
10. Text Book of Medicine by YashpalMunjal
11. Text book of Pharmacovigilance: concept and practice by GP Mohanta and PK Manna
12. http://www.whoumc.org/DynPage.aspx?id=105825&mn1=7347&mn2=7259&mn3=7297
13. http://www.ich.org/
14. http://www.cioms.ch/
15. http://cdsco.nic.in/
16. http://www.who.int/vaccine_safety/en/
17. http://www.ipc.gov.in/PvPI/pv_home.html

BP806ET	QUALITY CONTROL AND STANDARDIZATION OF HERBALS(Theory)	45 Hours

Scope:

In this subject the student learns about the various methods and guidelines for evaluation and standardization of herbs and herbal drugs. The subject also provides an opportunity for the student to learn cGMP, GAP and GLP in traditional system of medicines.

Objectives:

Upon completion of the subject student shall be able to;

1. Know WHO guidelines for quality control of herbal drugs
2. Know Quality assurance in herbal drug industry
3. Know the regulatory approval process and their registration in Indian and international markets
4. Appreciate EU and ICH guidelines for quality control of herbal drugs

Course Content

UNIT-I Basic tests for drugs – Pharmaceutical substances, Medicinal plants materialsand dosage forms, WHO guidelines for quality control of herbal drugs, Evaluation of commercial crude drugs intended foruse	**10 Hours**
UNIT-II • **Quality assurance in herbal drug industry** of cGMP, GAP, GMP and GLP in traditional system of medicine • WHO guidelines on current Good Manufacturing Practices (cGMP) for Herbal Medicines, WHO guidelines on GACP for Medicinal Plants.	**10 Hours**
UNIT-III • EU and ICH guidelines for quality control of herbal drugs. • Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines	**10 Hours**
UNIT-IV • Stability testing of herbal medicines. Application of various chromatographic techniques in standardization of herbal products. • Preparation of documents for new drug application and export registration • GMP requirements and Drugs & Cosmetics Act provisions.	**08 Hours**

UNIT-V Regulatory requirements for herbal medicines. WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems. Comparison of various Herbal Pharmacopoeias. **Recommended Books (Latest Editions)** • Role Pharmacognosy by Trease and Evans • Pharmacognosy by Kokate, Purohit andGokhale • Rangari, V.D., Text book of Pharmacognosy and Phytochemistry Vol. I,Carrier Pub., 2006. • Aggrawal, S.S., Herbal Drug Technology. Universities Press,2002. • EMEA. Guidelines on Quality of Herbal Medicinal Products/Traditional Medicinal Products, • Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India,2002. • Shinde M.V., Dhalwal K., Potdar K., Mahadik K. Application of quality control principles to herbal drugs. International Journal of Phytomedicine 1(2009); p.4-8. • WHO. Quality Control Methods for Medicinal Plant Materials, World Health Organization, Geneva, 1998. WHO. Guidelines for the Appropriate Use of Herbal Medicines. WHO Regional Publications, Western Pacific Series No 3, WHO Regional office for the Western Pacific, Manila,1998. • WHO. The International Pharmacopeia, Vol. 2: Quality Specifications, 3rdedn. World Health Organization, Geneva,1981. • WHO. Quality Control Methods for Medicinal Plant Materials. World Health Organization, Geneva,1999. • WHO. WHO Global Atlas of Traditional, Complementary and Alternative Medicine. 2 vol. set. Vol. 1 contains text and Vol. 2, maps. World Health Organization, Geneva,2005. • WHO. Guidelines on Good Agricultural and Collection Practices (GACP)for Medicinal Plants. World Health Organization, Geneva, 2004.	**07 Hours**

BP807ET	COMPUTER AIDED DRUG DESIGN (Theory)	45 Hours

Scope:
This subject is designed to provide detailed knowledge of rational drug design process and various techniques used in rational drug design process.

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

1. Understand the design and discovery of leadmolecules
2. Classify the role of drug design tools for drug discoveryprocess
3. Understand and analyse concepts of QSAR anddocking
4. Analyse and apply various strategies to develop new drug likemolecules.
5. Use various molecular modeling software to design new drugmolecule

Course Content

UNIT-I **Introduction to Drug Discovery and Development -** Stages of drug discovery and development, Lead discovery approaches - Rational approaches to lead discovery based on traditional medicine, Random screening, Non-random screening, serendipitous drug discovery, lead discovery based on drug metabolism, lead discovery based on clinical observation. **Introduction to Ligand based and Structure Based DD** **Analog Based Drug Design -** Bioisosterism, Bioisosteric replacement **Case studies -** Ligand based (Design of inhibitors of tubulin polymerization eg. Colchicine), Structure based (Design of HMG-CoA reductase inhibitors. eg. Statins) and Analog based DD (Design of H2 histamine antagonist eg. Cimetidine)	**14 Hours**
UNIT- II **Introduction to Computational tools Molecular Modeling -** Introduction to molecular mechanics and quantum mechanics. Energy Minimization methods and Conformational Analysis, global conformational minima determination. **Molecular docking -** Rigid docking, flexible docking, manual docking, Docking based screening.	**10 Hours**
UNIT- III **Quantitative Structure Activity Relationship (QSAR) and Pharmacophore modeling** **Introduction -** SAR versus QSAR, History and development of QSAR, Types of physicochemicalparameters **2D QSAR -** Experimental and theoretical approaches for the determination of physicochemical parameters such as Partition coefficient, Hammet's substituent constant and Tafts steric constant. Hansch's analysis, Free Wilson analysis **3D-QSAR approaches -** COMFA and COMSIA. **Pharmacophore modeling -** Drug likeness screening, Concept of Pharmacophore mapping and Pharmacophore based screening	**14 Hours**

UNIT- IV **Informatics & Methods in drug design** Introduction to Bioinformatics, chemo informatics **Databases -** Chemical database, Natural compound database, Drug like compound database , Drug bank	**07 Hours**
Recommended Books (Latest Editions) 1. Robert GCK, ed., "Drug Action at the Molecular Level" University PrakPress Baltimore. 2. Martin YC. "Quantitative Drug Design" Dekker,NewYork. 3. Delgado JN, Remers WA eds "Wilson &Gisvolds's Text Book of OrganicMedicinal & Pharmaceutical Chemistry" Lippincott,NewYork. 4. Foye WO "Principles of Medicinal chemistry 'Lea&Febiger. 5. Korolkovas A, BurckhalterJH. "Essentials of Medicinal Chemistry" Wiley Interscience. 6. WolfME,ed"TheBasisofMedicinalChemistry,Burger'sMedicinalChemistry" John Wiley & Sons,NewYork. 7. PatrickGraham,L.,AnIntroductiontoMedicinalChemistry,OxfordUniversityPress. 8. Smith HJ, Williams H, eds, "Introduction to the principles of Drug Design" WrightBoston. 9. Silverman R.B. "The organic Chemistry of Drug Design and Drug Action"Academic Press NewYork. 10. D. J. Triggle, John Bodenhan Taylor, Peter Kennewell, Comprehensive Medicinal Chemistry, Volume I-VIII : Germany: Elsevier Science.	

BP808ET	CELL AND MOLECULAR BIOLOGY (Theory)	45 Hours

Scope:

Cell biology is a branch of biology that studies cells–their physiological properties,their structure, the organelles they contain ,interactions with their environment,their lifecycle, division, death and cell function. This is done both on a microscopic and molecular level. Cell biology research encompasses both the great diversity of single-celled organisms like bacteria and protozoa, as well as the many specialized cells in multi-cellular organisms such as humans, plants, and sponges.

Objectives:

Upon completion of the subject student shall be able to:

1. Summarize cell and molecular biology history, cellular functioning and Composition & describe the chemical foundations of cell biology.
2. Describe cellular membrane structure and function properties and functionsof DNA, CellCycle.
3. Describe basic molecular genetics mechanisms.
4. Understand the cell signaling pathways with their regulations and role indisease process.

Course contents

UNIT-I Cell and Molecular Biology: Definitions theory and basics and Applications. Cell and Molecular Biology: History and Summation. Properties of cells and cell membrane, Prokaryotic versus Eukaryotic, Cellular Reproduction, Chemical Foundations – an Introduction and Reactions (Types)	**10 Hours**
UNIT-II DNA and the Flow of Molecular Information, DNA Functioning, DNA and RNA, Types of RNA, Transcription and Translation	**10 Hours**
UNIT-III Proteins: Defined and Amino Acids, Protein Structure, Regularities in Protein Pathways, Cellular Processes, Positive Control and significance of Protein Synthesis	**10 Hours**
UNIT-IV Science of Genetics, Transgenics and Genomic Analysis, Cell Cycle analysis, Mitosis and Meiosis, Cellular Activities and Checkpoints Clinical phase, Post approval phase (PMS)	**08 Hours**

UNIT-V Cell Signals: Introduction, Receptors for Cell Signals, Signaling Pathways: Overview, Misregulation of Signaling Pathways, Protein-Kinases: Functioning	**07 Hours**
Recommended Books (latest edition): 1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology,Blackwell Scientific publications, OxfordLondon. 2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors,Delhi. 3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn. 4. Malcolm Harris, Balliere Tindall and Cox: PharmaceuticalMicrobiology. Rose: IndustrialMicrobiology. 5. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed.Japan 6. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution. Peppler: MicrobialTechnology. 7. Edward: Fundamentals ofMicrobiology. 8. N.K.Jain: Pharmaceutical Microbiology, VallabhPrakashan,Delhi 9. Bergeys manual of systematic bacteriology, Williams and Wilkins- A WaverlyCompany 10. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principlesand 11. Applications of Recombinant DNA: ASM Press Washington D.C. RA Goldshyet. al., :KubyImmunology.	

BP809ET	COSMETIC SCIENCE (Theory)	45 Hours
Scope: Thiscourseisdesignedtoimpartfundamentalknowledgeofcosmeticandcosmeceutical products &their formulationstudies. **Objectives:** Upon completion of the course, the student shall be able to: 1. Understand the concepts of cosmetics; anatomy of skin v/s hair, general excipients used incosmetics. 2. Explain the concept of cosmeceuticals, history, difference between cosmetics & cosmeceuticals & cosmeceuticals agents 3. Know different Laws and Acts that regulate pharmaceutical industry 4. Understand the approval process and regulatory requirements for drug products **Course contents**		
UNIT-I Classification of cosmetic and cosmeceutical products, Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticals from cosmetics, cosmetics as quasi and OTC drugs **Cosmetic excipients:** Surfactants, rheology modifiers, humectants, emollients, preservatives. Classification and application **Skin:** Basic structure and function of skin. **Hair:** Basic structure of hair. Hair growth cycle. **Oral Cavity:** Common problem associated with teeth and gums**.**		**10 Hours**
UNIT-II **Principles of formulation and building blocks of skin care products:** Face wash, Moisturizing cream, Cold Cream, Vanishing cream and their advantages and disadvantages. Application of these products in formulation of cosmeceuticals. **Antiperspants & deodorants**- Actives & mechanism of action. **Principles of formulation and building blocks of Hair care products:** Conditioning shampoo, Hair conditioner, anti-dandruff shampoo. Hair oils, Chemistry and formulation of Para-phylene diamine based hairdye. Principles of formulation and building blocks of oral care products: Toothpaste for bleeding gums, sensitive teeth. Teeth whitening, Mouthwash.		**10 Hours**

UNIT-III Sun protection, Classification of Sunscreens and SPF. **Role of herbs in cosmetics:** Skin Care: Aloe and turmeric Hair care: Henna and amla. Oral care: Neem and clove **Analytical cosmetics:** BIS specification and analytical methods for shampoo, skin cream and toothpaste**.**	**10 Hours**
UNIT-IV **Principles of Cosmetic Evaluation**: Principles of sebumeter, corneometer. Measurement of TEWL, Skin Color, Hair tensile strength, Hair combing properties, Soaps and syndet bars. Evolution and skin benfits.	**08 Hours**
UNIT-V Oily and dry skin, causes leading to dry skin, skin moisturisation. Basic understanding of the terms Comedogenic, dermatitis. Cosmetic problems associated with Hair and scalp: Dandruff, Hair fall causes Cosmetic problems associated with skin: blemishes, wrinkles, acne, prickly heat and body odor. Antiperspirants and Deodorants- Actives and mechanism of action	**07 Hours**
References 1) Harry's Cosmeticology, Wilkinson, Moore, Seventh Edition, GeorgeGodwin. 2) Cosmetics – Formulations, Manufacturing and Quality Control, P.P. Sharma, 4th Edition, Vandana Publications Pvt. Ltd., Delhi. 3) Text book of cosmelicology by Sanju Nanda &Roop K. Khar, TataPublishers.	

BP810ET	EXPERIMENTAL PHARMACOLOGY (Theory)	45 Hours

Scope:

This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.

Objectives

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

1. Understand the applications of various commonly used laboratory animals.
2. Demonstrate the various screening methods used in preclinical research.
3. Comprehend and demonstrate the importance of biostatistics and research methodology.
4. Design and execute a research hypothesis independently.

Course contents

UNIT-I **Laboratory Animals:** Study of CPCSEA and OECD guidelines for maintenance, breeding and conduct of experiments on laboratory animals, Common lab animals: Description and applications of different species and strains of animals. Popular transgenic and mutant animals. Techniques for collection of blood and common routes of drug administration in laboratory animals, Techniques of blood collection and euthanasia.	**10 Hours**
UNIT-II **Preclinical screening models** a. Introduction: Dose selection, calculation and conversions, preparation of drug solution/suspensions, grouping of animals and importance of sham negative and positivecontrolgroups.Rationaleforselectionofanimalspeciesandsexforthestudy. b. Study of screening animal models for Diuretics, nootropics, anti-Parkinson's, antiasthmatics, Preclinical screening models: for CNS activity- analgesic, antipyretic, anti-inflammatory, general anaesthetics, sedative and hypnotics, antipsychotic, antidepressant, antiepileptic, antiparkinsonism, alzheimer's disease.	**10 Hours**
UNIT-III **Preclinical screening models:** ForANSactivity,sympathomimetics,sympatholytics,parasympathomimetics,parasympatholytics, skeletal muscle relaxants, drugs acting on eye, local anaethetics	**10 Hours**

UNIT-IV Preclinical screening models: for CVS activity- antihypertensives, diuretics, antiarrhythmic, antidyslepidemic, anti aggregatory, coagulants, and anticoagulants Preclinical screening models for other important drugs like antiulcer, antidiabetic, anticancer and antiasthmatics	**08 Hours**
UNIT-V Research methodology and Bio-statistics. Selection of research topic, review of literature, research hypothesis and study design Pre- clinical data analysis and interpretation using Students‘t’ test and One-way ANOVA. Graphical representation ofdata	**07 Hours**
Recommended Books (latest edition): 1. Fundamentals of experimental Pharmacology-byM. N.Ghosh 2. Hand book of Experimental Pharmacology-S.K. Kulkarni 3. CPCSEA guidelines for laboratory animal facility. 4. Drug discovery and Evaluation by Vogel H.G. 5. Drug Screening Methods by Suresh Kumar Gupta and S. K.Gupta 6. Introduction to biostatistics and research methods by PSS Sundar Rao and J Richard	

BP811ET	ADVANCED INSTRUMENTATION TECHNIQUES (Theory)	45 Hours

Scope:

This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart advanced knowledge on the principles and instrumentation of spectroscopic and chromatographic hyphenated techniques. This also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drugtesting.

