

**PROGRESSIVE EDUCATION SOCIETY'S MODERN COLLEGE OF  
PHARMACY, NIGDI, PUNE  
(AUTONOMOUS)**

**AFFILIATED TO**

**SAVITRIBAI PHULE PUNE UNIVERSITY**



**FACULTY OF SCIENCE AND TECHNOLOGY**



**RULES & SYLLABUS**

**FIRST YEAR BACHELOR OF PHARMACY (B. Pharm.) COURSE – 2025 Pattern  
(WITH EFFECT FROM ACADEMIC YEAR 2025-2026)**

## 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**

<b>Course code</b>	<b>Name of the course</b>	<b>No. of Hours per week/Total no of hours</b>	<b>Tutorial</b>	<b>Credit points</b>
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
<b>Total</b>		<b>32/34<sup>\$</sup>/36<sup>#</sup>/480/510<sup>\$</sup>/540<sup>#</sup></b>	<b>4</b>	<b>27</b>

#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
<b>Total</b>		<b>32/480</b>	<b>4</b>	<b>29</b>

\*Non University Examination (NUE)

	Democracy, Election and Governance*	2/30		2
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**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
<b>Total</b>		<b>28/420</b>	<b>4</b>	<b>24</b>

**Table-IV: Course of study for semester IV**

<b>Course code</b>	<b>Name of the course</b>	<b>No. of Hours per week/Total no of hours</b>	<b>Tutorial</b>	<b>Credit points</b>
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
<b>Total</b>		<b>31/465</b>	<b>5</b>	<b>28</b>

**Table-V: Course of study for semester V**

<b>Course code</b>	<b>Name of the course</b>	<b>No. of Hours per week/Total no of hours</b>	<b>Tutorial</b>	<b>Credit points</b>
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
<b>Total</b>		<b>27/405</b>	<b>5</b>	<b>26</b>

**Table-VI: Course of study for semester VI**

<b>Course code</b>	<b>Name of the course</b>	<b>No. of Hours per week/Total no of hours</b>	<b>Tutorial</b>	<b>Credit points</b>
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
<b>Total</b>		<b>30/450</b>	<b>6</b>	<b>30</b>

**Table-VII: Course of study for semester VII**

<b>Course code</b>	<b>Name of the course</b>	<b>No. of Hours per week/Total no of hours</b>	<b>Tutorial</b>	<b>Credit points</b>
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
<b>Total</b>		<b>28/420</b>	<b>4</b>	<b>24</b>

\* 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
<b>Total</b>		<b>24/360</b>	<b>4</b>	<b>22</b>

**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*
<b>Total credit points for the program</b>	<b>209</b>

\* 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 course through semesters I to VIII shall be conducted 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.

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**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 <sup>#</sup>	115/125\$/130 <sup>#</sup>	23/24\$/26 <sup>#</sup> Hrs	185/200\$/210 <sup>#</sup>	490/525\$/ 540 <sup>#</sup>	31.5/33\$/ 35 <sup>#</sup> Hrs	675/725\$/ 750 <sup>#</sup>

#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)

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**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

	Democracy Election and Governance*	10	15	1 Hr	25	25	2 Hr	50
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**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

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**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

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**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

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**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

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**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



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**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**

<b>Theory</b>		
<b>Criteria</b>	<b>Maximum Marks</b>	
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	
<b>Total</b>	<b>10</b>	<b>5</b>
<b>Practical</b>		
Attendance (Refer Table – XII)	2	
Based on Practical Records, Regular viva voce, etc.	3	
<b>Total</b>	<b>5</b>	

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

<b>Percentage of Attendance</b>	<b>Theory</b>	<b>Practical</b>
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

<b>Exam Type</b>	<b>Marks allotted</b>	<b>Duration</b>
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
<b>Total</b>	<b>30 marks</b>

#### 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
<b>Total</b>	<b>30 marks</b>

### Question paper pattern for practical sessional examinations

I. Synopsis	= 10
II. Experiments	= 25
III. Viva voce	= 05
<b>Total</b>	<b>40 marks</b>

## 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 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**

<b>Semester</b>	<b>For Regular Candidates</b>	<b>For Failed Candidates</b>
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)	= 5 x 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
<b>Total</b>	<b>= 75 marks</b>

**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
<b>Total</b>	<b>= 50 marks</b>

**For 35 marks paper**

I. Long Answers (Answer 1 out of 2)	= 1 x 10 = 10
II. Short Answers (Answer 5 out of 7)	= 5 x 5 = 25
<b>Total</b>	<b>= 35 marks</b>

**Question paper pattern for end semester practical examinations**

I. Synopsis	= 05
II. Experiments	= 25
III. Viva voce	= 05
<b>Total</b>	<b>= 35marks</b>

**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

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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

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	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 AB and 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 C<sub>1</sub>, C<sub>2</sub>, C<sub>3</sub>, C<sub>4</sub> and C<sub>5</sub> and the student's grade points in these courses are G<sub>1</sub>, G<sub>2</sub>, G<sub>3</sub>, G<sub>4</sub> and G<sub>5</sub>, respectively, and then students' SGPA is equal to:

$$\text{SGPA} = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4G_4 + C_5G_5}{C_1 + C_2 + C_3 + C_4 + C_5}$$

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:

$$\text{SGPA} = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4 * \text{ZERO} + C_5G_5}{C_1 + C_2 + C_3 + C_4 + C_5}$$

#### **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 status in case of F grade(s), till the course(s) is/are passed. When the course(s) is/are passed by obtaining a pass grade on subsequent examination(s) the CGPA shall only reflect the new grade and not the fail grades earned earlier. The CGPA is calculated as:

$$\text{CGPA} = \frac{C_1S_1 + C_2S_2 + C_3S_3 + C_4S_4 + C_5S_5 + C_6S_6 + C_7S_7 + C_8S_8}{C_1 + C_2 + C_3 + C_4 + C_5 + C_6 + C_7 + C_8}$$

where C<sub>1</sub>, C<sub>2</sub>, C<sub>3</sub>,.... is the total number of credits for semester I, II, III,.... and S<sub>1</sub>, S<sub>2</sub>, S<sub>3</sub>,.... 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**

**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

***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
<b>Total</b>	<b>75 Marks</b>

***Evaluation of Presentation:***

Presentation of work	25 Marks
Communication skills	20 Marks
Question and answer skills	30 Marks
<b>Total</b>	<b>75 Marks</b>

**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.

**B] Practice School /Project Coordinator:**

One of the Staff members shall be assigned as the Project coordinator for a given Academic Year.

