



Amrutvahini Sheti & Shikshan Vikas Sanstha's

AMRUTVAHINI COLLEGE OF PHARMACY, SANGAMNER

- Approved by Pharmacy Council of India (PCI), New Delhi
- Permanently Affiliated to Savitribai Phule Pune University
- University ID : PU/AN/Pharm/83, 2004; Puncode : CPHA016760
- DTE CODE : 5194
- A.I.S.H.E. Code : C-42026
- NAAC "A" Grade

An Autonomous College

Ref. AV/CP/588

Date: 13/10/2025

Academic Program Regulations-2025-26:B.Pharm

The Bachelor of Pharmacy (B.Pharm) program being offered at Amrutvahini College of Pharmacy, Sangamner (An Autonomous College) under the title "Academic Program Regulations-2025 has been duly approved by the Academic Council of Amrutvahini Sheti & Shikshan Vikas Sanstha's, Amrutvahini College of Pharmacy, Sangamner (An Autonomous College).

Dr.M.J.Chavan
Chairman-Academic Council & Principal



॥ विद्या सर्वस्य भूषणम् ॥

AMRUTVAHINI[®]

Since 1978

Amrutvahini Sheti & Shikshan Vikas Sanstha's
Amrutvahini College of Pharmacy, Sangamner
(An Autonomous College)

Academic Program Regulations-2025
[Framed under Regulation 6, 7 & 8 of the Bachelor of Pharmacy (B. Pharm) course regulations
2014]

BACHELOR OF PHARMACY

Academic Year
2025-26
[Revision 0.0]

Amrutvahini Sheti & Shikshan Vikas Sanstha's
Amrutvahini College of Pharmacy, Sangamner
Nashik-Pune Highway, Ghulewadi, Amrutnagar,
Tal. Sangamner, Dist.-Ahilynagar, Pin Code:- 422608

Vision

Our college will be recognized as socially cautious centre of excellence in innovative education through its contribution in training, scholarly research in pharmacy profession and services to society.

Mission

For translation of our vision into reality college is striving to:

M1: Provide value based student centric and sustained quality pharmaceutical education.

M2: Foster advanced and innovative research that benefits pharmaceutical industry and community.

M3: Encourage and strengthen leadership, competitiveness, ethical reasoning and intellectual curiosity.

Program Educational Objectives

PEO 1: Graduates of the program will be having strong background and skills in pharmaceutical sciences and able to use these tools in Pharmaceutical industry and/or institutes wherever necessary for success.

PEO 2: Technically sound and mentally robust with critical thinking abilities to excel in career.

PEO 3: Professional and ethical attitude and have ability to address healthcare issues of community.

PROGRAM OUTCOMES

PO	Title	Statement
PO1	Pharmacy Knowledge	Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioural, social, and administrative pharmacy sciences; and manufacturing practices.
PO2	Planning Abilities	Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines
PO2	Problem analysis	Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions
PO4	Modern tool usage	Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.
PO5	Leadership skills	Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfilment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and well-being.

PO6	Professional Identity	Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees)
PO7	Pharmaceutical Ethics	Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behaviour that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions
PO8	Communication	Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.
PO9	The Pharmacist and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.
PO10	Environment and sustainability	Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO11	Lifelong learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self- assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

TABLE OF CONTENT

Sr. No.	Title
1	Introduction
2	Regulations
3	Short Title and Commencement
4	Minimum qualification for admission
5	Duration of the program
6	Medium of instruction and examinations
7	Working days in each semester
8	Attendance and progress
9	Program/Course credit structure
10	Academic work
11	Course of study
12	Program Committee
13	Examinations/Assessments
14	Improvement of internal assessment
15	Promotion and award of grades
16	Award of performance grades
17	Carry forward of marks
18	Academic Progression
19	Grading of performances
20	Practice School
21	Industrial training (Desirable)
22	Project work
23	Award of Ranks
24	Award of degree
25	Duration for completion of the program of study
26	Re-admission after break of study
27	Addendum