Objectives:

Upon completion of the course the student shall be able to

1. Express the principle of the advanced instruments used and justify its applications in drug analysis
2. Understand the principles of analytical techniques and its application in analysis of drugs
3. Explain the importance and methods for the calibration of various analytical instruments
4. Formulate and justify techniques for the analysis of drugs using various analytical instruments.

Course contents

UNIT-I **Nuclear Magnetic Resonance spectroscopy** Principles of ^{1}H-NMR, chemical shift, factors affecting chemical shift, coupling constant, Spin - spin coupling, relaxation, instrumentation and applications **^{13}C-NMR-** Introduction to ^{13}C-NMR spectroscopy **Mass Spectrometry** Principles, , Ionization techniques –Electron impact, chemical ionization, MALDI, FAB, Analyzers-Time of flight and Quadrupole, instrumentation, Fragmentation, applications **Simple structural elucidation problems**	**14 Hours**
UNIT-II **Thermal Methods of Analysis** Principles, instrumentation and applications of Thermogravimetric Analysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC)	**07 Hours**
UNIT-III **Electrophoresis** Introduction, factors affecting electrophoretic mobility, Techniques of paper, gel,capillary electrophoresis, applications **X-Ray Diffraction Methods**	**10 Hours**

Origin of X-rays, basic aspects of crystals, Xray Crystallography, rotating crystal technique, single crystal diffraction,powder diffraction, and applications. **Calibration of following Instruments** Electronic balance, UV-Visible spectrophotometer, IR spectrophotometer, Fluorimeter, HPLC.	
UNIT-IV **Radio immuno assay** Principle, different methods, Importance, various components, Limitation and Applications of Radioimmunoassay **Extraction techniques** General principle and procedure involved in the solid phase extraction and liquid-liquid extraction.	**06 Hours**
UNIT-V **Hyphenated techniques** Introduction to hyphenated techniques and types of techniques Details of LC-MS, GC-MS, HPTLC-MS, MS/MS.	**08 Hours**

Recommended Books (Latest Editions)

1. Instrumental Methods of Chemical Analysis by B.KSharma
2. Organic spectroscopy by Y.RSharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I.Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B.Stenlake
6. Organic spectroscopy by WilliamKemp
7. Quantitative Analysis of Drugs by D. C. Garrett
8. Spectrophotometric identification of Organic Compounds by Silverstein
9. Introduction to Spectroscopy by Donald Pavia
10. Spectroscopy of Organic compounds by P.S.Kalsi
11. Introduction to Spectroscopy by Donald Pavia
12. Spectroscopy of Organic compounds by P.S.Kalsi

BP812ET	**DIETARY SUPPLEMENTS AND NUTRACEUTICALS (Theory)**	**45 Hours**

Scope:

This subject covers foundational topic that are important for understanding the need and requirements of dietary supplements among different groups in the population.

Objective:

This module aims to provide an understanding of the concepts behind the theoretical applications of dietary supplements. By the end of the course, students should be able to:

1. Understand the need of supplements by the different group of people to maintain healthy life.
2. Understand the outcome of deficiencies in dietary supplements.
3. Recognize the components in dietary supplements and the application.
4. Acquaint with the regulatory and commercial aspects of dietary supplements including healthclaims.

Course content:

UNIT-I	
Definitions of Functional foods, Nutraceuticals and Dietary supplements. Classification of Nutraceuticals, Health problems and diseases that can be	**07 Hours**

prevented or cured by Nutraceuticals i.e. weight control, diabetes, cancer, heart disease, stress, osteoarthritis, hypertension etc. Public health nutrition, maternal and child nutrition, nutrition and ageing, nutrition education in community. Source, Name of marker compounds and their chemical nature, Medicinal uses and health benefits of following used as nutraceuticals/functional foods: Spirulina, Soyabean, Ginseng, Garlic, Broccoli, Gingko, Flaxseeds	
UNIT-II **Phytochemicals as nutraceuticals**: Occurrence and characteristic features (chemical nature medicinal benefits) of following **Carotenoids**- α and β-Carotene, Lycopene, Xanthophylls, leutin **Sulfides:** Diallyl sulfides, Allyl trisulfide. **Polyphenolics**: Reservetrol **Flavonoids-** Rutin , Naringin, Quercitin, Anthocyanidins, catechins, Flavones **Prebiotics / Probiotics.:** Fructo oligosaccharides, Lacto bacillum **Phyto estrogens :** Isoflavones, daidzein, Geebustin, lignans **Tocopherols** Proteins, vitamins, minerals, cereal, vegetables and beverages as functional foods: oats,Wheat bran, rice bran, sea foods, coffee, tea and the like.	**15 Hours**
UNIT-III **Introduction to free radicals:** Free radicals, reactive oxygen species,production of free radicals in cells, damaging reactions of free radicals on lipids, proteins, Carbohydrates, nucleic acids. Dietary fibres and complex carbohydrates as functional food ingredients.	**07 Hours**
UNIT-IV **Free radicals** in Diabetes mellitus, Inflammation, Ischemic reperfusion injury, Cancer, Atherosclerosis, Free radicals in brain metabolism and pathology, kidney damage, muscle damage. Free radicals involvement in other disorders. Free radicals theory of ageing. **Antioxidants:** Endogenous antioxidants – enzymatic and nonenzymatic antioxidant defense, Superoxide dismutase, catalase, Glutathione peroxidase, Glutathione Vitamin C, Vitamin E, α- Lipoic acid, melatonin Synthetic antioxidants: Butylated hydroxy Toluene, Butylated hydroxy Anisole. Functional foods for chronic disease prevention.	**10 Hours**

UNIT-V Effect of processing, storage and interactions of various environmental factors on the potential of nutraceuticals. Regulatory Aspects; FSSAI,FDA, FPO,MPO, AGMARK. HACCP and GMPs on Food Safety. Adulteration of foods. Pharmacopoeial Specifications for dietary supplements and nutraceuticals.	**06 Hours**
References: 1. Dietetics by SriLakshmi 2. Role of dietary fibres and neutraceuticals in preventing diseases by K.T Agusti and P.Faizal: BSPublication. 3. Advanced Nutritional Therapies by Cooper. K.A.,(1996). 4. The Food Pharmacy by Jean Carper, Simon & Schuster, UK Ltd.,(1988). 5. Prescription for Nutritional Healing by James F.Balchand Phyllis A.Balch2nd Edn., Avery Publishing Group, NY(1997). 6. G. Gibson and C.williams Editors *2000 Functional foods* Woodhead Publ. Co.London. 7. Goldberg, I. *Functional Foods*. 1994. Chapman and Hall, NewYork. 8. Labuza, T.P. 2000 Functional Foods and Dietary Supplements: Safety, Good Manufacturing Practice (GMPs) and Shelf Life Testing in *Essentials of Functional Foods* M.K. Sachmidl and T.P. Labuza eds. AspenPress. 9. Handbook of Nutraceuticals and Functional Foods, Third Edition (Modern Nutrition) 10. Shils, ME, Olson, JA, Shike, M. 1994 *Modern Nutrition in Health and Disease*. Eighth edition. Lea andFebiger	

BP 813 **PW PROJECT WORK** 150 **Hours**

A] Selection of the Project Topic

All the students shall undertake a project under the supervision of a teacher and submit a report. The project can be based on Lab oriented (small part of original research work) Study / Survey oriented or Computational studies or oriented. / Review topic/ Extension of Practice school work etc., based on Current Trends in Pharmaceutical science. The project shall be carried out in group not exceeding 5 in number. The project report shall be submitted in triplicate (typed & hard bound copy not less than 25 pages).

The internal and external examiner appointed for evaluation of the project shall be approved teachers of SPPU /Industrial Experts appointed by Principal of the respective institute. 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

B] **Evaluation of Dissertation Book:**

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

C] Evaluation of Presentation:

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

Explanation: All the students should be evaluated thoroughly based on their performance in the Laboratory /Literature work and presentation done as individual student under given criteria.

Savitribai Phule Pune University

(Formerly University of Pune)

Circular No. 278 of 2021

Revised Dates of Commencement and Conclusion of Engineering, Architecture and Pharmacy for the Academic Year 2021-2022
For Affiliated Colleges/Recognised Institutes

It is hereby informed that, the revised dates of commencement and conclusion of the Courses, under the faculty of Engineering, Architecture and Pharmacy for the academic year 2021-22 shall be as under :

Name of the Faculty	Name of the Courses	Year	Revised 2021 - 2022			
			First Term		Second Term	
			Commencement	Conclusion	Commencement	Conclusion
Science & Technology	Engineering	TE, BE	02/08/2021	30/11/2021	03/01/2022	26/04/2022
	B.Architecture	III, IV & V	15/06/2021	04/12/2021	03/01/2022	30/04/2022
		II	20/08/20201	10/12/2021	03/01/2022	30/04/2022
	B. Pharmacy	III & IV	17/08/2021	18/12/2021	03/01/2022	10/05/2022
		II	23/08/2021	18/12/2021	03/01/2022	10/05/2022
	M. Pharmacy	II	23/08/2021	18/12/2021	03/01/2022	15/05/2022

NOTE

1. **All Programmes shall be conducted in Online Mode until further notice.**
2. **In view of prevailing COVID-19 situation in the Country, Colleges / Institutes shall required to follow the guidelines / instructions issued by the Government of Maharashtra from time to time.**

Deputy Registrar
(P.G. Admission)

Ganeshkhind, Pune-07
Ref. No. PGS/ 3578
Date: 29/09/2021

Copy to:
The Heads of all University Departments, Savitribai Phule Pune University, Pune.
The Principals of all Affiliated Colleges, Savitribai Phule Pune University, Pune.
The Directors of all Recognized Institutes, Savitribai Phule Pune University, Pune.

Copy to: for information
The Members of the Management Council, Savitribai Phule Pune University, Pune.
The Registrar, Savitribai Phule Pune University, Pune.
The Deans of Faculties, Savitribai Phule Pune University, Pune.

Savitribai Phule Pune University

(Formerly University of Pune)

Circular No. 302 of 2022

Important Notification

Revised Dates of Commencement and Conclusion of terms of U.G. / P.G. Courses for the Academic Year 2022-23 for Affiliated Colleges / Recognised Institutes.

In reference to the earlier circular issued by the University bearing no. 173 dated 10.06.2022 the dates of commencement and conclusion of First Term and Second Term in the academic calendar for the academic year 2022-23, for the following courses are being revised as under.

Sr No	Name of the Courses , Faculties & Year	2022 – 2023			
		First Term		Second Term	
		Commencement	Conclusion	Commencement	Conclusion
1	Science & Technology				
	Science	20/06/2022	30/11/2022	26/12/2022	04/05/2023
	B.Engineering : II	17/08/2022	10/12/2022	02/01/2023	29/04/2023
	B.Engineering : III IV	18/07/2022	30/11/2022	02/01/2023	29/04/2023
	M.Engineering : II	18/07/2022	12/11/2022	09/01/2023	06/05/2023
	B.Architecture : II	08/08/2022	04/12/2022	19/12/2022	04/05/2023
	B.Architecture : III IV V	20/06/2022	08/11/2022	30/12/2022	15/05/2023
	M.Architecture:II	19/09/2022	07/01/2023	23/01/2023	20/05/2023
	B. Pharmacy: II III	01/08/2022	10/12/2022	02/01/2023	10/05/2023
	B. Pharmacy: IV	15/07/2022	03/12/2022	02/01/2023	10/05/2023
	M. Pharmacy : II	01/08/2022	10/12/2022	26/12/2022	30/06/2023
2	Commerce & Management				
	Commerce	20/06/2022	30/11/2022	26/12/2022	04/05/2023
	MBA II (including SIP project of 8	01/09/2022	30/01/2023	15/02/2023	26/05/2023
	MCA II	01/09/2022	16/12/2022	02/01/2023	15/04/2023
	BHMCT II III IV	01/09/2022	16/12/2022	02/01/2023	15/04/2023
3	Humanities				
	Arts	20/06/2022	30/11/2022	26/12/2022	04/05/2023
	Mental Moral and Social Sciences				
	L.L.B. II	31/10/2022	31/01/2023	06/02/2023	15/05/2023
	L.L.B. III	04/07/2022	12/12/2022	08/01/2023	15/05/2023
	B.A. L.L.B. II	31/10/2022	31/01/2023	06/02/2023	15/05/2023
	B.A. L.L.B. III IV V	04/07/2023	12/12/2022	08/01/2023	15/05/2023
4	Inter-disciplinary Studies				
	Education : II	15/09/2022	06/01/2023	17/01/2023	10/05/2023
	Physical Education : II	15/09/2022	06/01/2023	17/01/2023	10/05/2023
	B.Lib & M.Lib	15/07/2022	30/11/2022	02/01/2023	04/05/2023
	Fine Arts & Performing Art	20/06/2022	30/11/2022	26/12/2022	04/05/2023
	Journalism PG	15/07/2022	30/11/2022	02/01/2023	04/05/2023

NOTE :

1. The dates of commencement and conclusion of the University concerned Department / Affiliated Colleges / Recognised Institutes for the Academic year of all those courses whose admission was made under Common Entrance Test (CET) conducted by Government of Maharashtra / Savitribai Phule Pune University will be declared separately.

Ganeshkhind, Pune-07
Ref. No. PGS/4929
Date: 15/10/2022

Deputy Registrar
(P.G.Admission)

Copy to: for Information and necessary action

The Deans of Faculties.
The Registrar, Savitribai Phule Pune University, Pune.
The Director, Examinations & Evaluation, Savitribai Phule Pune University, Pune.
The Heads of all University Departments.
The Principals of all Affiliated Colleges.
The Directors of all Recognized Institutes.
The Heads of all the Administrative Sections of the University Office.
Asstt. Registrar, office of the Hon. Vice-Chancellor, Savitribai Phule Pune University
Asstt. Registrar, office of the Hon. Pro-Vice-Chancellor, Savitribai Phule Pune University

PRAVARA RURAL COLLEGE OF PHARMACY

Activity Calendar – 2021-22 (Odd Semester)

Changes may occur depending upon COVID 19 situation.