Duties of the Coordinator:

- a) Overall co-ordination
- b) Facilitator in Guide-Student allotment.
- c) Preparation of schedules and Time – tables.
- d) All relevant documentation and filing
- e) Submission of marks to and communication with College and University exam sections.

**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 the human body.
4. Perform the various experiments related to special senses and nervous system.
5. Appreciate coordinated working patterns of different organs of each system.

### COURSE CONTENT:

Unit	Topics	Hours
<b>Unit I</b>	<b>a) Introduction to Human Body</b> – Definition and scope of anatomy and physiology– Levels of structural organization and body systems– Basic life processes– Homeostasis, Basic anatomical terminology <b>b) Cellular Level of Organization</b> – Structure and functions of cell– Transport across cell membrane, Cell division and cell junctions. General principles of cell communication– Intracellular signaling pathways: a) Contact-dependent b) Paracrine c) Synaptic d) Endocrine <b>c) Tissue Level of Organization</b> – Classification of tissues– Structure, location and functions of epithelial, muscular, nervous, and connective tissues	<b>10 hrs</b>
<b>Unit II</b>	<b>a) Skeletal System</b> – 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 <b>b) Joints</b> – Structural and functional classification– Types of joint movements and articulation	<b>08 hrs</b>
<b>Unit III</b>	<b>a) Body Fluids and Blood</b> – Body fluids– Composition and functions of blood– Hemopoiesis– Formation of hemoglobin– Anemia– Mechanisms of coagulation– Blood grouping, Rh factor– Transfusion, its significance– Disorders of blood– Reticuloendothelial system. <b>b) Lymphatic System</b> – Lymphatic organs and tissues– Lymphatic vessels– Lymph circulation and functions	<b>10 hrs</b>
<b>Unit IV</b>	<b>a) Peripheral Nervous System</b> - Classification of PNS– Structure and functions of sympathetic and parasympathetic nervous system– Origin and functions of spinal and cranial nerves <b>b) Special Senses</b> – Structure and functions of Skin, eye, ear, nose, and tongue– Disorders of special senses	<b>10 hrs</b>

<b>Unit V</b>	<b>a) Cardiovascular System</b> – Anatomy of heart– Blood circulation– Structure and functions of blood vessels (artery, vein, capillaries)– Conduction system of heart– Heartbeat and its regulation by ANS– Cardiac output and cardiac cycle– Regulation of blood pressure– Pulse– Electrocardiogram (ECG)– Heart disorders	<b>7 hrs</b>
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**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. Principles 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 Design: 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-I (Practical)**

### **4 Hours/week**

Practical physiology is complementary 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 into the subject.

1. Study of compound microscopes.
2. Microscopic study of epithelial and connective tissue
3. Microscopic study of muscular and nervous tissue
4. Identification of axial bones
5. Identification of appendicular bones
6. Introduction to hemocytometry.
7. Enumeration of white blood cell (WBC) count
8. Enumeration of total red blood corpuscles (RBC) count
9. Determination of bleeding time
10. Determination of clotting time
11. To Study the integumentary and special senses using specimen, Models etc.
12. To demonstrate positive and negative feedback mechanism.
13. Determination of erythrocyte sedimentation rate (ESR).
14. Determination of heart rate and pulse rate.
15. Recording blood pressure.

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



**Reference Books (Latest Editions)**

1. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje ,Academic Publishers Kolka

**BP102T. PHARMACEUTICAL ANALYSIS-I(Theory) 45 hours****Scope**

This course deals with the fundamentals of analytical chemistry and the 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	Topic	Hours
Unit I		
a	Pharmaceutical analysis - Definition and scope	05
	Different techniques of analysis	
	Methods of expressing concentration, Introduction to Mole Concept (units like % w/v, %v/v, % w/w, including aligation method)	
	Primary and Secondary standards (along with examples)	
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
II 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.	12
b	Complexometric titration: Classification, metal ion indicators, masking and demasking reagents, and estimation of Calcium gluconate I.P.	
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.	

(AUTONOMOUS)

a	ii. Preparation and standardization of potassium permanganate I. P., Ceric Ammonium Sulphate I. P./B. P. and Sodium Thiosulphate I. P./B. P. iii. Types of redox titrations (Principles and applications): permanganometry, cerimetry, iodimetry, iodometry, bromatometry, dichrometry, titrations with potassium iodate I. P.	08
<b>UNIT-V</b>		
	<b>Electrochemical methods of analysis</b>	
	<b>i. Conductometry</b> - Introduction, Conductivity cell, Conductometric titrations, applications.	
	<b>ii. Potentiometry</b> - Electrochemical cell, construction and working of reference (Standard Hydrogen Electrode, Silver Chloride Electrode and Calomel Electrode) and Indicator Electrodes (Metal electrodes and Glass Electrode), methods to determine end-point of potentiometric titration and applications.	10
	<b>iii. Polarography</b> - Principle and Ilkovic Equation	
b	<b>Refractometry</b> - Introduction, refractive index, specific and molar refraction, measurement of RI, Abbe's refractometer and applications.	

**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 Brookscole.
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.

**BP108P. PHARMACEUTICAL ANALYSIS-I (Practical)**

**4 Hours /week**

<b>I. Introduction to Analytical Glassware</b>		
Introduction to measuring glasswares, calibration of glasswares, introduction to labwares		1 turn
<b>I. (A) Preparation and standardization of</b>		
1	Aq. Sodium Hydroxide I. P.	3 turns
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.	
<b>I (B) Preparation of stock solutions and serial dilutions</b>		1 turn
<b>II. Assay of the following compounds along with standardization of Titrant</b>		
1	Ammonium chloride by acid-base titration	6 turns
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	Ferrous sulphate I. P. by cerimetry	
6	Copper sulphate I. P. by iodometry	
<b>III (A) To calibrate Potentiometer and Conductometer</b>		<b>1 turn</b>
<b>III. (B) Determination of Normality by electro-analytical methods</b>		
1	Conductometric titrations of strong acid against strong base	3 turns
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)	
<b>IV. Measurement of refractive index of some samples</b> (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. Mahadik K. R., Wadodkar S.G., More H. N, Pharmaceutical Analysis, Vol. I and II, Nirali Prakashan