INTRODUCTION

RECOMMENDATIONS OF NATIONAL REGULATORY AUTHORITIES

The University Grants Commission (UGC) came with recommendations for improving the quality and effectiveness of higher education provisions in the country. The ministry of Human Resource Development at the Central level and the Ministry of Higher & Technical Education, Government of Maharashtra have also repeatedly stressed on the need for universities to pay prompt attention to improve the quality of education. The National education policy 2020 (NEP 2020) incorporates Indian Knowledge System (IKS) principles to enhance interdisciplinary learning, integrate traditional wisdom with modern knowledge, and foster a more inclusive and holistic educational experience. An important concern voiced more strongly in recent times, is the need to develop a Choice-Based Credit System (CBCS) in tune with global trends and the adoption of a sound grading system for reflecting learner performance. This is in line with the recommendation of the UGC in its Action Plan for Academic and Administrative Reforms (Ref. UGC letters January 2008; March 2009).

“Curricular flexibility and learners’ mobility are issues that warrant our urgent attention. These can be addressed by introducing credit based courses and credit accumulation. In order to provide with some degree of flexibility to learners, we need to provide flexibility in course selection and also a minimum as well as a maximum permissible span of time in which a course can be completed by a learner. The Choice-Based Credit System (CBCS) imminently fits into the emerging socioeconomic milieu and could effectively respond to the educational and occupational aspirations of the upcoming generations. In view of this, institutions of higher education in India would do well to invest thought and resources into introducing CBCS. Aided by modern communication and information technology, CBCS has a high probability to be operationalized efficiently and effectively — elevating learners, institutions and higher education system in the country to newer heights...”.

RATIONALE FOR INTRODUCTION OF CREDIT AND GRADING SYSTEM

The UGC while outlining the several unique features of the Choice-Based Credit System (CBCS) has, in fact, given in a nutshell, the rationale for its introduction. Among the features highlighted by the UGC are: Enhanced learning opportunities, ability to match learners, scholastic needs and aspirations, inter-institution transferability of learners (following the completion of a semester), part-completion of an academic programme in the institution of enrolment and part-completion in a specialized (and recognized) institution, improvement in educational quality and excellence, flexibility for working learners to complete the programme over an extended period of time, standardization and comparability of educational programmes across the country, etc. This Choice Based Credit System enables a much-required shift in focus from teacher-centric to learner-centric education since the workload estimated is based on the investment of time in learning, not in teaching. It also focuses on continuous evaluation which will enhance the quality of education. It can be concluded from the above discussion that it is very much essential to implement the Choice Based Credit System in higher education in India. Course credit structure, examination/assessment and grading are mainly focused aspects of this manual and discussed in subsequent chapters.

DIRECTIVES OF PHARMACY COUNCIL OF INDIA

The Pharmacy Council of India (PCI) in exercise of the powers conferred to it under the sections 10 and 18 of the Pharmacy Act 1948 (8 of 1948), with the approval of the Central Government, had made the Bachelor of Pharmacy (B. Pharm.) Course Regulations, 2014 and Master of Pharmacy (M. Pharm.) Course regulations vide Gazette dated December 10, 2014. Further as per regulations 6 and 8 of the above course regulations the PCI has also prescribed the Rules and Syllabus for B. Pharm. course and Scheme and Syllabus for M. Pharm., its letter Ref 14-136/2016-PCI and Ref 14- 154/2015 PCI dated December 21, 2016, with the subject heading “Statutory Scheme/Rules and syllabus for B. Pharm and M. Pharm. courses”. It is thus mandatory to implement the directives of PCI with regard to the Rules/Regulations/Syllabus for recognition and extension of approval of B. Pharm. and M. Pharm. programs of institutes/Universities by the PCI

CHAPTER- I: REGULATIONS

1. Short Title and Commencement

These regulations shall be called as “The Revised Regulations for the B. Pharm. Degree Program Choice based credit system (CBCS) of the Pharmacy Council of India, New Delhi”. They shall come into effect from the Academic Year 2025-26. The regulations framed are subject to modifications from time to time by the authorities of Amrutvahini Sheti & Shikshan Vikas Sanstha’s Amrutvahini College of Pharmacy, Sangamner as per the directions of the 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 the authorities of Amrutvahini Sheti & Shikshan Vikas Sanstha’s, Amrutvahini College of Pharmacy, Sangamner as per the directions of the Pharmacy Council of India.