Week No.	Month	Week Days							No. of Working Days	Events
		Mon	Tue	Wed	Thu	Fri	Sat	Sun		
1	July-21				1	2	3	4	2	2: Principal, HOD, Dean and IQAC Meeting 15 Admission Meeting(FYUG, FYPG) 16.Principal, HOD, Dean Meeting 19-25 Subject choice circulation. Workload distribution at department level and submission of workload to Academic Dean & Principal 20.-Ashadi Ekadashi 21- Bakri Id Holiday 24.- Alumni Overview meeting with Coordinator, HOD, Principal & TPO 24- Department Level Research meet. 26.- Orientation program by the faculty at department level 28.- Preparation of Class Time Table & Submission to Academic Dean 29-31.- Orientation program for faculty at Institute level 30.-Department Advisory Board Meeting 31. Admission Meeting(FYUG, FYPG)
2		5	6	7	8	9	10	11	6	
3		12	13	14	15	16	17	18	5	
4		19	20	21	22	23	24	25	5	
5		26	27	28	29	30	31		6	
1	Aug 2021							1		Aug 17 & Aug 18: Subject orientation Aug 21: National Webinar Aug 22: Padmashri Jayanti Aug 23: Topic selection for second year PG Aug 24:Expert lecture Aug 29: National Sports Day Aug 30: Student council election Aug 31: Academic Review Meeting
2		2	3	4	5	6	7	8		
3		9	10	11	12	13	14	15	6	
4		16	17	18	19	20	21	22	3	
5		23	24	25	26	27	28	29	6	
6		30	31						2	

7	Sep 2021			1	2	3	4	5	3	September 1st to September 5: Observation of National Nutrition Week September 5, 2021: Teachers Day September 6, 2021: International Day of Charity (Visit to Orphanage) September 7, 2021:Industrial visit (Third & Final Year) September 9, 2021:Industrial visit (First & Second Year) September 10,2021: Ganesh Chaturti September 15,2021:Expert lecture September 1, 2021: Inauguration of students Council. September 8, 2021: International Literacy Day September 11,2021: Expert lecture on account of World suicide prevention day September 11, 2021: Hospital visit (Second Year) September 11, 2021: Industrial Visit(M.Pharm) September 16, 2021: World Ozone day September 20-27: Sessional & Continuous assessment September 25, 2021: World Pharmacist Day September 27, 2021: Academic Review Meeting September 27, 2021: Students feedback (1st to Final Year) & Academic audit (Internal) September 30, 2021: World Heart Day Rally
8		6	7	8	9	10	11	12	5	
9		13	14	15	16	17	18	19	5	
10		20	21	22	23	24	25	26	6	
11		27	28	29	30				4	
12	Oct 2021					1	2	3	1	October 1, 2021: Swacctha Abhiyan October 2, 2021: Mahatma Gandhi Jayanti October 4, 2021:Expert Lecture October 5, 2021:Expert Lecture October 6, 2021:Soft skill training(Personality development workshop) October 10, 2021: World Mental Health day awareness seminar. October 11, 2021: National Girl Childs Day &Kanya RatnaAbhiyan (Inter Collegiate Debate competition) October 12, 2021: PG Specialisation presentation. October 12, 2021: Workshop on Competitive Examination October 16, 2021: Workshop on Research ethics October 18-23,2021: Sessional & Continuous assessment October 25, 2021:Expert Lecture October 26, 2021:Expert Lecture
13		4	5	6	7	8	9	10	6	
14		11	12	13	14	15	16	17	6	
15		18	19	20	21	22	23	24	6	
16		25	26	27	28	29	30	31	6	

17	Nov 2021	1	2	3	4	5	6	7	3	November 7, 2021: National Cancer Awareness Day November 14, 2021: Expert lecture on World diabetes day November 14, 2021: National Epilepsy Day November 26, 2021: Constitution Day of India
18		8	9	10	11	12	13	14	6	
19		15	16	17	18	19	20	21	2	
20		22	23	24	25	26	27	28	0	
21		29	30						0	
Total Working Days									**100**	

Colour Index			
Working days with activity	**Working teaching days**	**University Exam Days**	**Holidays**
23	41		36

LOKNETE DR. BALASAHEB VIKHE PATIL
(PADMABHUSHAN AWARDEE)
PRAVARA RURAL EDUCATION SOCIETY

CALENDER OF EVENTS

ACADEMIC YEAR - 2022-23

PRAVARA RURAL COLLEGE OF PHARMACY, PRAVARANAGAR

A/P- LONI, DISTRICT – AHMEDNAGAR (MH) 413736
Approved by AICTE & PCI (New Delhi)
Affiliated to Savitribai Phule Pune University, Pune
E-mail: - principal.bpharmloni@pravara.in Website: - http://www.prcop.in
Phone No: - 02422(273526) Mob.9423787429

"We started with a handful of students under a thatched shed called Pravara Public School in 1964. But our story dates back to 1950 when the Pravara Cooperative Sugar Factory enabled prosperity for hitherto debt-ridden farmers. Pravara Rural Education Society took things to the next level by utilizing education for nation building, women empowerment, and integrated rural development. Today, our 42 thousand plus students and over 1 lakh alumni continue to
carry forward our values to the world as we create synergy between the global and the local."

Hon'ble Namdar. Shri. Radhakrishna Vikhe Patil

Cabinet Minister Of Revenue, Animal Husbandry
& Dairy Development, Govt. Of Maharashtra
Chairman Loknete Dr.balasaheb Vikhe Patil (padmabhushan Awardee)
Pravara Rural Education Society

VISION

To become a center of excellence in pharmaceutical education, training, research and continuous professional development of pharmacists in rural India.

MISSION

1. Our mission is to introduce excellence in Pharmacy education through quality education, infrastructure and learning resources to meet the needs of students in pursuit of knowledge.
2. To develop, promote and nurture research activities in pharmaceutical sciences
3. To make professionally competent and ethical pharmacists of international standard to cater the needs of rural to global healthcare.

GOALS

1. To educate and train pharmacists to cater for the needs of society.
2. To promote use of indigenous resources for pharmacy industry.
3. To create excellent research center at college to provide many innovative research methods to develop Institute-Industrial linkages.
4. To develop consortium for consultancy service in education, training, health care with reference to pharmacy profession.
5. To increase the global linkages by attracting international scientific forums for Collaborative educational programmes.

GOVERNING BODY

Sr. No.	Name	Designation
1	Hon. Shri. Radhakrishna Eknathrao Vikhe Patil Chairman, Pravara Rural Education Society	Chairman
2	Hon. Shri. Annasaheb Sarangdhar Mhaske Patil Trustee, PRES	Member
3	Hon.Shri Bhaskarrao N.Kharde Patil Director PRES Loni	Member
4	Hon Shri Kailas S.Tambe Patil Director PRES Loni	Member
5	Shri Bharat Ghogare, Joint Secretary, PRES	Member
6	Dr. Sambhaji Nalkar Chief Scientist, KVK Babhaleshwar	Member
7	Ex- officio Member	Nominee, All India Council for Technical Education (AICTE)- Regional officer
8	Nominee of affiliating University	Nominee of affiliating University- Savitribai Phule Pune University
9	Ex-officio Member	Nominee of the State Government- Director of Technical Education (DTE) (Ex-officio) represented by Joint Director DTE office, Nashik
10	Dr.B.M.Patil, Representative of Teacher	Member
11	Dr. Santosh B. Dighe , Representative of Teacher	Member
12	Mr.Chetan Patni	Managing Director at Kaytross ACG Lifesciences Ltd.Nashik
13	Dr.Rahul Kunklol	Director Research PIMS Loni
14	Dr.Suhas S.Siddheshwar, Representative of Teacher	Member
15	Dr. Sanjay B. Bhawar Principal, Pravara Rural College of Pharmacy, Loni	Member Secretary

COLLEGE DEVELOPMENT COMMITTEE

Sr.No.	Name	Designation
1	Hon. Shri Radhakrishna Vikhe Patil Chairman PRES Loni	Chairman
2	Shri Bharat V.Ghogare Patil Joint secretary PRES Loni	Member
3	Dr. Suhas S.Siddheshwar HOD, Pharmaceutics	Member
4	Dr. B.M.Patil Senior professor	Member
5	Dr. Someshwar D.Mankar Training and Placement Officer	Member
6	Mrs.Hemlata S.Bhawar HOD, Pharmaceutical Chemistry	Member
7	Mr. Ramakant A.Vikhe Non - Teaching Staff Representative	Member
8	Hon.Shri Bhaskarrao N.Kharde Patil Educationist, Director PRES Loni	Member
9	Dr.S.N.Hiremath Principal PRES COP(Diploma) Loni	Member
10	Dr.Sambhaji Nalkar Chief Scientist KVK Babeleshawar	Member
11	Mr. Prashant B.Gagare Entrepreneur and Alumnus	Member
12	Dr.Santosh B. Dighe IQAC Co-Ordinator	Member
13	Mr. Pratik Malwade Student Representative	Member
14	Mr. Vipul Karnjekar Student Representative	Member
15	Dr. Sanjay B.Bhawar	Principal & Member secretary

LIST OF COMMITTEES AND MEETINGS

Sr. No	**Name of the committee/Cell**	Convener	**Date of Meeting**
1	Academic/ Program Committee	Dr. S R Vikhe	Every month of 5 th
2	Admission Committee	Mr. D NVikhe	17/3/23, 3/6/23
3	Affiliations Cell (SPPU/PCI/AICTE/DTE)	Dr. A P Patel	8/8/22, 27/12/22
4	Alumni Cell	Mrs.H.S Bhawar	8/8/22, 3/1/23
5	Antiragging Committee/Antiragging squad	Dr. R J Bhor	2/8/22, 8/11/22, 14/2/23, 16/5/23& As case arrives
6	Student Development/ Welfare Committee	Dr. RJ Bhor	17/8/22, 4/10/22 19/12/22, 15/2/23
7	Career Guidance /Training & Placement Cell	Dr. S D Mankar	18/8/22, 10/10/22 5/1/23,10/4/23
8	Sports & Extracurricular activity Committee	Dr. A P Patel	8/8/22, 7/1/23, 13/2/23, 16/5/23
9	Code of Conduct & Discipline Committee	Dr. S R Vikhe	3/10/22, 8/2/23& As case arrives
10	Skill & Entrepreneurship Development Cell	Mr. G S Shinde	2 2/8/22, 12/12/22
11	Student Council	Dr. R J Bhor	8/8/22, 3/10/22, 12/12/22, 13/2/23, 17/4/23
12	Examination Committee	Mr.A S Dighe	12/9/22, 14/11/22
13	Grievance Redressal Cell	Mr.S D Magar	30/8/22, 3/3/23& As case arrives
14	Hostel Committee	Mrs.S AVikhe	13/8/22, 26/11/22, 28/1/23, 25/3/23& As case arrives
15	IAEC	Dr. S B Dighe	5/9/22, 15/2/23
16	Institute-Industry Interaction cell	Dr. S.D. Mankar	13/9/22, 24/1/23, 20/4/23

17	IQAC	Dr. S B Dighe	26/8/2022,28/11/22 27/2/23,31/5/23
18	Library Committee	Dr.R K Godage	2/6/22, 6/9/22, 9/12/22, 6/3/22
19	Purchase &Maintenance Committee	Mr.S D Magar	15/6/22 15/12/22
20	Student Mentoring Committee	Dr.R K Godage	7/10/22, 25/1/23,28/3/23
21	Equal Opportunity Cell (SC/ST/OBC/Minority &Divyangan)	Mrs.H S Bhawar	18/8/22, 15/12/22
22	NSS	Mr.M S Bhosale	22/8/22, 14/10/22, 7/12/22, 17/3/23
23	Publicity Committee	Mr.D N Vikhe	1/7/222, 24/4/23
24	Women Empowerment Cell	Mrs. K V Dhamak	27/8/22, 25/2/23
25	Internal Complaints Committee & Antiharassment Squad	Mrs. K V Dhamak	24/12/22, 22/4/23
26	CDC	Dr.S B Bhawar	15/9/22, 11/1/23
27	GB	Dr.S B Bhawar	6/10/22, 8/2/23
28	Research Committee (Promotion & Evaluation)	Dr.S S Siddheshwar	17/8/22, 15/11/22, 28/1/23, 11/4/23
29	Innovation & Incubation Cell	Dr.S S Siddheshwar	17/8/22, 15/11/22, 13/2/23
30	DIC	Dr. S B Dighe	28/8/22, 23/1/23
31	Parent Teacher Association	Mrs.T S Nirmal	25/9/22, 16/2/23
32	Website Committee	Mr.M H Kolhe	12/8/22, 18/1/23
33	Scholarship Committee (Non-Government)	Mr.G S Shinde	13/9/22, 23/1/23

ACTIVITY CALENDAR 2022-23

August-2022

2-Tuesday	Anti-ragging committee meeting
5-Friday	NSS Cell -Selection of NSS volunteers
8-Monday	Student council meeting
8-Monday	Affiliation cell meeting
8-Monday	Sport and extracurricular activity committee meeting
12-Friday	Web site committee meeting
13-Saturday	Academic Committee meeting
13-Saturday	Hostel committee meeting
15-Monday	NSS Cell -Har Ghar Tiranga , cleaning drive & celebration of Independence day
17-Wednesday	Student welfare committee
17-Wednesday	Innovation & incubation cell meeting
17-Wednesday	Research committee meeting
18-Thursday	TPC Cell - Expert lecture to T.Y.B.and Final Y.B.Pharm student
18-Thursday	Career guidance/Training placement cell meeting
20-Saturday	TPC Cell - Industrial visit of S.Y.B.Pharm at SciTech Sinnar
22-Monday	TPC Cell - Industrial visit of T.Y.B.Pharm at Sahyadri Farms, Nashik
22-Monday	NSS cell meeting
25-Thursday	TPC Cell - Industrial visit of Final .Y.B.Pharm at Premium Serum, Narayangaon
26-Friday	IQAC Meeting
27-Saturday	Women Empowerment cell meeting
27-Saturday	TPC Cell - GPAT / NIPER training Session by Dr. Machhindra Bochare
29-Monday	DIC meeting
29-Monday	National Sport Day celebration
30-Tuesday	Grievance Redressal committee meeting
30-Tuesday	TPC Cell - Training session by IRA Research Consultancy
31-Wednesday To 6- Tuesday	Cultural Dept - Ganapati Festival celebration