**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**

<p><b>UNIT – I</b></p> <p>▪ <b>Historical background and development of profession of pharmacy:</b> History of profession of Pharmacy in India in relation to pharmacy education, industry and organization, Pharmacy as a career. Introduction of pharmacopoeias. Introduction to DPCO act</p> <p><b>Dosage forms:</b> Introduction to various dosage forms including ayurvedic formulations</p> <p>▪ <b>Prescription:</b> Definition, Parts of prescription, handling of Prescription and Errors in prescription.</p> <p>▪ <b>Posology:</b> Definition, Factors affecting posology. Paediatric dose calculations based on age, body weight and body surface area.</p>	<p><b>10 Hrs</b></p>
<p><b>UNIT – II</b></p> <p>• <b>Pharmaceutical calculations:</b> Weights and measures – Imperial &amp; Metric system, Calculations involving percentage solutions, allegation, proof spirit and isotonic solutions based on freezing point and molecular weight.</p> <p>• <b>Powders:</b> Definition, classification, advantages and disadvantages, Simple &amp; compound powders – official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions.</p> <p>• <b>Liquid dosage forms:</b> Advantages and disadvantages of liquid dosage forms. Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques. Classification of Solvent System</p>	<p><b>10 Hrs</b></p>
<p><b>UNIT – III</b></p> <p>• <b>Monophasic liquids:</b> Definitions, classification and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments and Lotions.</p> <p>• <b>Biphasic liquids:</b></p> <p>• <b>Suspensions:</b> Definition, advantages and disadvantages, classifications, Preparation of suspensions; Flocculated and Deflocculated suspension &amp; stability problems and methods to overcome and Evaluation tests</p>	<p><b>10 Hrs</b></p>

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<p>• <b>Emulsions:</b> Definition, classification, emulsifying agent, test for the identification of type of Emulsion, Methods of preparation &amp; stability problems and methods to overcome.</p>	
<p><b>UNIT – IV</b>  <b>Suppositories:</b> Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value &amp; its calculations, evaluation of suppositories.  <b>Pharmaceutical incompatibilities:</b> Definition, classification, physical, chemical and therapeutic incompatibilities with examples.</p>	<b>8 Hours</b>
<p><b>UNIT V</b>  <b>Semisolid dosage forms:</b> 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  <b>Introduction to Surgical aids</b> - Surgical dressings, absorbable gelatin sponge, sutures, ligatures and medicated bandages.</p>	<b>7 Hours</b>

**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. E.A. Rawlins, Bentley's Text Book of Pharmaceutics, English Language Book Society, Elsevier Health Sciences, USA.

**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) Aluminum 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) Cocoa Butter suppository
- c) Zinc Oxide suppository

**9. Semisolids (Any two experiments)**

- a) Sulphur ointment
- b) Non-staining iodine ointment with methyl salicylate
- c) Carbopol gel

**10. 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 Wilkins, 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 and Dosage Form Design, Churchill Livingstone,



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Edinburgh.

4. Indian pharmacopoeia.
5. A text book Professional Pharmacy by N.K.Jain and S.N.Sharma

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(AUTONOMOUS)  
**BP104T. PHARMACEUTICAL INORGANIC CHEMISTRY (Theory)**  
**45 Hours**

**Scope**

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

**Objectives**

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

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

**COURSE CONTENT**

UNIT	TOPIC	HOURS
<b>UNIT I</b>		
	<b>Impurities in pharmaceutical substances:</b> History of Pharmacopoeia, Source and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate	<b>07 Hours</b>
<b>General methods of preparation</b> , assay for the compounds superscripted with <b>asterisk (*)</b> , properties and medicinal uses of inorganic compounds belonging to the following classes		
<b>UNIT II</b>		
	<b>Acids, Bases and Buffers:</b> Buffer equations and buffer capacity in general, buffers in pharmaceutical system, preparation, stability, buffered isotonic solutions, measurement of tonicity, calculations and method of adjusting isotonicity	
	<b>Major extra and intracellular electrolytes:</b> Function of major physiological ions, Electrolyte used in the replacement therapy: Sodium chloride*, Potassium chloride, Calcium gluconate* and Oral Rehydration Salt (ORS), Physiological acid base balance <b>Dental products:</b> Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement.	<b>10 Hours</b>
<b>UNIT III Inorganic Compounds in Marketed Formulations (Example for each Category)</b>		

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	<b>Gastrointestinal agents</b> <b>Acidifiers:</b> Ammonium chloride* and Dil. HCl <b>Antacid:</b> Ideal properties of antacids, combinations of antacids, Sodium Bicarbonate*, Aluminum hydroxide gel, Magnesium hydroxide mixture <b>Cathartics:</b> Magnesium sulphate, Sodium orthophosphate, Kaolin and Bentonite <b>Antimicrobials:</b> Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*, Iodine and its preparations	<b>10 Hours</b>
<b>UNIT IV</b>		
	<b>Miscellaneous compounds</b> <b>Expectorants:</b> Potassium iodide, Ammonium chloride*. <b>Emetics:</b> Copper sulphate*, Sodium potassium tartarate <b>Haematinics:</b> Ferrous sulphate*, Ferrous gluconate <b>Poison and Antidote:</b> Sodium thiosulphate*, Activated charcoal, Sodium nitrite <b>Astringents:</b> Zinc Sulphate, Potash Alum <b>Tableting Aids:</b> <b>Diluents:</b> Calcium sulfate* <b>Lubricants:</b> Calcium stearate, Magnesium stearate	<b>11 Hours</b>
<b>UNIT V</b>		
	<b>Radiopharmaceuticals:</b> Radio activity, Measurement of radioactivity, Properties of $\alpha$ , $\beta$ , $\gamma$ radiations, half-life, radio isotopes and study of radio isotopes - Sodium iodide $I^{131}$ , Storage conditions, precautions & pharmaceutical application of radioactive substances.	<b>07 Hours</b>