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 100 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.

7.1.2 Minimum credit requirements: The minimum credit points required for award of the B. Pharm degree for different categories are as follows (Table I);

Table I Minimum Credit required for award of Degree

Category	Credit points required for award of B.Pharm degree			
	From the courses of University examination*	From the courses of Non-University examination	From Extra-curricular activities	Total
Physics, Chemistry, Mathematics and Biology (PCMB)	204	10	02	216
Physics, Chemistry and Biology (PCB)	204	12	02	218
Physics, Chemistry and Mathematics (PCM)	204	13	02	219
Lateral entry	158	07	02	167+52 (credit points transferred from D Pharm program) = 219
*are only taken for the calculation of SGPA/CGPA				

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. The teacher should maintain the teaching plan and syllabus completion of respective courses for regular monitoring of teaching-learning process.

9. Course of study

The course of study for B. Pharm shall include Semester Wise Theory & Practical as given in Table – II to IX. 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 – II to IX.

Table-II: Course of study for semester I

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP101T	Human Anatomy and Physiology I– Theory	3	1	4
BP102T	Pharmaceutical Analysis I – Theory	3	1	4
BP103T	Pharmaceutics I – Theory	3	1	4
BP104T	Pharmaceutical Inorganic Chemistry – Theory	3	1	4
BP105T	Communication skills – Theory*	2	-	2
BP106RBT BP106RMT	Remedial Biology/ Remedial Mathematics – Theory*	2	-	2
BP107P	Human Anatomy and Physiology – Practical	4	-	2
BP108P	Pharmaceutical Analysis I – Practical	4	-	2
BP109P	Pharmaceutics I – Practical	4	-	2
BP110P	Pharmaceutical Inorganic Chemistry – Practical	4	-	2
BP111P	Communication skills – Practical*	2	-	1
BP112RBP	Remedial Biology – Practical*	2	-	1
Total		32/34[§]/36[#]	4	27/29[§]/30[#]

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

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

*Non University Examination (NUE). Internal assessment only.

Table-III: Course of study for semester II

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

Table-IV: Course of study for semester III

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

Table-V: Course of study for semester IV

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

Table-VI: Course of study for semester V

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

Table-VII: Course of study for semester VI

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

Table-VIII: Course of study for semester VII

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

Table-IX: Course of study for semester VIII

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP801T	Biostatistics and Research Methodology	3	1	4
BP802T	Social and Preventive Pharmacy	3	1	4
BP803T	Advanced Instrumentation Techniques	3	1	4
BP803ET	Pharma Marketing Management	3 + 3 = 6	1 + 1 = 2	4 + 4 = 8
BP804ET	Pharmaceutical Regulatory Science			
BP805ET	Pharmacovigilance			
BP806ET	Quality Control and Standardization of Herbals			
BP807ET	Computer Aided Drug Design			
BP808ET	Cell and Molecular Biology			
BP809ET	Cosmetic Science			
BP810ET	Experimental Pharmacology			
BP811ET	Dietary Supplements and Nutraceuticals			
BP813PW	Project Work	12	-	6
Total		27	5	26

Table-X: Semester wise credits distribution

Semester	Credit Points	Credit points for lateral entry
I	27/29 ^{\$} /30 [#]	52 credit transferred from D Pharm program
II	29	
III	24	31
IV	28	28
V	26	26
VI	30	30
VII	24	24
VIII	26	28
Extracurricular/ Co-curricular activities	02*	02*
Total credit points for the program	216/218^{\$}/219[#]	219

* The credit points assigned for extracurricular and or co-curricular activities shall be given by the principal of the college.

^{\$}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.

*** Extracurricular/ Co-curricular activities**

Two mandatory Credits will be required to be earned by a student to obtain a Degree.
The Grade awarded will be either ‘O’, ‘A’ or ‘B’.