September-2022

3-Saturday	TPC Cell - GPAT / NIPER training Session Mr.Pratap Pawar
5-Monday	IAEC meeting
5-Monday	Blood donation camp
6-Tuesday	Library committee meeting
7-Wednesday	TPC Cell -Expert session by Dr. Rahul Kumar Garg
10-Saturday	Academic Committee meeting
10-Saturday	TPC Cell - Expert session by Mr. Vikrant Dhamak
12-Monday	Examination committee meeting
14-Wednesday	TPC Cell - Workshop on Pharmacovigilance by Kite-Ai
19- Monday	TPC Cell - **NSS Awareness Rally "Road Safety Program" with Traffic** Police Department, Loni
19- Monday To 23-Friday	S.Y. T.Y.& Final Y.B.Pharm first Practical continuous assessment examination
24-Saturday	First Progress review presentation of M. Pharm students
24-Saturday	Alumni Cell -Expert lecture by Alumni
26- Monday	TPC Cell - **One Day Workshop for students. Lecture on "NSS and Personality Development". Essay Competition on NSS Day** Celebration.
26- Monday To 30-Friday	S.Y. T.Y.& Final Y.B.Pharm first Theory continuous assesement examination
29-Tuesday	NSS Cell -Body check-up program on occasion of World Heart day.
30-Friday	NSS Cell -Rain Water Harvesting Program in College Campus

October- 2022

1-Saturday	TPC Cell - Soft skill Training by GTT Foundation
2-Sunday	NSS Cell **-Gandhi Jayanti" Communal Harmony Day & International** Day of Non-Violence. Cleaning program in college campus. Quiz and Debate competition
3-Monday	Code of conduct meeting
3-Monday	Student council meeting
4-Tuesday	Student development committee meeting
5-Wednesday	TPC Cell -Expert session by Dr.Parivallal Padbnabhan
7-Friday	Student Mentoring Committee meeting
8-Saturday	Academic Committee meeting
8-Saturday	IQAC Cell -Seminar on molecular Docking
10-Monday	Career guidance/Training placement cell meeting
10-Monday	TPC Cell - GPAT / NIPER training Session by Mr.Harshad Jadhav
14-Friday	NSS cell meeting
14-Friday	TPC Cell - Expert session by Mr. Machindra Patare
15-Saturday	Alumni Cell - Expert lecture by Alumni
20-Thursday	TPC Cell - Expert session by Dr.Rahul Rahane
25-Tuesday	TPC Cell - Expert session by Mr.Shivprasad Khose
27-Thursday	TPC Cell - Training session by CLINI INDIA

November-2022

5-Saturday	TPC Cell - One day workshop by Shodh Advantech
5-Saturday	TPC Cell - Expert session by Dr.R.T.Dolas
7-Monday	NSS Cell -Swaccha Wari -Swasth WariNirmal Wari -HaritWari Program
7-Monday	Sports & Extracurricular activity Committee meeting
7-Monday To 9 - Wednesday	Cultural Dept - Induction Day program (B.Pharm & M.Pharm)
7-Monday	Grievance Redressal committee meeting
8-Tuesday	Antiragging Committee/Antiraggingsquad
10-Thursday	TPC Cell - Workshop on Research Methodology Dr.Abhay Gandhi
12-Saturday	Academic Committee meeting
12-Saturday	**Fresher's party (Genesis)**
14-Monday	Examination committee meeting
15-Tuesday	TPC Cell - Training Session by Rubicon India
15-Tuesday	Research Committee (Promotion & Evaluation) meeting
15-Tuesday	Innovation & Incubation Cell meeting
16-Wednesday	Second Progress review presentation & Journal club of M.Pharm students
18-Friday	IQAC Cell - Workshop on Application of Network Pharmacology
19-Saturday	Alumni Cell -Expert lecture by Alumni
20-Sunday	TPC Cell - GPAT training session by Mr.Vikrant Dhamak
21- Monday To 25- Friday	F.Y.S.Y. T.Y.& Final Y.B.Pharm Second Practical continuous assessment examination
26- Saturday	NSS Cell -Constitution Day (Savidhan Din) Lecture on Importance of Constitution.
28- Monday To 3 - Saturday	F.Y S.Y. T.Y.& Final Y.B.Pharm Second Theory continuous assesementexamination
26- Saturday	Hostel Committee meeting
28- Monday	IQAC meeting
30-Wednesday	NSS Cell **-Cleaning Program at "Dudheshwar temple" Nimgaonjali** under Swacchata Abhiyan Program

December-2022

1-Thursday	NSS Cell -AIDS awareness rally in Loni village on occasion of World AIDS Day Celebration
2-Friday	Odd semester SPPU Semester Theory & Practical Exam
7-Wednesday	NSS meeting
9-Friday	Library Committee meeting
10-Saturday	Academic Committee meeting
10-Saturday	IQAC Cell - Hands on Training on Design expert software
12-Monday	Alumni Cell -Expert lecture by Alumni
12-Monday	Student council meeting
15-Thursday	Purchase committee meeting
12-Monday To 18-Sunday	NSS special camp
24-Saturday	Women Empowerment Cell meeting
24-Saturday	Internal Complaints Committee & Anti -harassment Squad meeting

January -2023

3-Monday	Alumni Cell meeting
3-Monday	Third Progress review presentation & Journal club of M. Pharm students
5-Thursday	Career guidance/Training placement cell meeting
5-Thursday	TPC Cell - Industrial visit final year B.Pharm
6-Friday	Parents meet
7-Saturday	TPC Cell - Industrial visit Third year B. Pharm
10-Tuesday	IQAC Cell -Workshop on scientific publication
10-Tuesday	TPC Cell - Industrial visit Second year B. Pharm
12-Thursday	NSS Cell -Lecture on self-confidence on occasion of national youth day
13-Friday	Academic Committee meeting
15-Sunday	NSS Cell - Swacchata Abhiyan at College
18-Wednesday	Website Committee meeting
18-Wednesday	TPC Cell - Industrial visit First year B.Pharm
23-Monday	Scholarship Committee (Non-Government) meeting
23-Monday	DIC meeting
24-Tuesday	Industry and Institute interaction cell meeting
25-Wednesday	NSS Cell -National voters Day celebration
25-Wednesday	Student Mentoring Committee meeting
26-Thursday	NSS Cell -Republic Day celebration
28-Saturday	Hostel Committee meeting
28-Saturday	TPC Cell -Workshop on Personality Development by Jeevan Sanjivani, Satara
30-Monday	NSS Cell -Visit & awareness program at Lohare orphan school on occasion of world leprosy Day
31-Tuesday	Alumni Cell -Expert lecture by Alumni

February -2023

1-Wednesday	Field visit of Third year B.Pharm
2-Thursday	NSS Cell -Self-defense training program
4-Saturday	NSS Cell - Cancer Awareness & Medicine Counseling Rally on occasion World Cancer Day.
8-Wednesday	Code of Conduct & Discipline Committee meeting
10-Friday	TPC Cell - Workshop on Good Clinical Practices
11-Saturday	Academic Committee meeting
11-Saturday	Alumni Cell -Expert lecture by Alumni
12-Sunday	Alumni Meet
13-Monday	Student council meeting
13-Monday	Affiliation cell meeting
13-Monday	Research Committee (Promotion & Evaluation) meeting
13- Monday	Innovation & Incubation Cell meeting
14-Tuesday To 19- Sunday	NSS Cell - **Youth week' celebration with following activity I. Poster** Competition II. Just a Minute, III. Debate Competition, IV. Rangoli competition V. Guest Lecture.
15-Wednesday	TPC Cell - Expert session on Entrepreneurship Development
15-Wednesday	IAEC meeting
16-Thursday To 24-Friday	Annual sport Day
16-Thursday	Parent Teacher Association meeting
16-Thursday	IQAC Cell -Workshop on HPTLC
25-Saturday	TPC Cell - Workshop on Herbal drug Standardization by Dr. Punit Rachh
25-Saturday	Women Empowerment Cell meeting
25-Saturday	Internal Complaints Committee & Anti -harassment Squad meeting
22 –Wednesday to 24-Friday	**Cultural day's**
25-Saturday	Annual social gathering 2k23
27-Monday To 3 - Friday	First Sessional Practical Examination B & M.Pharm
27-Monday	IQAC meeting

March -2023

3-Friday	Grievance Redressal committee meeting
6—Monday	Library Committee meeting
9- Thursday To 14-Tuesday	First sessional Theory Examination B & M.Pharm
10-Friday	NSS Cell - Guest Lecture and Health Hygiene Program on occasion of **World Women's Day'**
11-Saturday	Academic Committee meeting
17-Friday	NSS meeting
17-Friday	Admission committee meeting
25-Saturday	Hostel Committee meeting
25-Saturday	Alumni Cell -Expert lecture by Alumni
28-Tuesday	Student Mentoring Committee meeting
28-Tuesday	TPC Cell - Industrial Visit of F.Y.M.Pharm

April-2023

5-Wednesday	TPC Cell - Expert lecture by Mr. Ravi Gaware
6-Thursday	Sport Dept. -International sport Day celebration
7-Friday	TPC Cell - Training session by Smart Chem Plus
7-Friday	NSS Cell - Health Check -Up Camp on Occasion of World Health Day
8-Saturday	Academic Committee meeting
10-Monday	TPC Cell - Expert lecture by Dr.Sayyad Sadik
11-Tuesday	Research Committee (Promotion & Evaluation) meeting
17- Monday	Student council meeting
20-Thursday	Industry and Institute interaction cell meeting
22-Saturday	Women Empowerment Cell meeting
22-Saturday	Alumni Cell -Expert lecture by Alumni
22-Saturday	Internal Complaints Committee & Anti -harassment Squad meeting
27-Thursday	Publicity Committee meeting

May -2023

3-Wednesday	Academic Committee meeting
2- Monday To 6 - Saturday	Second Sessional Practical Examination
8- Monday To 12 - Friday	Second sessional Theory Examination B & M. Pharm
13- Saturday	Cultural Dept. - Farewell function
14-Sunday	SPPU Even Semester Examination Theory and Practical
16-Tuesday	Anti-ragging Committee/Anti-ragging squad meeting
17-Wednesday	Parents meet
16-Tuesday	Sports & Extracurricular activity Committee meeting
27-Saturday	Hostel Committee meeting
31-Wednesday	IQAC meeting
31-Wednesday	NSS Cell - Lecture on Tobacco side effect on occasion of Anti -Tobacco Day 2023.

June -2023

1-Thursday To 6 - Tuesday	M. Pharm Thesis submission
2-Friday	Admission committee meeting
6-Tuesday	Student Mentoring Committee meeting

B. PHARM PROGRAM OUTCOMES

1. Pharmacy Knowledge: Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.
2. Planning Abilities: Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.
3. Problem analysis: Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.
4. Modern tool usage: Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.
5. Leadership skills: Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and well-being.
6. Professional Identity: Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).

B. PHARM PROGRAM OUTCOMES

7. Pharmaceutical Ethics: Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.

8. Communication: Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.

9. The Pharmacist and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.

10. Environment and sustainability: Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

11. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

Pravara Rural College of Pharmacy
Weekly workload and Subject Distribution- PG, Odd Semester, 2022-2023

Subject Code	Subject	Name of staff allotted Theory (4hr/ week)	Practical (12hr/ week)		Subject Total hr
			A	B	
F Y M. Pharm QAT					
MPAT101T	Modern Pharmaceutical analytical techniques	GSS	----	----	4
MQA102T	Quality Management System	SDMN	----	----	4
MQA103T	Quality control Quality Assurance	PSG	----	----	4
MQA104T	Product development and technology transfer	SSS	----	----	4
MQA105P	Pharmaceutical Quality Assurance (PR)	PSG/SAV [6+6]	6	6	12
F Y M. Pharm Pharm. Chemistry					
MPC102T	Advanced organic chemistry I	HSB	----	----	4
MPC103T	Advanced Medicinal Chemistry	RJB	----	----	4
MPC104T	Chemistry of Natural Products	RKG	----	----	
MPC105P	Pharmaceutical Chemistry I (PR)	HSB/MHK [6+6]	6	6	12
F Y M. Pharm Pharmacognosy					
MPG102T	Advanced Pharmacognosy I	DNV	----	----	4
MPG103T	Phytochemistry	SRV	----	----	4
MPG104T	Industrial Pharmacognostical Technology	APP	----	----	4
MPG105P	Pharmacognosy Practical I (PR)	DNV/APP [6+6]	6	6	12
Second Year M Pharm III SEM [All Branches]					
MRM 301T	Research Methodology	BMP	----	----	4
	Indian Constitution	SBB	----	----	4

Academic Incharge

PG Coordinator

Principal

PRINCIPAL
Pravara Rural College of Pharmacy
Pravaranagar, A/p. Loni-413736

Pravara Rural College of Pharmacy
Weekly workload and Subject Distribution- PG, Odd Semester, 2022-2023

Subject Code	Subject	Name of staff allotted Theory (4hr/ week)	Practical (12hr/ week)		Subject Total hr
			A	B	
F Y M. Pharm QAT					
MPAT101T	Modern Pharmaceutical analytical techniques	GSS	----	----	4
MQA102T	Quality Management System	SDMN	----	----	4
MQA103T	Quality control Quality Assurance	PSG	----	----	4
MQA104T	Product development and technology transfer	SSS	----	----	4
MQA105P	Pharmaceutical Quality Assurance (PR)	PSG/SAV [6+6]	6	6	12
F Y M. Pharm Pharm. Chemistry					
MPC102T	Advanced organic chemistry I	HSB	----	----	4
MPC103T	Advanced Medicinal Chemistry	RJB	----	----	4
MPC104T	Chemistry of Natural Products	RKG	----	----	
MPC105P	Pharmaceutical Chemistry I (PR)	HSB/MHK [6+6]	6	6	12
F Y M. Pharm Pharmacognosy					
MPG102T	Advanced Pharmacognosy I	DNV	----	----	4
MPG103T	Phytochemistry	SRV	----	----	4
MPG104T	Industrial Pharmacognostical Technology	APP	----	----	4
MPG105P	Pharmacognosy Practical I (PR)	DNV/APP [6+6]	6	6	12
Second Year M Pharm III SEM [All Branches]					
MRM 301T	Research Methodology	BMP	----	----	4
	Indian Constitution	SBB	----	----	4

Academic Incharge
Dr. S. R. Vikhe

PG Coordinator

Principal

PRINCIPAL
Pravara Rural College of Pharmacy
Pravaranagar, A/p. Loni-413736

Pravara Rural College of Pharmacy
Teaching workload – UG + PG
Odd Semester, 2022-23