**Recommended Books (Latest Editions)**

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London, 4 th edition.
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry, 3 rd Edition
4. M.L Schroff, Inorganic Pharmaceutical Chemistry
5. Bentley and Driver's Textbook of Pharmaceutical Chemistry
6. Anand & Chatwal, Inorganic Pharmaceutical Chemistry 7. Indian Pharmacopoeia
7. Block. Roche. Soine. Wilson, Inorganic Medicinal and Pharmaceutical Chemistry, Indian Edition, ISBN 0-8121-0443-9, Pg no: 435-437

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

**Scope**

This practical course deals with the hands-on aspects of inorganic pharmaceutical chemistry. It covers:

- conducting limit tests for common inorganic impurities (chlorides, sulphates, iron, heavy metals, arsenic, etc)
- identification tests of inorganic pharmaceutical substances and their purity
- assay and determination of inorganic pharmaceutical preparations and mixtures
- preparation of selected inorganic pharmaceutical compounds (e.g., boric acid, alum, ferrous sulphate)
- qualitative & quantitative analysis of inorganic drugs and their excipients in a laboratory environment

**Objectives**

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

1. Perform and interpret limit tests for inorganic impurities in pharmaceutical substances.
2. Carry out identification tests and purity checks for pharmaceutically important inorganic compounds.
3. Prepare standard solutions and carry out volumetric/gravimetric/complexometric titrations of selected inorganic pharmaceutical preparations.
4. Synthesize or prepare selected inorganic drugs in the laboratory & evaluate their quality.
5. Demonstrate good laboratory practices, maintain accurate records, communicate results and understand the significance of quality control in inorganic pharmaceuticals.

I. Introduction to Inorganic Chemicals & their Side effects	<b>1 turns</b>
II. Use of Merck Index to Learn Safety & Properties of Chemicals	<b>1 turns</b>
<b>III. Limit Test of the following:</b> 1. Chloride 2. Sulphate 3. Iron 4. Arsenic 5. Lead 6. Heavy metals	<b>6 turns</b>

(AUTONOMOUS)

<b>IV. Identification Test</b> 1. Magnesium Hydroxide 2. Ferrous sulphate 3. Sodium bicarbonate 4. Calcium gulconate 5. Copper sulphate	<b>3 turns</b>
<b>V. Test for Purity</b> 1. Swelling power of Bentonite 2. Neutralizing capacity of Aluminium hydroxide gel 3. Determination of Potassium iodate and iodine in potassium iodide	<b>3 turns</b>
<b>VI. Preparation of Inorganic Pharmaceuticals</b> 1. Boric acid 2. Potash alum 3. Ferrous sulphate	<b>3 turns</b>

**Recommended Books:**

1. Practical Handbook of Pharmaceutical Inorganic Chemistry by Pranita S. Shankaratti, Sejal T. Bhase, Shruti S. Chame & Snehal D. Barve — JEC Publications.
2. A Practical Book of Pharmaceutical Inorganic Chemistry (As Per PCI Latest Pattern) by Ketan B. Patil, Narendra B. Patil & Paresh A. Patil — IP Innovative Publication.
3. Practical Pharmaceutical Inorganic Chemistry (Simplified) by K. S. Jain, J. N. Kadam & M. G. Shinde — Nirali Prakashan.
4. Practical Pharmaceutical Chemistry Vol I & II by A.H. Beckett & J.B. Stenlake (Stahlon Press of University of London).
5. A. I. Vogel – Textbook of Quantitative Inorganic Analysis, 5th Edition, Longman Group Ltd.
6. G. R. Chatwal & S. K. Anand – Instrumental Methods of Chemical Analysis, Himalaya Publishing House.
7. R. M. Verma – Analytical Chemistry, CBS Publishers & Distributors.
8. WHO & OSHA laboratory safety guidelines
9. The Merck Index — an Encyclopedia of Chemicals, Drugs, and Biologicals, 15th Edition, Royal Society of Chemistry.

**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. Effectively manage the team as a team player
4. Develop interview skills
5. Develop Leadership qualities and essentials

**COURSE CONTENT**

<b>UNIT – I</b>	<b>Communication Skills:</b> Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context	<b>7 Hrs</b>
	<b>Barriers to communication:</b> Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers	
	<b>Perspectives in Communication:</b> Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment	
<b>UNIT – II</b>	<b>Elements of Communication:</b> Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical	<b>7 Hrs</b>
	<b>Communication Styles:</b> Introduction, The Communication Styles Matrix with example for each -Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style	
<b>UNIT – III</b>	<b>Basic Listening Skills:</b> Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations	<b>7 Hrs</b>
	<b>Effective Written Communication:</b> Introduction, When and When Not to Use Written Communication - Complexity of the Topic, Amount of Discussion' Required, Shades of Meaning, Formal Communication	
	<b>Writing Effectively:</b> Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message	
<b>UNIT – IV</b>	<b>Interview Skills:</b> Purpose of an interview, Do's and Dont's of an interview	<b>5 Hrs</b>
	<b>Giving Presentations:</b> Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery	
<b>UNIT – V</b>	<b>Group Discussion:</b> Introduction, Communication skills in group discussion, Do's and Dont's of group discussion.	<b>4 Hrs</b>

## **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, 2<sup>nd</sup> Edition, Pearson Education, 2011
2. Communication skills, Sanjay Kumar, Pushpalata, 1<sup>st</sup> Edition, Oxford Press, 2011
3. Organizational Behaviour, Stephen .P. Robbins, 1<sup>st</sup> Edition, Pearson, 2013
4. Brilliant- Communication skills, Gill Hasson, 1<sup>st</sup> Edition, Pearson Life, 2011
5. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5<sup>th</sup> Edition, Pearson, 2013
6. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1<sup>st</sup> Edition Universe of Learning LTD, 2010
7. Communication skills for professionals, Konar nira, 2<sup>nd</sup> Edition, New arrivals –PHI, 2011
8. Personality development and soft skills, Barun K Mitra, 1<sup>st</sup> Edition, Oxford Press, 2011
9. Soft skill for everyone, Butter Field, 1<sup>st</sup> Edition, Cengage Learning india pvt.ltd, 2011
10. Soft skills and professional communication, Francis Peters SJ, 1<sup>st</sup> Edition, Mc Graw Hill Education, 2011

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11. Effective communication, John Adair, 4<sup>th</sup> Edition, Pan Mac Millan, 2009
12. Bringing out the best in people, Aubrey Daniels, 2<sup>nd</sup> Edition, Mc Graw Hill, 1999.