Sr. No.	Name of faculty	Initial of faculty	UG		PG		Total Workload
			TH	Pract	Th	Pract	
	Department of Pharmacology						
1	Dr. Bhawar Sanjay Balaheb	SBB	-	-	4	-	04
2	Dr. Biradargoudu M. Patil	BMP	-	-	4	-	04
3	Dr. Dighe Santosh Bhausaheb	SBD	4	4	-	-	08
4	Miss. Ghorpade Rajashree Dadasaheb	RDG	4	4	-	-	08
5	Miss Dhuwane Shweta Shantrao	SSD	-	8	-	-	08
6	Miss Gondkar Sharadha Rajendra	SRG	-	8	-	-	08
	Department of Pharmaceutical Chemistry						
7	Dr. Bhor Rohit Jaysingh	RJB	4	-	4	-	08
8	Mrs.Bhawar Hemlata Sanjay	HSB	4	-	4	6	14
9	Mr.Magar Sagar Dattatray	SDMG	4	8	-	-	12
10	Mr.Dighe Amol Sopanrao	ASD	4	4	-	-	08
11	Mr.Bhosale Mayur Shivaji	MSB	4	4	-	-	08
12	Miss. Wani Nilima Mahesh	NMW	2	4	-	-	06
13	Miss Zaware Ankita Omprakash	AOZ	-	8	-	-	08
14	Mr.Bhawar Popat Zumbarlal	PZB	-	8	-	-	08
15	Mr.Kade Siddharth Popat	SPK	-	8	-	-	08
16	Miss Ghule Vanita Pradip	VPG	-	8	-	-	08
	Department of Pharmacognosy						
17	Dr. Vikhe Suryavanshi Rahul	SRV	4	4	4	-	12
18	Dr. Patel Aisha Pirmohammad	APP	-	-	4	6	10
19	Mr.Vikhe Dattatrayrao Navnath	DNV	4	4	4	6	18
20	Miss Raut Puja Gorakshanath	PGR	-	8	-	-	08
21	Miss. Gorde Renuja Annasaheb	RAG	8	2	-	-	10
22	Mr.Dighe Shantaram Umamao	SUD	-	8	-	-	08
23	Miss. Jangam Kanchan Kishor	KKJ	-	4	-	-	04
	Department of Pharmaceutics						
24	Dr. Siddheshwar Subhas Shivaji	SSS	4	4	4	-	12
25	Dr. Mankar Sureshwar Dattatraya	SDMN	4	4	4	-	12
26	Miss. Sanad Tejal Sunil	TSN	4	4	-	-	08

27	Miss. Gawali Payal Sopan	PSG	-	4	4	6	14
28	Miss. Bhalerao Pratibha Sudhakar	PSB	-	4	-		04
29	Mr. Tarpure Rushikesh Raosaheb	RRT	-	4	-		04
	Department of Quality Assurance Techniques						
30	Dr. Gadge Rahul Keshav	RKG	4	-	4	-	08
31	Mr. Kolhe Mahesh Hari	MHK	4	4	-	6	14
32	Mr. Shinde Ganesh Shashikant	GSS	4	4	4	-	12
33	Miss. Dhamak Kavita Vitthalrao	KVD	4	4	-	-	08
34	Mrs. Vikhe Sneha Abhishek	SAV	-	4	-	6	10
	Department of Pharmacy Practice						
35	Dr.Bhane Vaibhav Vitthal	VVB	2	2	-	-	04
36	Dr.Dumre Gaurao Subhash	GSD	2	2	-	-	04

Academic Incharge

PG Coordinator

Principal

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Pravara Rural College of Pharmacy
Pravaranagar, A/p. Loni-[illegible]

PRAVARA RURAL COLLEGE OF PHARMACY • PRAVARANAGAR •

Say what you do!!, Do what you say!!, Prove it!!!, Improve it!!!

PRAVARA RURAL EDUCATION SOCIETY'S
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LONI

Examination Policy

Policy Applies to: All Staff and Students

Governing Authority- Academic Administrative Committee

Responsible Officer- College Examination Officer

Approval Date-

Effective Date-

Date of Last Revision- Not Applicable

Date of Policy Review-

1. **Policy Statement:**
   The purpose of this Policy and the associated procedures is to achieve coordination and consistent examination practices.

2. **Policy Scope:**
   The Policy applies to all staff and students of Pravara Rural College Of Pharmacy, Pravaranagar.

3. **Definitions:**

Terms used in this policy and the associated procedu[illegible]nsistent with the *Savitribai Phule Pune University Glossary of Terms*. In addition, the following words and expressions in this po[illegible]e the meanings listed below:

External examination: means any examination admi[illegible]y the rules and regulations of *Savitribai Phule Pune University*

Internal examination : means any examination administered by a college examination department.

Examination adjustment : means a change to examination conditions that take account of an ongoing medical or personal condition.

Special examination adjustments: means a change to examination conditions that account for a temporary disability or acute medical condition.

4.Timing Of Examinations:

4.1 Standard study periods

There will be a designated, maximum four week examination period at the end of the first and second semesters for the conduct of external theory and practical examinations.

4.2 Internal examinations

Internal Examinations for theory and practical will be arranged and conducted by the college.

4.3 External Examination sessions

External theory Examinations may be held within the period 10am to 1 pm ,2 pm to 5 pm Monday to Saturday (excluding public holidays) .The detailed time table for examination will be displayed by university.

4.4 Internal Examination sessions:

College examination department will prepare the time table for both theory and practical and as per the time table internal examination are conducted.

5.Examination Organization:

External theory and practical examination organized as per the time table given by university or a Internal examination organized by the college examination department as identified in the academic calendar.

5.1 University Examination:

5.1.1 All university examinations will occur within the examination periods as given by university.. Examinations falling outside these periods will be organized by college.

5.1.2 college is responsible for:

a. Production of quality-assured examination papers;

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b.Submission of examination papers to designed CAP Centers accordance with the timelines

identified by the university.

e. ensuring availability of a designated responsible academic staff member during examinations.

5.1.3 For Internal examinations, College examination section is responsible for:

a. To prepare time table of examinations within the period designated for internal examinations.

a. publishing a time table for the students and staff;
b. allocation of examination rooms;
c. coordination of professionally-printed examination papers;
d. secure management of examination papers;
e. supply of examination writing Papers.
f. provision of adequate examination supervision (invigilation);
g. processes relating to recruitment, appointment and management of examination supervisors;
h. implementing any examination adjustments for students as required.

5.2 Supplementary examinations:

External supplementary examination will be carried out as per the time table given by university.

5.3 Rules For Examanation:

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

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.

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.

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.

Examinations/Assessments

The scheme for internal assessment and end semester examinations is given in Table – below **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#**	**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		4 Hrs	50

BPe608P	Pharmacology III – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BPe609P	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**

Conduct of Continuous Internal Evaluation:

Every semester students has to go through the Continuous Internal Evaluation (CIE). CIE Is Conducted as per University guidelines.

Continuous Assessment Guidelines as per SPPU, Pune

Theory	
Criteria	**Marks**
Academic activities (Any 2 activities e.g. quiz, assignment, open book test, class test)	20
Sessional Exam	20
Total	40
Practical	
Attendance	5
Based on Practical Records	10
Regular viva voce, etc	5
Sessional Practical Exam	20
Total	40

Internal assessment: Continuous mode as per PCI syllabus

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

Scheme for awarding internal assessment: Continuous mode

Theory		
Criteria	**Maximum Marks**	
Attendance (Refer Table – XII)	4	2
Academic activities (Average of any 3 activities e.g. quiz, assignment, open book test, field work, group discussion and seminar)	3	1.5
Student – Teacher interaction	3	1.5

Total	10	5
Practical		
Attendance (Refer Table – XII)	2	
Based on Practical Records, Regular viva voce, etc	3	
Total	5	

Guidelines for the allotment of marks for attendance:

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

Sessional Exams

Two Sessional exams for 2018 pattern shall be conducted for each theory / practical course as per the schedule fixed by the college(s). One Sessional exams for 2018 pattern and 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. 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.

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**

Promotion and award of grades A student shall be declared PASS and eligible for getting gradein 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.

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 examinationof that course. However his/her marks of the Internal Assessmentshallbe carried overand he/she shall be entitled for grade obtained by him/her on passing.

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.

Re examination of end semester examinations *Re examination of end semester examinations* shall 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 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**

Academic Progression No student shall be admitted to any examination unless he/she fulfills the norms prescribed by University. 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 II, IV and VI 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 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 DOP's upon successful completion of the courses of I to VIII semesters within the stipulated time period as per the norms specified.

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 DOP's upon successful completion of the courses of III to VIII semesters within the stipulated time period as per the norms specified.

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 2015 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 Pharmacy – Theory/Practicals	Semester IV	Minimum 50% marks with D 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
01	Medicinal Chemistry I – Theory/ Practical	Semester V	Minimum 50% marks with D grade

Grading of performances

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 below:

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 AB and a corresponding grade point of zero. He/she should reappear for the said evaluation/examination in due course.

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:

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

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_n is the total number of credits for semester I,II,III, ... and S_1,S_2, S_n is the SGPA of semester I,II,III,.....

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

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
	75 Marks

Total

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.

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

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.

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.

6 .Publication of Examination Schedule:

6.1 Final theory examination time tables will be published at least six weeks prior to the commencement of the main examination by the university and for practical at least one week prior to the commencement of practical examination.

6.2 Examination timetable information will be made available to staff and students.

It is the responsibility of each student to:

a. To identify the dates, times and venues of examinations they are to attend; and,

b. To notify college examination department of any clashes by the published due date.

7 .Location of examination:

7.1. Venues for examinations must adhere to the University examination standards.

7.2 Seating arrangement of Students will be displayed at notice board half an hour before the starting of the examination.

8.Production of examination papers:

8.1 For internal examination each faculty will submit 1 question paper set in sealed cuvelop to the college examination officer one hour before examination. College examination officer will do photocopy of the question paper and will distribute to thestudents.

8.2 For external theory examination University will sent OTP to principal and college examination officer half an hour before examination. Then college examination officer will download the question paper from specified university site and will do the photocopy of it.

9.Examination Supervision:

9.1 Examination supervisors are responsible for the conduct of examinations and for ensuring compliance with this policy. A student must comply with all directions given by the examination supervisor and the supervisor's decision is final.

9.2 supervisor Duty:

a. To confirm the identity of the students through the hall ticket issued by university

a. To see that they are not in possession of any unauthorized device or material

b leave an examination room if a supervisor considers that a candidate's behaviour is such as to disturb or distract any other candidate;

c. surrender any device or material, which the supervisor considers to be unauthorized, for the duration of the exam, and/or

d. comply with any direction that the supervisor deems necessary to ensure the proper and efficient conduct of the examination.

10.Examination Condition:

10.1 Entry to Examination Room

10.1.1 A person other than the supervisor, or other authorized person , may not enter or remain in an examination room during an examination.

10.1.2. A candidate, on entering an examination room, must proceed to the place to which that candidate is directed by the supervisor. A candidate must not leave that place without permission or direction from a supervisor.

10.1.3 A person, whether a candidate or not, who is permitted to enter or leave an examination room must comply with conditions as outlined by the supervisor.

10.2. Starting time

10.2.1. The time listed on the examination timetable is the time when the examination commences. Candidates must not commence writing until the supervisor has given permission.

10.3 Late arrival

10.3.1 Candidates who arrive within the first 30 minutes after the start of an examination will be permitted to undertake that examination but will not be allowed additional time.

10.3.2 Candidates who arrive later than 30 minutes after the start of an examination will not be permitted to undertake that examination.

10.4 Early departure from examination rooms

10.4.1 Except in circumstances related to illness, a candidate must not leave the examination room;

a.During the first 30 minutes of an examination; or

b. during the final 10 minutes of an examination.

10.4.2 Candidates who wish to leave the examination room prior to the scheduled finish time (and within the times specified above) must adhere to instructions provided by the supervisor.

10.5. Illness during examination

10.5.1 If a candidate becomes ill during an examination and temporarily leaves the examination venue, but remains under supervision, no extra time will be allowed for the candidate to complete the examination. In this circumstance the candidate may submit an application for special consideration as per the rule framed by university.

10.5.2 If the candidate decides to continue the examination, the Examination Supervisor may make a decision to move the student to an alternative location, to reduce disruption to other students. The time required for the move will be added to the student's allocated examination time.

10.5.3 If the candidate cannot continue with the examination, the supervisor will note this and report the matter to examination department.

11.Conclusion of examination:

11.1 At the conclusion of the examination all candidates must maintain examination conditions until all papers have been collected and the supervisor has given students permission to leave the examination room.

11.2 Materials in Examination:

11.2.1 Nominated materials permitted in examinations

11.2.1.1 Where specified books or other materials (restricted to open book examinations) are permitted to be taken into an examination, such materials will be limited to those specifically approved by the Lecturer in Charge and such materials will be listed on the examination paper cover sheet.

11.2.1.2 Where an examination is designated 'open book', the relevant text book and allowable materials may be taken into the examination.

11.2.1.3The supervisor or other authorized person will inspect any such materials to ensure that they comply with the approved list provided by the Lecturer in Charge and do not contain any unauthorized materials.

11.2.1.4 The use of e-books is not permitted in any examination

11.3 Use of dictionaries in examinations

11.3.1 English language dictionaries are not acceptable in an examination room

11.3.2 The dictionary must not contain any notations or any additional material and must be presented to the supervisor for inspection.

12.2 Minor disruptions to an examination, for a period of 15 minutes or less, will be accommodated by the provision of an equivalent period of additional time added to the end of the allocated examination time by approval of the college examination department

12.3 The principal or college examination officer will determine the appropriate course of action in the event of a significant disruption to an examination. A significant disruption may include repeated minor disruptions in the same examination session.

12.4 In the event of an evacuation of an examination venue, the college examination officer in consultation with the principal will determine which of the following outcomes will apply, with consideration to minimizing disadvantage to students:

a.. the examination may be declared void and a new examination scheduled for a date and time within the current examination period;

b..students' examination scripts may be marked and the mark stand;

c..organizing different examination venues;

13. Examination adjustment for students with disabilities or medical condition:

13.1 Permanent disability and/or chronic medical condition

13.1.1. Adjustments to the examination conditions for students with a permanent disability and/or chronic medical condition will be incorporated in Education Inclusion Plans developed by Disability Services.

13.2 Unexpected temporary disability or medical condition

13.2.1 If a student has an unexpected temporary disability or medical condition, the student may apply for special adjustments to examination arrangements through submission of the relevant documents to college examination department

13.2.2 If, due to the timing of the request, the college examination department can give extra time as per the regulations given in university

13.3 Notification of examination adjustment and special adjustment requirements

13.3.1 Students with a disability and/or medical condition should consult a Disability Adviser to register for examination adjustments as early as possible, preferably at the time of enrolment and no later than the census date of the relevant study period.

14. Collection of Examination papers:

14.1 supervisor must collect all the answer sheet from the student and submit to college examination department.

15. Missing Examination papers or answer sheet:

15.1 In the event of examination papers, writing booklets or answer sheets being lost, stolen or destroyed, the college examination officer in consultation with the principal will determine a course of action for those students who have been directly affected so as to minimize disruption or disadvantage to those students.

16. Deferred Examination:

16.1 Internal Based Deferred Examination:

16.1.1 Application:

16.1.1.1. Where a candidate is unable to attend an examination due to illness or other exceptional circumstance (beyond their control) the candidate is required to submit the relevant documentation for a internal examination to the college examination department.