**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

<b>UNIT I</b>	<p><b>Living world:</b></p> <ul style="list-style-type: none"> <li>• Definition and characters of living organisms</li> <li>• Diversity in the living world</li> <li>• Binomial nomenclature</li> <li>• Five kingdoms of life and basis of classification. Salient features of Monera, Potista, Fungi, Animalia and Plantae, Virus,</li> </ul> <p><b>Morphology of Flowering plants</b></p> <ul style="list-style-type: none"> <li>• Morphology of different parts of flowering plants – Root, stem, inflorescence, flower, leaf, fruit, seed.</li> <li>• General Anatomy of Root, stem, leaf of monocotyledons &amp; Dicotylidons</li> </ul>	<b>7Hours</b>
<b>UNIT II</b>	<p><b>Body fluids and circulation</b> 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</p> <p><b>Digestion and Absorption</b> Human alimentary canal and digestive glands Role of digestive enzymes Digestion, absorption and assimilation of digested food</p> <p><b>Breathing and respiration</b> Human respiratory system Mechanism of breathing and its regulation Exchange of gases, transport of gases and regulation of respiration Respiratory volumes</p>	<b>7Hours</b>
<b>UNIT III</b>	<p><b>Excretory products and their elimination</b></p> <ul style="list-style-type: none"> <li>• Modes of excretion</li> <li>• Human excretory system- structure and function</li> <li>• Urine formation</li> <li>• Rennin angiotensin system</li> </ul>	<b>7Hours</b>

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	<b>Neural control and coordination</b> <ul style="list-style-type: none"> <li>• Definition and classification of nervous system</li> <li>• Structure of a neuron</li> <li>• Generation and conduction of nerve impulse</li> <li>• Structure of brain and spinal cord</li> <li>• Functions of cerebrum, cerebellum, hypothalamus and medulla oblongata</li> </ul>	
	<b>Chemical coordination and regulation</b> <ul style="list-style-type: none"> <li>• Endocrine glands and their secretions</li> <li>• Functions of hormones secreted by endocrine glands</li> </ul>	
	<b>Human reproduction</b> <ul style="list-style-type: none"> <li>• Parts of female reproductive system</li> <li>• Parts of male reproductive system</li> <li>• Spermatogenesis and Oogenesis</li> <li>• Menstrual cycle</li> </ul>	
<b>UNIT IV</b>	<b>Plants and mineral nutrition:</b> Essential mineral, macro and micronutrients Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation	<b>5Hours</b>
	<b>Photosynthesis</b> Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis	
<b>UNIT V</b>	<b>Plant respiration:</b> Respiration, glycolysis, fermentation (anaerobic).	<b>4Hours</b>
	<b>Plant growth and development</b> Phases and rate of plant growth, Condition of growth, Introduction to plant growth regulators	
	<b>Cell - The unit of life</b> Structure and functions of cell and cell organelles. Cell division	
	<b>Tissues</b> Definition, types of tissues, location and functions.	

**Text Books**

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

**Reference Books**

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

**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**

<b>UNIT – I</b>	<p><b>Partial fraction</b> Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction, Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics.</p> <p><b>Logarithms</b> Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems.</p> <p><b>Function:</b> Real Valued function, Classification of real valued functions</p> <p><b>Limits and continuity :</b> Introduction, Limit of a function, Definition of limit of a function (<math>\square - \square n n</math> definition),  <math display="block">\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = na^{n-1}, \quad \lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1,</math></p>	<b>6Hours</b>
<b>UNIT – II</b>	<p><b>Matrices and Determinant:</b> 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, Application of Matrices in solving Pharmacokinetic equations Respiratory volumes</p>	<b>6Hours</b>

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<b>UNIT – III</b>	<b>Calculus</b> <b>Differentiation</b> : Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function , Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula), Derivative of the quotient of two functions (Quotient formula) – <b>Without Proof</b> , Derivative of $x^n$ w.r.t $x$ , where $n$ is any rational number, Derivative of $e^x$ , Derivative of $\log_e x$ , Derivative of $a^x$ , Derivative of trigonometric functions from first principles ( <b>without Proof</b> ), Successive Differentiation, Conditions for a function to be a maximum or a minimum at a point. Application	<b>6 Hours</b>
<b>UNIT –IV</b>	<b>Analytical Geometry</b> <b>Introduction:</b> Signs of the Coordinates, Distance formula, <b>Straight Line</b> : 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 <b>Integration:</b> Introduction, Definition, Standard formulae, Rules of integration , Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application	<b>6 Hours</b>
<b>UNIT-V</b>	<b>Differential Equations</b> : Some basic definitions, Order and degree, Equations in separable form , Homogeneous equations, Linear Differential equations, Exact equations, <b>Application in solving Pharmacokinetic equations</b> <b>Laplace Transform</b> : Introduction, Definition, Properties of Laplace transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives, Application to solve Linear differential equations, <b>Application in solving Chemical kinetics and Pharmacokinetics equations</b>	<b>6 Hours</b>

**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**

**BP201T: 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 haematological 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	Topics Covered	Hours
<b>Unit I</b>	<b>a) Nervous System</b> – Organization of nervous system– Neuron, neuroglia– Classification & properties of nerve fibers– Electrophysiology, action potential, nerve impulse– Receptors, synapse, neurotransmitters <b>b) Central Nervous System</b> – Meninges, brain ventricles, cerebrospinal fluid (CSF)– Structure & functions of cerebrum, brain stem, cerebellum– Spinal cord: gross structure, afferent & efferent tracts– Reflex activity	<b>10 hrs</b>
<b>Unit II</b>	<b>a) Digestive System</b> – GI tract anatomy– Functions of stomach (acid secretion, parasympathetic control, pepsin action)– Anatomy & functions of small and large intestine– Salivary glands, pancreas, liver– GI movements, digestion & absorption of nutrients– Disorders of GIT <b>b) Energetics</b> – ATP formation and role– Creatinine phosphate– Basal Metabolic Rate (BMR)	<b>08 hrs</b>
<b>Unit III</b>	<b>a) Respiratory System</b> – Anatomy of respiratory system and lungs– Mechanism & regulation of respiration– Lung volumes and capacities– Transport of respiratory gases– Artificial respiration and resuscitation methods, disorders of respiratory system <b>b) Urinary System</b> – Anatomy of kidney, nephron, and urinary tract– Functions of kidney and urinary tract– Physiology of urine formation–	<b>10 hrs</b>