16.1.1.2 College examination department will verify the documents submitted by student and will set a new time table for the examination.

17 Publication of past examination paper:

17.1 All the past examination papers will be kept in library from where the students can access it.

18.Breach of Policy:

18.1. Expulsion from examination room

18.1.1 An Examination supervisor may expel any candidate from the examination room, where that candidate is believed to be in breach of this policy.

18.1.2 Report and investigation:

An Examination Supervisor must report any alleged breach of this policy to the College Examination Officer, who will refer the matter to the relevant authority.

18.1.3 Any alleged breach of the examination conditions will be referred to the College Examination Officer who may:

a. issue a formal warning; or
b. refer the matter to the Designated Officer for resolution in accordance with the Student Conduct and Discipline Policy.

18.1.4 In cases of alleged cheating the matter will be referred to the Principal and must be investigated and resolved in accordance with the Academic Integrity and Misconduct Policy.

18.1.5. In cases of alleged falsified documentation the matter will be referred to the Academic Dean, and must be investigated and resolved in accordance with the Policy on Dealing with Instances of Falsified, Fraudulent or Misleading Documentation.

19. Role and Responsibilities:

LOKNETE. DR. BALASAHEB VIKHE PATIL
(PADMA BHUSHAN AWARDEE)
PRAVARA RURAL EDUCATION SOCIETY
PRAVARA RURAL
COLLEGE OF PHARMACY
LONI

Date- 6/12/2021

Student Notice

PRAVARA RURAL COLLEGE OF PHARMACY

EXAMINATION CIRCULAR NO. - PRCOP/B & M Pharm/2020-21/Exam/ 2-/5

B. & M. PHARM Second Sessional Examination and Continues Assessment Time Table 2021-22

B. PHARM SEMESTER – III (2019 Pattern)

Sr. No	Date of Examination	Time	Subject		
Practical Sessional Exam					
		9:00 am to 1:00 pm	Batch A	Batch B	Batch C
1	8/12/2021		PP I	POC II	PMicro
2	9/12/2021		POC II	PP I	PE
3	10/12/2021		PMicro	PE	PP I
4	11/12/2021		PE	PMicro	POC II
Theory Continues Assessment					
1	20/12/2021	2:00 pm to 3:00 pm	Pharmaceutical Organic Chemistry II		
2	21/12/2021		Physical Pharmaceutics- I		
3	22/12/2021		Pharmaceutical Microbiology		
4	23/12/2021		Pharmaceutical Engineering		
Theory Sessional Exam					
1	27/12/2021	11:00 am to 12:30 pm	Pharmaceutical Organic Chemistry II		
2	28/12/2021		Physical Pharmaceutics- I		
3	29/12/2021		Pharmaceutical Microbiology		
4	30/12/2021		Pharmaceutical Engineering		

B. PHARM SEMESTER – V (2019 Pattern)

Sr. No	Date of Examination	Time	Subject		
Practical Sessional Exam					
		9:00 am to 1:00 pm	Batch A	Batch B	Batch C
1	8/12/2021		Formulative Pharmacy	PCOL II	PCOG PHY II
2	9/12/2021		PCOG PHY II	Formulative Pharmacy	PCOL II
3	10/12/2021		PCOL II	PCOG PHY II	Formulative Pharmacy
Theory Continues Assessment					
1	20/12/2021	2:00 pm to 3:00 pm	Medicinal Chemistry II		
2	21/12/2021		Formulative Pharmacy		
3	22/12/2021		Pharmacology II		
4	23/12/2021		Pharmacognosy and Phytochemistry II		
5	24/12/2021		Pharmaceutical Jurisprudence		
Theory Sessional Exam					
1	27/12/2021	11:00 pm to 12:30 pm	Medicinal Chemistry II		
2	28/12/2021		Formulative Pharmacy		
3	29/12/2021		Pharmacology II		
4	30/12/2021		Pharmacognosy and Phytochemistry II		
5	31/12/2021		Pharmaceutical Jurisprudence		

B. PHARM SEMESTER – VII (2018 Pattern)

Sr. No	Date of Examination	Time	Subject
Practical Sessional Exam			
1	8/12/2021	9:00 am to 1:00 pm	Instrumental Methods of Analysis (Batch A)
2	9/12/2021		Instrumental Methods of Analysis (Batch B)
3	10/12/2021		Instrumental Methods of Analysis (Batch C)
Theory Continues Assessment			
1	20/12/2021	2:00 pm to 3:00 pm	Instrumental Methods of Analysis
2	21/12/2021		Industrial Pharmacy
3	22/12/2021		Pharmacy Practice
4	23/12/2021		Novel Drug Delivery System
Theory Sessional Exam			
1	27/12/2021	11:00 am to 12:30 pm	Instrumental Methods of Analysis
2	28/12/2021		Industrial Pharmacy
3	29/12/2021		Pharmacy Practice
4	30/12/2021		Novel Drug Delivery System

M. PHARM SEMESTER – III (2019 Pattern)

Sr. No	Date of Examination	Time	Subject
1	27/12/2021	2:00 pm to 3: 30 pm	Research Methodology
2	28/12/2021	2.00 pm to 3.30 pm	Introduction to Constitution

Note- i) Practical Sessional Examination will be conducted before theory Sessional Examination as per the time table only.

ii) 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.

iv) Continues assessment pattern as mention below:

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

Mr. A. S. Dighe

Dr. R. S. Jadhav

Dr. S. B. Bhawar

PRAVARA RURAL EDUCATION SOCIETY'S
PRAVARA RURAL COLLEGE
OF PHARMACY
LONI

Date- 18/04/2022

Student Notice

PRAVARA RURAL COLLEGE OF PHARMACY

EXAMINATION CIRCULAR NO. - PRCOP/B & M Pharm/2021-22/Exam/

B & M PHARM first Sessional Examination and Continues Assessment Time Table 2021-22

B. PHARM SEMESTER – II (2019 Pattern)

Sr. No	Date of Examination	Time	Subject		
Theory Sessional Exam					
1	2/5/2022	10:00 Am to 11:30 Am	Human Anatomy and Physiology II		
2	4/5/2022		Pharmaceutical Organic Chemistry I		
3	5/5/2022		Biochemistry		
4	6/5/2022		Pathophysiolog		
5	9/5/2022		Computer Applications in Pharmacy		
6	9/5/2022	2:00 Pm to 3:30 Pm	Environmental sciences		
Theory Continues Assessment					
1	25/4/2022	9:00 Am to .... Pm	Human Anatomy and Physiology II		
2	26/4/2022		Pharmaceutical Organic Chemistry I		
3	27/4/2022		Biochemistry		
4	28/4/2022		Pathophysiolog		
5	29/4/2022		Computer Applications in Pharmacy		
6	30/4/2022		Environmental sciences		
Practical Continues Assessment & Sessional Exam					
1	25/4/2022	10:00 Am to ..... Pm	BIOCHEM	POC-I	CA
2	26/4/2022		CA	BIOCHEM	.....
3	27/4/2022		POC-I	CA	HAP-II
4	28/4/2022		....	HAP-II	BIOCHEM
5	29/4/2022		HAP-II	.....	POC-I

M. PHARM SEMESTER – II (2019 Pattern)

Sr. No	Date of Examination	Time	Subject
1	2/5/2022	3:30 Pm to 5: 00 Pm	Advanced Spectral Analysis Hazards and Safety Management Medicinal Plant biotechnology
2	4/5/2022		Advanced Organic Chemistry –II Pharmaceutical Validation Advanced Pharmacognosy–II
3	5/5/2022		Computer Aided Drug Design Audits and Regulatory Compliance Indian system of medicine
4	6/5/2022		Pharmaceutical Process Chemistry Pharmaceutical Manufacturing Technology Herbal cosmetics
5	9/5/2022	10:00 am to ….	Pharmaceutical Chemistry Practical II Pharmaceutical Quality Assurance Practical II Pharmacognosy Practical II

Note- i) The examination will be conducted by as per the time table only.

ii) 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.

iv) Continues assessment pattern as mention below:

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

Mr. A. S. Dighe
Exam In-chrge

Dr. R. S. Jadhav
CEO

Dr. S. B. Bhawar
Principal

PRAVARA RURAL EDUCATION SOCIETY'S
PRAVARA RURAL COLLEGE
OF PHARMACY
LONI

Date- 24/03/2022

Student Notice

PRAVARA RURAL COLLEGE OF PHARMACY

B. PHARM Second Sessional Examination and Continues Assessment
Time Table 2021-22

B. PHARM SEMESTER – IV (2019 Pattern)

Sr. No	Date of Examination	Time	Subject		
Theory Sessional Exam					
1	2/5/2022	10:00 Am to 11:30 Am	Pharmaceutical Organic Chemistry III		
2	4/5/2022		Medicinal Chemistry I		
3	5/5/2022		Physical Pharmaceutics II		
4	6/5/2022		Pharmacology I		
5	9/5/2022		Pharmacognosy and Phytochemistry-I		
Theory Continues Assessment					
1	25/4/2022	9:00 Am to …. Pm	Pharmacology I		
2	26/4/2022		Physical Pharmaceutics II		
3	27/4/2022		Pharmaceutical Organic Chemistry III		
4	28/4/2022		Pharmacognosy and Phytochemistry-I		
5	29/4/2022		Medicinal Chemistry I		
Practical Continues Assessment & Sessional Exam					
1	25/4/2022	2:00 Pm to 6:00 Pm	PP-II	P'COG	P'COL-I
2	26/4/2022		P'COG	MC-I	PP-II
3	27/4/2022		…..	PP-II	MC-I
4	28/4/2022		MC-I	….	P'COG
5	29/4/2022		P'COL-I	P'COL- I	….

B. PHARM SEMESTER – VI (2019 Pattern)

Sr. No	Date of Examination	Time	Subject		
Theory Sessional Exam					
1	2/5/2022	2:00 Pm to 3:30 Pm	Medicinal Chemistry III		
2	4/5/2022		Pharmacology III		
3	5/5/2022		Herbal Drug Technology		
4	6/5/2022		Biopharmaceutics and Pharmacokinetics		
5	9/5/2022		Pharmaceutical Biotechnology		
6	10/5/2022		Quality Assurance		
Theory Continues Assessment					
1	25/4/2022	2:00 Pm to …. Pm	Medicinal Chemistry III		
2	26/4/2022		Biopharmaceutics and Pharmacokinetics		
3	27/4/2022		Pharmacology III		
4	28/4/2022		Quality Assurance		
5	29/4/2022		Pharmaceutical Biotechnology		
6	29/4/2022		Herbal Drug Technology		
Practical Continues Assessment & Sessional Exam					
1	25/4/2022	10:00 am to 2:00 Pm	HDT	MC-III	P'COL-III
2	26/4/2022		P'COL-III	HDT	MC-III
3	27/4/2022		MC-III	P'COL-III	HDT

B. PHARM SEMESTER – VIII (2018 Pattern)

Sr. No	Date of Examination	Time	Subject
Theory Sessional Exam			
1	2/5/2022	2:00 Pm to 3:30 Pm	Biostatistics and Research Methodology
2	4/5/2022		Social and Preventive Pharmacy
3	5/5/2022		Pharmaceutical Regulatory Science
4	6/5/2022		Quality Control and Standardizations of Herbals
Theory Continues Assessment			
1	25/4/2022	9:00 Am to …. Pm	Biostatistics and Research Methodology
2	26/4/2022		Social and Preventive Pharmacy
3	27/4/2022		Quality Control and Standardizations of Herbals
4	28/4/2022		Pharmaceutical Regulatory Science

Note- i) The examination will be conducted by as per the time table only.

Iii) 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.

iv) Continues assessment pattern as mention below:

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
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85 – 89	2	1
80 – 84	1	0.5
Less than 80	0	0

Mr. A. S. Dighe
Exam In-chrge

Dr. R. S. Jadhav
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Principal

LOKNETE. DR. BALASAHEB VIKHE PATIL
(PADMA BHUSHAN AWARDEE)
PRAVARA RURAL EDUCATION SOCIETY
PRAVARA RURAL
COLLEGE OF PHARMACY
LONI

Date- 11/1/2022

Student Notice

PRAVARA RURAL COLLEGE OF PHARMACY

EXAMINATION CIRCULAR NO. - PRCOP/B & M Pharm/2020-21/Exam/ 213

B. PHARM Re-sessional Examination Time Table 2021-22

(Online Mode)

B. PHARM SEMESTER – III (2019 Pattern)

Sr. No	Date of Examination	Time	Subject
Practical Sessional Exam			
		2:00 Pm to …	**BATCH - (ONLY DSY)**
1	17/1/2022		PP I
2	18/1/2022		POC II
3	19/1/2022		PMicro
4	20/1/2022		PE
Theory			
1	17/1/2022	11:00 am to 12:00 pm	Pharmaceutical Organic Chemistry II
2	18/1/2022		Physical Pharmaceutics- I
3	19/1/2022		Pharmaceutical Microbiology
4	20/1/2022		Pharmaceutical Engineering

B. PHARM SEMESTER – V (2019 Pattern)

Sr. No	Date of Examination	Time	Subject
Theory Sessional Exam			
1	17/1/2022	11:00 am to 12:00 pm	Medicinal Chemistry II
2	18/1/2022		Formulative Pharmacy
3	19/1/2022		Pharmacology II
4	20/1/2022		Pharmacognosy and Phytochemistry II
5	21/1/2022		Pharmaceutical Jurisprudence

B. PHARM SEMESTER – VII (2018 Pattern)

Sr. No	Date of Examination	Time	Subject
Theory Sessional Exam			
1	17/1/2022	11:00 am to 12:00 pm	Instrumental Methods of Analysis
2	18/1/2022		Industrial Pharmacy
3	19/1/2022		Pharmacy Practice
4	20/1/2022		Novel Drug Delivery System

Mr. A. S. Dighe
Exam In-chrge

Dr. R. S. Jadhav
CEO

Dr. S. B. Bhawar
Principal

LOKNETE. DR. BALASAHEB VIKHE PATIL
(PADMA BHUSHAN AWARDEE)
PRAVARA RURAL EDUCATION SOCIETY
PRAVARA RURAL
COLLEGE OF PHARMACY
LONI

Date- 14/12/2021

Student Notice

EXAMINATION CIRCULAR NO. - PRCOP/B & M Pharm/2020-21/Exam/ 216

B. PHARM External practical Examination Time Table 2021-22

B. PHARM SEMESTER – III (2019 Pattern)

Sr. No	Date of Examination	Subject		
		Batch A Time: 9:00 AM to 1:00 PM	**Batch B Time: 2:00 AM to 6:00 PM**	**Batch C Time: 9:00 AM to 1:00 PM**
1	21/12/2021	Pharmaceutical Organic Chemistry II	Pharmaceutical Organic Chemistry II	Physical Pharmaceutics- I
2	22/12/2021	Physical Pharmaceutics- I	Physical Pharmaceutics- I	Pharmaceutical Organic Chemistry II
3	23/12/2021	Pharmaceutical Microbiology	Pharmaceutical Microbiology	Pharmaceutical Engineering
4	24/12/2021	Pharmaceutical Engineering	Pharmaceutical Engineering	Pharmaceutical Microbiology

NO.OF STUDENTS: 66
Batch A- 1-22
Batch B- 23-44
Batch C- 45-66

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B. PHARM SEMESTER – V (2019 Pattern)

Sr. No	Date of Examination	Subject		
		Batch A Time: 9:00 AM to 1:00 PM	Batch B Time: 2:00 AM to 6:00 PM	Batch C Time: 9:00 AM to 1:00 PM
1	21/12/2021	Formulative Pharmacy	Formulative Pharmacy	Pharmacology II S
2	22/12/2021	Pharmacology II	Pharmacology II	Formulative Pharmacy
3	23/12/2021	Pharmacognosy and Phytochemistry II	Pharmacognosy and Phytochemistry II	.....
4	24/12/2021	.....	....	Pharmacognosy and Phytochemistry II

NO.OF STUDENTS: 74
Batch A- 1-24
Batch B- 25-48
Batch C- 49-73 & Dighe R. C

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B. PHARM SEMESTER – VII (2018 Pattern)

	Date of Examination	Subject		
		Batch A Time: 9:00 AM to 1:00 PM	Batch B Time: 2:00 AM to 6:00 PM	Batch C Time: 9:00 AM to 1:00 PM
1	22/12/2021	Instrumental Methods of Analysis	Instrumental Methods of Analysis	.....
2	23/12/2021	.....	.....	Instrumental Methods of Analysis

NO.OF STUDENTS: 70
Batch A- = 1-23
Batch B- 24-46
Batch C= 47-70

Note- i) Practical Examination will be conducted as per the time table only.

Mr. A. S. Dighe
Exam In-chrge

Dr. R. S. Jadhav
CEO

Dr. S. B. Bhawar
Principal

19/09/2

Assignment - 1

PAGE NO.:
DATE / /

Q.1) Explain Principle and Instrumentation of IR ?

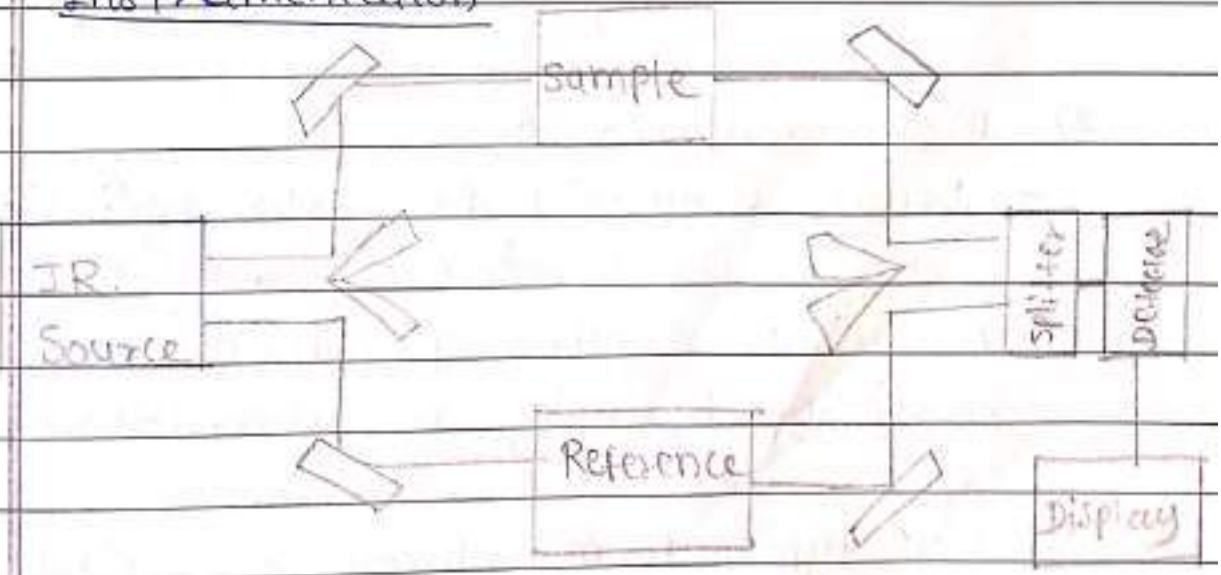
→ **Principle -**

Infrared spectroscopy works on the principle that all molecules Vibrate and absorbs energy in the infrared region. The IR radiations is passed through sample, some radiation are absorbed by sample and some radiation are passed.

Representing spectrum indicates molecular absorption and transmission creates molecular fingerprints of atom.

No two molecules give same spectrum in IR spectroscopy.

- **Instreumentation -**



Instrumentation of IR

PAGE NO.:
DATE / /

- The main components of IR -

1) Sources of radiation
2) Monochromators
3) Sample cells, and
4) Detectors.

1) Sources of radiation -

- IR requires a source of radient energy for isolating narrow frequency bands.
- Source should be steady
- Intensity sufficient for detection.
- Should extend over desired wavelengths.

- Ex - (1) Nernst Glower
(2) Globar
(3) Nichrome wire
(4) Rhodium wire
(5) Tungsten filament lamp.

2) Monochromators -

- Desired frequencies from the radiation source should be selected and the radiations of other frequencies should be rejected by using monochromators.

- Two types of monochromators are used -
(a) Prism Monochromator
(b) Grating Monochromator.

PAGE NO.:
DATE / /

3) Sample cells -

- IR Spectroscopy used for the characterisation of solid, liquid samples, thus the samples handled separately and specifically.
- Sample cells should be transparent to IR radiations.
- Three types of Sampling -

a) Sampling of Solids -

1) solid dissolved in solvent
2) As solid film
3) Mull Technique
4) Pressed pellet Technique (Disk method)

b) Sampling of liquids -

- liquid sample squeezed between two Sodium chloride plates.
- Calcium fluoride plates are used for water containing samples.

c) Sampling of Gases -

- The sample / gaseous sample is introduced into a gas cell (10 cm long) having NaCl walls.
- Very few organic compounds are examined as gases.

DATE / /

4) Detectors -

- Except in near IR region, where a photoconductivity cell is basically used
- No better choice than thermal detectors. (for all frequencies).
- Types -
  - Golay cell.
  - Bolometer
  - Thermocouple
  - Thermistor
  - Pyroelectric detector.

Assignment -2 14/11/21

Q.2) Explain Chromatography in details?

→ Chromatography is a combination of laboratory techniques that are used for separating the mixture components. It deals with a sample dissolved in a mobile phase which is allowed to move through an immobile and immiscible stationary phase.

- Chromatography could be either preparative (type of purification) or analytical (for analysis small amount of sample requires) chromatography.

Classification of Chromatography -

PAGE NO.:
DATE / /

A) Adsorption chromatography -
- Column chromatography
- Gas solid chromatography.

B) Partition Chromatography -
- Liquid - liquid partition chromatography
- Paper chromatography
- Thin layer chromatography
- Reverse phase partition or extraction chromatography.

C) Ion - Exchange chromatography -
- Cation exchange chromatography
- Anion exchange chromatography
- Inorganic exchange chromatography
- Liquid exchange chromatography
- Ion chromatography
- Exclusion chromatography
-

D) Exclusion chromatography -
- Gel permeation chromatography
- Ion exclusion chromatography
- Molecular sieve chromatography

E) Electrochromatography -
- Zone electrophoresis
- Boundary layer method.
- Curtain chromatography
- Capillary electrophoresis.

* General Principles -

Principle chromatography involves separation of components into varied bands and their identification. Separation occurs based on the differential affinities of compounds for stationary and mobile phase.
The variation in affinities among constituents occurs due to relative adsorption or partition coefficient in both pases.

Theories of Chromatography -

- There are two theories of chromatography depending on the migration rate of solute and the development of peaks in the chromatogram -
(a) Plate Theory &
(b) Rate or kinetic Theory.

(a) Plate Theory -

- martin and synge proposed this theory as per which a column used in chromatography is made up of Theoretical plates arranged in series of different but continuous horizontal layers.

PAGE NO.:
DATE / /

Solute equilibrium between the stationary and mobile phases occurs at each plate. Solute migration occurs from one plate to another, present just below, by a sequencial step by step transfer.

$\therefore n = \frac{l}{h}$ (where,

n = no. of theoretical plates.
l = length of column.
h = hight equivalent of theoretical plate.

No. of theoretical plates ↑ separation efficiency also ↑.

No. of theoretical Plates $(N) = \frac{5.55 t_R^2}{W_{1/2}^2}$

(b) Rate or kinetic Theory -

for facilitating complete separation of all the sample components in minimum time. This can be done by modifying the mobile phase composition, by choosing a different stationary phase, or by altering the flow rate.

PAGE NO.:
DATE / /

Chromatograph Visualisation -

The chromatograms formed by elution can be visualised by;

(1) Retention factor (R_f)
(2) Prediction of column volumes (CV).

(1) Retention factor - (R_f)

- Is analysed for evaluation purpose.
- Ideal value for Rf is considered to be 0.2 - 0.4.

$$R_f = \frac{\text{Distance Travelled by the Compound}}{\text{Distance travelled by the Solvent front}}$$

(2) Prediction of Column Volumes - (CV)

- Elution from the column can be determined by TLC depending on Rf and CV.

$$CV = \frac{1}{R_f}$$

$$\Delta CV = \frac{1}{R_{f1}} - \frac{1}{R_{f2}}$$

- Greater the value of ΔCV easier will be separation & resolution both spots.
- This is real about chromatography.

ODD Sem PG QAT Pr

Pravara Rural Education Society's

PRAVARA RURAL COLLEGE OF PHARMACY
PRAVARANAGAR

LONI-413736, Tal. Rahata, Dist. Ahmednagar (M.S.)

DEGREE / DIPLOMA

ATTENDANCE
AND
ASSESSMENT RECORD

Year 2021 -2022

CLASS : I / II / III / FINAL YEAR B. / D.PHARM M.pharm

SUBJECT : QA Practical

NAME OF THE TEACHING STAFF : Dr. R.J. Bhor

DEPARTMENT : QA

Academic Year : From June 2021 20 To Dec. 2021

Class F.Y. M./D./B. Pharmacy Subject QA Practical

	FIRST Sessional	SECOND Sessional	THIRD Sessional	End of the academic year
Initials of H.O.D. with Date	17/2/22 RBL	14/3/22 RBC	—	

	Staff Member	H.O.D.	Academic Dean	Principal
Signature with Date	16/3/22			

I) Performance of engaging Theory Lectures / Practicals

i) No. of Theory Lectures / Practicals (engaged) :- ~~17~~ 18

ii) No. of Theory Lectures / Practicals (Prescribed) :- ~~16~~ 18

iii) Percentage of Target achieved :- $\frac{(i)}{(ii)} \times 100$ ~~94.11~~ % 100%

II) Performance of attendance of Students :-

i) Sum of total students present :- 18 × 18 = 240 270 - 54 = 216
(No. of Students multiplied by No. of Lectures engaged Minus total of absentee in year)

ii) No. of Lectures or Practicals engaged = 16

iii) No. of Students on Roll = 15

$$\text{Average Attendance} = \frac{(i) \times 100}{(ii) \times (iii)} = \frac{216 \times 100}{16 \times 15} \%$$

$$= \frac{21600}{240}$$

$$= 90\%$$

Sign. of the Teacher

CLASS: 1 Y. M. Pharm SUBJECT: QA

ATTENDANCE

Roll No	Name	Date / Month / Year / Period
1	Aher Prajakta A.	
2	Atre Omkar B.	
3	Borhade Manoj S.	
4	Barhade Ajay R.	
5	Ghorpade Amita B.	
6	Ghorpade Dipmala D.	
7	Kachare Akshay B.	
8	Karawade Shubham R.	
9	Kavanjekar Vipul A.	
10	Khemnar Priyanka P.	
11	Lahare Aditya S.	
12	Musale Prasana S.	
13	Sagar Priyanka M.	
14	Satpute Ajay D.	
15	Tupe Arpita V.	
	No. of Absentees	
	Initial of Staff Member	
	Initial of H.O.D.	

OR THE YEAR 2014 -2015

ANCE

Engaged	Attended	%	I	II	III	Best of Two
18	12	66.6	21	21		21
18	14	88.8	22	22		22
18	14	88.8	25	25		25
18	14	88.8	23	23		23
18	14	88.8	28	28		28
18	14	88.8	25	25		25
18	15	83.3	25	25		25
18	17	94.4	26	26		26
18	15	83.3	26	26		26
18	14	77.7	26	26		26
18	16	88.8	23	24		24
18	17	94.4	24	25		25
18	15	83.3	23	24		23
18	14	88.8	26	26		26
18	15	83.3	27	27		27

RECORD OF CLASS / PRACTICAL WORK

CLASS : ~~QA PR~~ F.Y.~~B~~.Ph SUBJECT : QA Practical

Lecture No.	Date	Topics Covered	Initials
(1)	13/1/22	Simultaneous estⁿ of paracetamol & caffine by UV.	RJB
(2)	20/1/22	Simultaneous estimⁿ of paracetamol & Diclofenac by UV	RJB
(3)	20/1/22	Assay of Quinine sulphate by fluorescence spectroscopy	RJB
(4)	27/1/22	To perform HPLC by using caffine	RJB
(5)	27/1/22	To estimate Na^+/K^+ by flame photometry	RJB
(6)	27/1/22	To estimate Na^+/K^+ by flame photometry	RJB
(7)	29/1/22	To perform inprocess Quality control of tablet	RJB
(8)	3/2/22	To perform IPQC of capsule	RJB
(9)	8/2/22	To perform IPQC of ointment	RJB

RECORD OF CLASS / PRACTICAL WORK

CLASS : F.Y. M.Pharm SUBJECT : QA practical

Lecture No.	Date	Topics Covered	Initials
(10)	8/2/22	To perform IPQC test of parenteral	RJB
(11)	22/2/22	Assay of raw material	RJB
(12)	24/2/22	To perform Preformⁿ study of tablet	RJB
(13)	7/3/22	To perform QC test for primary & secondary packing material	RJB
(14)	2/3/22	To improve solubility of drug	RJB
(15)	7/3/22	To study effect of pH on solubility of drug	RJB
(16)	7/3/22	To perform Accelerated Stability studies	RJB
(17)	8/3/22	To improve the solubility of drug by using co-solvent method	RJB
(18)	8/3/22	Estimation of olmesartan & Hydrochlorothiazide by Q method	RJB