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	Micturition reflex– Role of kidneys in acid-base balance– Renin-Angiotensin System (RAS)– Kidney disorders	
<b>Unit IV</b>	<b>a) Endocrine System</b> – Classification of hormones– Mechanism of hormone action– Structure & functions of: • Pituitary gland • Thyroid gland • Parathyroid gland • Adrenal gland • Pancreas • Pineal gland • Thymus– Endocrine disorders	<b>08 hrs</b>
<b>Unit V</b>	<b>a) Reproductive System</b> – Anatomy & functions of male and female reproductive systems– Sex hormones– Physiology of menstruation, fertilization– Spermatogenesis & oogenesis– Pregnancy & parturition, disorders of reproductive system <b>b) Introduction to Genetics</b> Chromosomes, genes and DNA– Protein synthesis– Genetic pattern of inheritance	<b>09 hrs</b>

**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



## **BP207P. HUMAN ANATOMY AND PHYSIOLOGY-II (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 determine the Platelet count.
2. To perform the differential leukocyte count (DLC).
3. Determination of osmotic fragility of RBCs.
4. To study the nervous system using specimen, models, etc.,
5. To study the endocrine system using specimen, models, etc
6. To demonstrate the general neurological examination
7. To demonstrate the function of olfactory nerve
8. To examine the different types of taste.
9. To demonstrate the visual acuity
10. To demonstrate the reflex activity
11. Recording of body temperature.
12. Determination of tidal volume and vital capacity.
13. Estimation of Haemoglobin Content
14. Determination of Blood Group.
15. Study of Digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens.
16. Recording of basal mass index.
17. Study of family planning devices and pregnancy diagnosis test.
18. Demonstration of total blood count by cell analyser.
19. Permanent slides of vital organs and gonads.
20. Visit to Hospital/ Pathology Laboratory.

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

**Reference Books (Latest Editions)**

1. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje, Academic Publishers Kolkata

**BP202T. PHARMACEUTICAL ORGANIC CHEMISTRY –I (Theory)****45 Hrs**

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

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

- 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 compound.

**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.**

<b>UNIT-I</b>	<b>(7Hrs)</b>
<b>Basic Principles of Organic Chemistry:</b> Atomic structure, Hybridization of atomic orbitals of carbon, nitrogen and oxygen to form molecular orbitals. Molecular orbital theory, Molecular orbitals, Types of bonds, bond fission, intermolecular forces, inductive effect, steric effect, electromeric, mesomeric effect and resonance, hyperconjugation, concept of tautomerism. Bonding and Antibonding orbitals, Bond dissociation energy, Polarity of molecules	<b>03 Hrs</b>
<b>Classification, nomenclature and isomerism:</b> Classification of Organic Compounds. Common and IUPAC systems of nomenclature of organic compounds (up to 10 Carbons open chain and carbocyclic compounds) Structural isomerism in organic compounds).	<b>04 Hrs</b>
<b>UNIT II</b>	<b>(10Hrs)</b>
<b>Alkanes*:</b> SP <sup>3</sup> hybridization in alkanes, Halogenation of alkanes, uses of paraffins.	<b>02 Hrs</b>

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<b>Alkenes*:</b> Stabilities of alkenes, SP <sup>2</sup> hybridization in alkenes E1 and E2 reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeffs orientation and evidences. E1 versus E2 reactions, Factors affecting E1 and E2 reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation.	<b>05 Hrs</b>
<b>Conjugated dienes*:</b> Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement	<b>03 Hrs</b>
<b>UNIT III</b>	<b>(10Hrs)</b>
<b>Alkyl Halides-</b> SN1 and SN2 reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations. SN1 versus SN2 reactions, Factors affecting SN1 and SN2 reactions Structure and uses of ethyl chloride, Chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform.	<b>06 Hrs</b>
<b>Alcohols*-</b> Qualitative tests, Structure and uses of Ethyl alcohol, Methyl alcohol, Structure and uses of chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol	<b>04 Hrs</b>
<b>UNIT IV</b>	<b>(10Hrs)</b>
<b>Carbonyl compounds* (Aldehydes and ketones)-</b> Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation,	<b>04 Hrs</b>
Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation	<b>04 Hrs</b>
Qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanilin, Cinnamaldehyde	<b>02 Hrs</b>
<b>UNIT V</b>	<b>(8 Hrs)</b>
<b>Carboxylic acids*-</b> Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids, amide and ester Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid. Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid	<b>05 Hrs</b>
<b>Aliphatic amines*-</b> Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine	<b>03 Hrs</b>

**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, Ved., 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

**BP208P. PHARMACEUTICAL ORGANIC CHEMISTRY – I (Practical)**  
**4 Hours/Week**

<b>1</b>	Important Reagents and Their Preparations	<b>1 Turn</b>
<b>2</b>	Introduction and Demonstration of Chem Draw Software	<b>1 Turn</b>
<b>3</b>	Construction of molecular models/ Working Models	<b>1 Turn</b>
<b>4</b>	Systematic qualitative analysis of unknown organic compounds like <ul style="list-style-type: none"><li>• Preliminary test: color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc.</li><li>• Detection of elements like nitrogen, sulphur and halogen by Lassaigne's test.</li><li>• Solubility test</li><li>• Functional group test like phenols, amides, carbohydrates, amines, carboxylic acids, aldehydes and ketones, alcohols, esters, aromatic and halogenated hydrocarbons, nitro compounds and anilides.</li><li>• Melting point/Boiling point of organic compounds.</li><li>• Identification of the unknown compound from the literature using melting point/ boiling point.</li></ul>	<b>10 Turns</b>
<b>5</b>	Preparation of suitable solid derivatives from organic compounds	<b>2 Turns</b>

**Recommended Books (Latest Editions)**

1. Practical Organic Chemistry by Mann and Saunders.
2. Vogel's text book of Practical Organic Chemistry
3. Advanced Practical organic chemistry by N.K.Vishnoi.
4. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.
5. Reaction and reaction mechanism by Ahluwalia/Chatwal.