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ACADEMIC CALENDAR 2021-22

Month	Day	Date	Activity	Adherence to calendar
August 2021	Sunday	1	Holiday	
	Monday	2	Regular academics	Adhere
	Tuesday	3	Regular academics	Adhere
	Wednesday	4	Regular academics	Adhere
	Thursday	5	Regular academics	Adhere
	Friday	6	Regular academics	Adhere
	Saturday	7	Holiday	
	Sunday	8	Holiday	Adhere
	Monday	9	Regular academics	Adhere
	Tuesday	10	Regular academics	Adhere
	Wednesday	11	Regular academics	Adhere
	Thursday	12	Regular academics	Adhere
	Friday	13	Regular academics	Adhere
	Saturday	14	Regular academics	Adhere
	Sunday	15	Holiday	
	Monday	16	Holiday	
	Tuesday	17	Subject orientation	Adhere
	Wednesday	18	Subject orientation	Adhere
	Thursday	19	Holiday	
	Friday	20	Regular academics	Adhere
	Saturday	21	National Webinar	Adhere
	Sunday	22	Padmashri Jayanti	Adhere
	Monday	23	Topic selection for second year PG	Adhere
	Tuesday	24	Expert lecture	Adhere
	Wednesday	25	Regular academics	Adhere
	Thursday	26	Regular academics	Adhere
	Friday	27	Regular academics	Adhere
	Saturday	28	Regular academics	Adhere
	Sunday	29	National Sports Day	Adhere
	Monday	30	Student council election	Non adherence
	Tuesday	31	Academic Review Meeting	Adhere
September 2021	Wednesday	1	Observation of National Nutrition Week&Inauguration of students Council.	Non adherence
	Thursday	2	Observation of National Nutrition Week	Non adherence
	Friday	3	Observation of National Nutrition Week	Non adherence

	Saturday	4	Observation of National Nutrition Week	Non adherence
	Sunday	5	Observation of National Nutrition Week&Teachers Day	Non adherence
	Monday	6	International Day of Charity (Visit to Orphanage)	Non adherence
	Tuesday	7	Industrial visit (Third& Final Year)	Adhere
	Wednesday	8	International Literacy Day	Non adherence
	Thursday	9	Industrial visit (First& Second Year)	Adhere
	Friday	10	Ganesh Chaturti	Adhere
	Saturday	11	Expert lecture on account of World suicide prevention day Hospital visit (Second Year) Industrial Visit(M.Pharm)	Adhere
	Sunday	12	Holiday	Adhere
	Monday	13	Regular academics	Adhere
	Tuesday	14	Regular academics	Adhere
	Wednesday	15	Expert lecture	Adhere
	Thursday	16	World Ozone day	Non adherence
	Friday	17	Regular academics	Adhere
	Saturday	18	Regular academics	Adhere
	Sunday	19	Regular academics	Adhere
	Monday	20	Sessional & Continuous assessment	Partial adherence Conducted on 18/10/2021-30/10/2021
	Tuesday	21	Sessional & Continuous assessment	
	Wednesday	22	Sessional & Continuous assessment	
	Thursday	23	Sessional & Continuous assessment	
	Friday	24	Sessional & Continuous assessment	
	Saturday	25	Sessional & Continuous assessment and World Pharmacist Day	
	Sunday	26	Sessional & Continuous assessment	
	Monday	27	Sessional & Continuous assessment Academic Review Meeting Students feedback (1st to Final Year) & Academic audit (Internal)	
	Tuesday	28	Regular academics	Adhere
	Wednesday	29	Regular academics	Adhere
	Thursday	30	World Heart Day Rally	Adhere
October 2021	Friday	1	Swacctha Abhiyan	Adhere
	Saturday	2	Mahatma Gandhi Jayanti	Adhere
	Sunday	3	Holiday	
	Monday	4	Expert Lecture	Partial adherence

	Tuesday	5	Expert Lecture	Conducted on 01/10/2021
	Wednesday	6	Soft skill training(Personality development workshop)	Adhere
	Thursday	7	Regular academics	Adhere
	Friday	8	Regular academics	Adhere
	Saturday	9	Regular academics	Adhere
	Sunday	10	World Mental Health day awareness seminar.	Adhere
	Monday	11	National Girl Childs Day &Kanya RatnaAbhiyan (Inter Collegiate Debate competition)	Non adherence
	Tuesday	12	PG Specialisation presentation Workshop on Competitive Examination	Adhere
	Wednesday	13	Regular academics	Adhere
	Thursday	14	Regular academics	Adhere
	Friday	15	Regular academics	Adhere
	Saturday	16	Workshop on Research ethics	Adhere
	Sunday	17	Holiday	
	Monday	18	Sessional & Continuous assessment	Adhere
	Tuesday	19	Sessional & Continuous assessment	
	Wednesday	20	Sessional & Continuous assessment	
	Thursday	21	Sessional & Continuous assessment	
	Friday	22	Sessional & Continuous assessment	
	Saturday	23	Sessional & Continuous assessment	
	Sunday	24	Holiday	
	Monday	25	Expert Lecture	Adhere
	Tuesday	26	Expert Lecture	Adhere
	Wednesday	27	Regular academics	Adhere
	Thursday	28	Regular academics	Adhere
	Friday	29	Regular academics	Adhere
	Saturday	30	Regular academics	Adhere
	Sunday	31	Holiday	
November 2021	Monday	1	Regular academics	Adhere
	Tuesday	2	Regular academics	Adhere
	Wednesday	3	Regular academics	Adhere
	Thursday	4	Regular academics	Adhere
	Friday	5	Regular academics	Adhere
	Saturday	6	Holiday	
	Sunday	7	National Cancer Awareness Day	Non adherence
	Monday	8	Regular academics	Adhere

	Tuesday	9	Regular academics	Adhere
	Wednesday	10	Regular academics	Adhere
	Thursday	11	Regular academics	Adhere
	Friday	12	Regular academics	Adhere
	Saturday	13	Regular academics	Adhere
	Sunday	14	National Cancer Awareness Day National Epilepsy Day	Non adherence
	Monday	15	Regular academics	Adhere
	Tuesday	16	Regular academics	Adhere
	Wednesday	17	Regular academics	Adhere
	Thursday	18	Regular academics	Adhere
	Friday	19	Regular academics	Adhere
	Saturday	20	Holiday	
	Sunday	21	Holiday	
	Monday	22	Regular academics	Adhere
	Tuesday	23	Regular academics	Adhere
	Wednesday	24	Regular academics	Adhere
	Thursday	25	Regular academics	Adhere
	Friday	26	Constitution Day of India	Adhere
	Saturday	27	Regular academics	Adhere
	Sunday	28	Holiday	
	Monday	29	Regular academics	Adhere
	Tuesday	30	Regular academics	Adhere
December 2021	Wednesday	1	Vacation	Vacation
	Thursday	2		
	Friday	3		
	Saturday	4		
	Sunday	5		
	Monday	6		
	Tuesday	7		
	Wednesday	8		
	Thursday	9		
	Friday	10		
	Saturday	11		
	Sunday	12		
	Monday	13		
	Tuesday	14		
	Wednesday	15		
	Thursday	16		
	Friday	17		
	Saturday	18		
	Sunday	19		
	Monday	20		
	Tuesday	21		
	Wednesday	22		

	Thursday	23		
	Friday	24		
	Saturday	25		
	Sunday	26	Sessional & Continuous assessment	Adhere
	Monday	27	Sessional & Continuous assessment	Adhere
	Tuesday	28	Sessional & Continuous assessment	Adhere
	Wednesday	29	Sessional & Continuous assessment	Adhere
	Thursday	30	Sessional & Continuous assessment	Adhere
	Friday	31		
January 2022	Saturday	1	Holiday	
	Sunday	2	Holiday	
	Monday	3	Regular academics	Adhere
	Tuesday	4	Regular academics	Adhere
	Wednesday	5	Regular academics	Adhere
	Thursday	6	Regular academics	Adhere
	Friday	7	Regular academics	Adhere
	Saturday	8	Regular academics	Adhere
	Sunday	9	Holiday	
	Monday	10	Regular academics	Adhere
	Tuesday	11	Regular academics	Adhere
	Wednesday	12	National Youth Day	Adhere
	Thursday	13	Regular academics	Adhere
	Friday	14	Regular academics	Adhere
	Saturday	15	Holiday	Adhere
	Sunday	16	Holiday	
	Monday	17	National Youth Day	Non adherence
	Tuesday	18	Regular academics	Adhere
	Wednesday	19	Regular academics	Adhere
	Thursday	20	Workshop on Hands on training-Equipment	Adhere
	Friday	21	Regular academics	Adhere
	Saturday	22	Regular academics	Adhere
	Sunday	23	Holiday	
	Monday	24	NSS Camp Expert lecture	Adhere
	Tuesday	25	NSS Camp	Partial adherence Conducted on 03-09/01/2022
	Wednesday	26	Republic Day	Adhere
	Thursday	27	Intercollegiate sports day	Adhere
	Friday	28	Intercollegiate sports day	Adhere
	Saturday	29	Intercollegiate sports day	Adhere
	Sunday	30	Martyrs Day	Non adherence

	Monday	31	Academic Review	Adhere
February 2022	Tuesday	1	Sports, Cultural Days	Partial adherence Conducted on 22-24/01/2022
	Wednesday	2	Sports, Cultural Days	
	Thursday	3	Sports, Cultural Days	
	Friday	4	Sports, Cultural Days	
	Saturday	5	Holiday	
	Sunday	6	Holiday	
	Monday	7	Regular academics	Adhere
	Tuesday	8	Expert lecture	Adhere
	Wednesday	9	Regular academics	Adhere
	Thursday	10	Industrial visit (Third& Final Year)	Adhere
	Friday	11	Industrial visit (First& Second Year)	Adhere
	Saturday	12	Industrial visit (M.Phrm)	Adhere
	Sunday	13	Holiday	
	Monday	14	Regular academics	Adhere
	Tuesday	15	Regular academics	Adhere
	Wednesday	16	Regular academics	Adhere
	Thursday	17	Regular academics	Adhere
	Friday	18	Regular academics	Adhere
	Saturday	19	Chatrapati Shivaji Maharaj Jayanti Holiday	Adhere
	Sunday	20	Holiday	
	Monday	21	Sessional & Continuous assessment	Partial adherence Conducted on 02-15/03/2022
	Tuesday	22	Sessional & Continuous assessment	
	Wednesday	23	Regular academics	
	Thursday	24	Sessional & Continuous assessment	
	Friday	25	Sessional & Continuous assessment	
	Saturday	26	Sessional & Continuous assessment	
	Sunday	27	Sessional & Continuous assessment Marathi Bhasha Din	
	Monday	28	Sessional & Continuous assessment	
March 2022	Tuesday	1	Holiday	
	Wednesday	2	Internal Academic Audit	Adhere
	Thursday	3	Expert lecture	Adhere
	Friday	4	National Safety Day	Non adherence
	Saturday	5	Holiday	

	Sunday	6	Holiday	
	Monday	7	International Conference	Adhere
	Tuesday	8	International Conference International Women's Day	Adhere
	Wednesday	9	International Conference	Adhere
	Thursday	10	International Conference	Adhere
	Friday	11	Regular Academics	Adhere
	Saturday	12	Regular Academics	Adhere
	Sunday	13	Holiday	
	Monday	14	Parent Teachers meet	Adhere
	Tuesday	15	World Consumer Rights Day	Non adherence
	Wednesday	16	Expert lecture	Adhere
	Thursday	17	Regular Academics	Adhere
	Friday	18	Regular Academics	Adhere
	Saturday	19	Regular Academics	Adhere
	Sunday	20	Holiday International Day of Happiness	Non adherence
	Monday	21	Regular Academics	Adhere
	Tuesday	22	World Water Day	Non adherence
	Wednesday	23	Regular Academics	Adhere
	Thursday	24	World TB Day	Non adherence
	Friday	25	Regular Academics	Adhere
	Saturday	26	Regular Academics	Adhere
	Sunday	27	Holiday	
	Monday	28	Regular Academics	Adhere
	Tuesday	29	Regular Academics	Adhere
	Wednesday	30	Regular Academics	Adhere
	Thursday	31	Regular Academics	Adhere
April 2022	Friday	1	Regular Academics	Adhere
	Saturday	2	Regular Academics	Adhere
	Sunday	3	Holiday	
	Monday	4	Regular Academics	Adhere
	Tuesday	5	Regular Academics	Adhere
	Wednesday	6	Regular Academics	Adhere
	Thursday	7	World Health Day	Non adherence
	Friday	8	Regular Academics	Adhere
	Saturday	9	Expert lecture	Adhere
	Sunday	10	Holiday	
	Monday	11	Regular Academics	Adhere
	Tuesday	12	Regular Academics	Adhere
	Wednesday	13	Regular Academics	Adhere
	Thursday	14	Ambedkar Jayanthi Holiday	Adhere
	Friday	15	Holiday	
	Saturday	16	Regular Academics	Adhere
	Sunday	17	Holiday	

	Monday	18	Sessional & Continuous assessment	Partial adherence Conducted on 04-08/04/2022
	Tuesday	19	Sessional & Continuous assessment	
	Wednesday	20	Sessional & Continuous assessment	
	Thursday	21	Sessional & Continuous assessment	
	Friday	22	Sessional & Continuous assessment	
	Saturday	23	Sessional & Continuous assessment	
	Sunday	24	Sessional & Continuous assessment	
	Monday	25	Regular Academics	Adhere
	Tuesday	26	World Intellectual Property Day	Non adherence
	Wednesday	27	Late Padmashri Dr.Vitthalrao Vikhe Patil Punyatithi	Adhere
	Thursday	28	Regular Academics	Adhere
	Friday	29	Regular Academics	Adhere
	Saturday	30	Regular Academics	Adhere
May 2022	Sunday	1	Maharashtra Din – Holiday	Adhere
	Monday	2	Regular Academics	Adhere
	Tuesday	3	Regular Academics	Adhere
	Wednesday	4	Regular Academics	Adhere
	Thursday	5	Late Padmabhushan Dr. Balasaheb Vikhe Patil Jayanti.	Adhere
	Friday	6	Regular Academics	Adhere
	Saturday	7	Regular Academics	Adhere
	Sunday	8	World Thalassemia Day/ Red Cross Day	Non adherence
	Monday	9	Regular Academics	Adhere
	Tuesday	10	Regular Academics	Adhere
	Wednesday	11	Vacation	Vacation
	Thursday	12		
	Friday	13		
	Saturday	14		
	Sunday	15		
	Monday	16		
	Tuesday	17		
	Wednesday	18		
	Thursday	19		
	Friday	20		
	Saturday	21		
	Sunday	22		
	Monday	23		
	Tuesday	24		
	Wednesday	25		
	Thursday	26		
	Friday	27		
	Saturday	28		

	Sunday	29		
	Monday	30		
	Tuesday	31		