### 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		10Hours
	<b>a) Biomolecules</b> Introduction, classification, chemical nature and biological role of carbohydrates, lipids, nucleic acids, amino acids and proteins.	3 Hr
	<b>b) Carbohydrate metabolism</b> i. Glycolysis – Pathway, energetics and significance. ii. Citric acid cycle- Pathway, energetics and significance. iii. HMP shunt and its significance; Glucose-6-Phosphate dehydrogenase (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. Clinical Data Based Case Study.	1 Hr 1 Hr 1 Hr 1 Hr 1 Hr 1 Hr
UNIT –II		8 Hours
	<b>a) Biological oxidation</b> i. Electron transport chain (ETC) and its mechanism. ii. Oxidative phosphorylation & its mechanism and substrate level. Phosphorylation Inhibitor	2 Hr 1 Hr

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	<b>iii. ETC and oxidative phosphorylation / uncouplers.</b>	1 Hr
	<b>b) Bioenergetics</b> <b>i.</b> Concept of free energy, endergonic and exergonic reaction, relationship between free energy, enthalpy and entropy. <b>ii.</b> Energy rich compounds; classification; biological significances of ATP and cyclic AMP.	2Hr 2Hr
<b>UNIT-III</b>		<b>10Hours</b>
	<b>a) Lipid metabolism</b> <b>i.</b> $\beta$ -Oxidation of saturated fatty acid (Palmitic acid). <b>ii.</b> Formation and utilization of ketone bodies; ketoacidosis. <b>iii.</b> <i>De novo</i> 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.	1 Hr 1 Hr 1 Hr 1 Hr 1 Hr
	<b>b) Amino acid metabolism</b> <b>i.</b> General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders <b>ii.</b> Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenylketonuria, alcaptonuria, tyrosinemia) <b>iii.</b> Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline <b>iv.</b> Catabolism of heme; hyperbilirubinemia	2 Hr 1 Hr 1 Hr 1 Hr
<b>UNIT-IV</b>		<b>10Hours</b>
	<b>Nucleic acid metabolism and genetic information transfer</b> <b>i.</b> Biosynthesis of purine and pyrimidine nucleotides. <b>ii.</b> Catabolism of purine nucleotides and hyperuricemia and gout disease. <b>iii.</b> Organization of mammalian genome. <b>iv.</b> Structure of DNA and RNA and their functions. <b>v.</b> DNA replication (semi conservative model) <b>vi.</b> Transcription or RNA synthesis. <b>vii.</b> Genetic code, Translation or Protein synthesis and inhibitors	2 Hr 2 Hr 1 Hr 1 Hr 1 Hr 1 Hr 2 Hr
<b>UNIT-V</b>		<b>07 hours</b>
	<b>Enzymes</b> <b>i.</b> Introduction, properties, nomenclature and IUB classification of enzymes. <b>ii.</b> Enzyme kinetics (Michaelis plot, Line Weaver Burke plot). <b>iii.</b> Enzyme inhibitors with examples. <b>iv.</b> Regulation of enzymes: enzyme induction and repression, allosteric enzyme-regulation. <b>v.</b> Therapeutic and diagnostic applications of enzymes and isoenzymes. <b>vi.</b> Coenzymes–Structure and biochemical functions; Co-factors.	1 Hr 2 Hr 1 Hr 1 Hr 1 Hr 1 Hr



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**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.

**BP209P. BIOCHEMISTRY (Practical)**  
**4 Hours/week**

Sr. No.	Title of Experiments	Turns
1.	Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch)	2 Turns
2.	Identification tests for Amino acids (any one aliphatic or aromatic)	2 Turns
3.	Identification tests for Proteins (albumin and Casein)	1 Turn
4.	Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method)	1 Turn
5.	Qualitative analysis of urine for abnormal constituents	2 Turns
6.	Introduction to Sample Collection Techniques. (video demonstration)	1 Turn
7.	Determination of blood creatinine	1 Turn
8.	Determination of blood sugar	1 Turn
9.	Determination of serum total cholesterol	1 Turn
10.	Preparation of buffer solution and measurement of pH	1 Turn
11.	Study of enzymatic hydrolysis of starch	1 Turn
12.	Determination of Salivary amylase activity	1 Turn
13.	Study the effect of Temperature on Salivary amylase activity.	1 Turn
14.	Study the effect of substrate concentration on salivary amylase activity.	1 Turn
15.	Estimation of SGOT and SGPT in Serum.	1 Turn

**References:**

1. David T. Plummer, Introduction of Practical Biochemistry. 3/Ed, Tata McGraw-Hill Education Pvt. Ltd.
2. Rajagopal and Ramakrishna, Practical Biochemistry for Medical students, Orient BlackSwan (1983)
3. Harold Varley, Varley's Practical Clinical Biochemistry, 6/Ed., CBS Publishers, New Delhi.
4. David T. Plummer, Introduction to Practical Biochemistry, III (ed.), McGraw-Hill Publishing Co., New York, 1987.
5. Alan H. Gowenlock, Varley's Practical Clinical Biochemistry, VI (ed.), Butterworth Heinemann Ltd., UK & CBS Publication, New Delhi, 2002.

## BP204T – PATHOPHYSIOLOGY (Theory) 45 Hours

### Scope:

Pathophysiology is the study of causes of diseases and the reactions of the body to such disease-producing factors. This subject is designed to impart a thorough knowledge of the pathological aspects of various disease conditions with relevance to pharmacological applications. It provides a foundational understanding of the pathophysiological mechanisms that occur during diseases. The study of this subject helps students gain essential knowledge required for the safe, rational, and effective practice of medicine. It also helps in understanding the pathology subject as a whole. It is important to note that pharmacotherapy of drugs is not considered for examination purposes in this subject, as it deals specifically with the pathological aspects.

### Objectives:

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

1. Describe the etiology (cause) and pathogenesis (development mechanism) of the selected disease states.
2. Identify and explain the signs and symptoms associated with various diseases.

### COURSE CONTENT

Unit	Topics Covered	Hours
<b>Unit I</b>	<b>Basic principles of Cell Injury and Adaptation</b> <ul style="list-style-type: none"> <li>• Definitions &amp; causes of cellular injury</li> <li>• Pathogenesis: Membrane, mitochondrial, ribosomal, nuclear damage</li> <li>• Morphology: Atrophy, Hypertrophy, Hyperplasia, Metaplasia, Dysplasia</li> <li>• Cell swelling, intracellular accumulation, calcification, enzyme leakage, cell death</li> <li>• Acid-base imbalance (acidosis/alkalosis), Electrolyte imbalance</li> </ul> <b>Inflammation and Repair</b> <ul style="list-style-type: none"> <li>• Signs and types of inflammation</li> <li>• Mechanisms: vascular permeability, WBC migration</li> <li>• Mediators of inflammation</li> <li>• Principles of wound healing in skin</li> </ul>	<b>10 hrs</b>
<b>Unit II</b>	<b>Cardiovascular system</b> <ul style="list-style-type: none"> <li>• Hypertension</li> <li>• Congestive heart failure</li> <li>• Ischemic heart disease (Angina, MI, Atherosclerosis, Arteriosclerosis)</li> </ul> <b>Respiratory system</b> <ul style="list-style-type: none"> <li>• Asthma</li> <li>• Chronic Obstructive Airway Disease (COAD)</li> </ul> <b>Renal system</b> <ul style="list-style-type: none"> <li>• Acute renal failure</li> <li>• Chronic renal failure</li> </ul>	<b>10 hrs</b>
<b>Unit III</b>	<b>Haematological diseases</b>	<b>12 hrs</b>

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	<ul style="list-style-type: none"> <li>• Iron deficiency anaemia, Megaloblastic anaemia, Sickle cell anaemia, Thalassemia, Haemophilia</li> </ul> <p><b>Endocrine system</b></p> <ul style="list-style-type: none"> <li>• Diabetes mellitus</li> <li>• Thyroid disorders (Hypo/Hyperthyroidism, Goitre)</li> <li>• Sex hormone disorders (Amenorrhoea, PCOS, Hypogonadism)</li> </ul> <p><b>Nervous system</b></p> <ul style="list-style-type: none"> <li>• Epilepsy</li> <li>• Parkinson's disease</li> <li>• Stroke</li> <li>• Psychiatric disorders: Depression, Schizophrenia, Alzheimer's</li> </ul> <p><b>Gastrointestinal system</b></p> <ul style="list-style-type: none"> <li>• Peptic ulcer</li> <li>• Inflammatory bowel disease</li> <li>• Jaundice</li> <li>• Hepatitis (A–F)</li> <li>• Alcoholic liver disease</li> </ul>	
<b>Unit IV</b>	<p><b>Diseases of Bones &amp; Joints</b></p> <ul style="list-style-type: none"> <li>• Rheumatoid arthritis</li> <li>• Osteoporosis</li> <li>• Gout</li> </ul> <p><b>Cancer</b></p> <ul style="list-style-type: none"> <li>• Classification</li> <li>• Etiology</li> <li>• Pathogenesis</li> </ul>	<b>6 hrs</b>
<b>Unit V</b>	<p><b>Infectious diseases</b></p> <ul style="list-style-type: none"> <li>• Tuberculosis, Leprosy</li> <li>• Malaria, Dengue</li> <li>• Meningitis, Typhoid</li> <li>• Urinary Tract Infections (UTI)</li> </ul> <p><b>Sexually Transmitted Diseases (STDs)</b></p> <ul style="list-style-type: none"> <li>• AIDS</li> <li>• Syphilis</li> <li>• Gonorrhoea</li> </ul>	<b>7 hrs</b>

**References:**

1. Pathologic Basis of Disease by Vinay Kumar, Abul K. Abas, Jon C. Aster; Robbins & Cotran; South Asia edition; India; Elsevier;2014.
2. Text book of Pathology by Harsh Mohan; 6th edition; India; Jaypee Publications;2010.
3. Basis of Therapeutics by Laurence B, Bruce C, Bjorn K.; Goodman Gilman's The Pharmacological; 12th edition; New York; McGraw-Hill;2011.
4. Best and Taylor's Physiological basis of medical practice by Best, Charles Herbert 1899-

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- 1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); 12th ed; united states.
5. William and Wilkins, Baltimore;1991 [1990printing].
  6. Davidson's Principles and Practice of Medicine by Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston; 21st edition; London; ELBS/Churchill Livingstone;2010.
  7. Textbook of Medical Physiology by Guyton A, John. E Hall; 12th edition; WB Saunders Company;2010.
  8. Pharmacotherapy: A Pathophysiological Approach by Joseph DiPiro, Robert L. Talbert, Gary Yee, Barbara Wells, L. Michael Posey; 9th edition; London; McGraw-Hill Medical; 2014.
  9. Basic Pathology by V. Kumar, R. S. Cotran and S. L. Robbins; 6th edition; Philadelphia; WB Saunders Company;1997.
  10. Clinical Pharmacy and Therapeutics by Roger Walker, Clive Edwards; 3rd edition; London; Churchill Livingstone publication;2003. 68

**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 Hours**

**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**

<b>UNIT – I</b>	<b>Number system:</b> 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	<b>06 hours</b>
	<b>Concept of Information Systems and Software:</b> Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project	
<b>UNIT – II</b>	<b>Web technologies:</b> Introduction to HTML, XML, CSS and Programming languages, introduction to web servers and Server Products, Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database	<b>06 hours</b>
<b>UNIT – III</b>	<b>Application of computers in Pharmacy</b> – 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	<b>06 hours</b>
<b>UNIT – IV</b>	<b>Bioinformatics:</b> Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery.	<b>06 hours</b>
<b>UNIT – V</b>	<b>Computers as data analysis in Preclinical development:</b> Chromatographic data analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMs)	<b>06 hours</b>

**BP210P. COMPUTER APPLICATIONS IN PHARMACY (Practical)**

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- 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**

<b>Unit-I</b>	The Multidisciplinary nature of environmental studies Natural Resources Renewable and non-renewable resources: 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	<b>10hrs</b>
<b>Unit-II</b>	Ecosystems <ul style="list-style-type: none"><li>▪ Concept of an ecosystem.</li><li>▪ Structure and function of an ecosystem.</li><li>▪ Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)</li></ul>	<b>10hrs</b>
<b>Unit-III</b>	Environmental Pollution: Air pollution; Water pollution; Soil pollution	<b>10hrs</b>

**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



**PROGRESSIVE EDUCATION SOCIETY'S MODERN COLLEGE OF PHARMACY, NIGDI, PUNE**

**(AUTONOMOUS)**

Encyclopedia, Jaico Publ. House, Mumbai, 1196p

7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.

8. Down of Earth, Centre for Science and Environmen