***Guidelines for Awarding credit points for Extracurricular/Co-curricular activities**

Sr.No.	Name of Activity	Maximum Credit points
1	Co-curricular activities: Swayam/NPTEL/Certificate courses/ Publication in relevant journals/ Scientific poster presentation/ Avishkar / Anveshan Competition	1
2	Extra-curricular activities: Participation in University youth festival/Cultural activities/Sports OR Engaging college association activities [@]	1

@Engaging college association activities (These activities have to be certified by the Principal)

Rubrics for Awarding Grades (O/A/B)

1. Co-curricular Activities (Max 1 Credit Point)

(Examples: NPTEL/SWAYAM, Certificate Courses, Publications, Poster Presentations, Avishkar/Anveshan Competitions)

Criteria	Grade O	Grade A	Grade B
Online Course (NPTEL/SWAYAM/Certificate)	≥ 80% score / Elite / Distinction	60–79% score / Successfully completed	40–59% score / Just pass
Publication in Relevant Journal	Published in Web of Science/Scopus with impact factor more than 2	Published in Web of Science/Scopus with impact factor 0.1 to 2	Published in Web of Science/Scopus without impact factor
Scientific Poster / Paper Presentation	Secured 1st/2nd prize at National/State level	Participation at National/State level OR prize at institutional level	Participation at institutional level
Avishkar / Anveshan	Selected for state/national level & prize winner	Selected at university level / participation at state level	Participation at college/university screening

2. Extra-curricular Activities (Max 1 Credit Point)

(Examples: Sports, Cultural, University Youth Festival, College Association Activities, Case Studies on market Survey/personality development, Understanding corporate culture))

Criteria	Grade O	Grade A	Grade B
Sports (University/College/National)	Winner/medal at University/State/National level	Participation at University/State/National level	Participation at intercollegiate/college level
Cultural / Youth Festival	Winner/Runner-up at University/State/National level	Participation at University/State/National level	Participation at intercollegiate/college level
College Association Engagement	Completed with exceptional contribution (leadership, organizing major events, certified by Principal)	Completed satisfactorily (active participation, regular involvement)	Completed delayed in Final Year
Campus to Corporate activities(Personality Development/Corporate Culture Understanding)	Demonstrated exceptional initiative in planning Campus to Corporate programs (e.g., led mock interviews, case studies, presentations, or personality development sessions; submitted reflective report certified by faculty)	Attended and Taken initiative in all Campus to Corporate sessions, participated actively in group discussions, mock interviews, and case studies with satisfactory performance	Attended Campus to Corporate sessions

General Grading Rubric

- **O (Outstanding):** Demonstrates excellence – distinction, leadership, prizes, $\geq 80\%$ achievement, or significant contribution.
- **A (Very Good):** Meets expectations with good performance – completed as required, but not top-level.
- **B (Satisfactory):** Minimum acceptable – participation or completion without distinction.

10. 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 Sessional exam (Internal Assessment) and before the end semester exam.

11. Examinations/Assessments

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

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

Semester I

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP101T	Human Anatomy and Physiology I– Theory	10	15	1 Hr.	25	75	3 Hrs.	100
BP102T	Pharmaceutical Analysis I – Theory	10	15	1 Hr.	25	75	3 Hrs.	100
BP103T	Pharmaceutics I – Theory	10	15	1 Hr.	25	75	3 Hrs.	100
BP104T	Pharmaceutical Inorganic Chemistry – Theory	10	15	1 Hr.	25	75	3 Hrs.	100
BP105T	Communication skills – Theory*	5	10	1 Hr.	15	35	1.5 Hrs.	50
BP106RBT BP106RMT	Remedial Biology/ Mathematics – Theory*	5	10	1 Hr.	15	35	1.5 Hrs.	50
BP107P	Human Anatomy and Physiology – Practical	5	10	4 Hrs.	15	35	4 Hrs.	50
BP108P	Pharmaceutical Analysis I – Practical	5	10	4 Hrs.	15	35	4 Hrs.	50
BP109P	Pharmaceutics I – Practical	5	10	4 Hrs.	15	35	4 Hrs.	50
BP110P	Pharmaceutical Inorganic Chemistry – Practical	5	10	4 Hrs.	15	35	4 Hrs.	50
BP111P	Communication skills – Practical*	5	5	2 Hrs.	10	15	2 Hrs.	25
BP112RBP	Remedial Biology – Practical*	5	5	2 Hrs.	10	15	2 Hrs.	25
Total		70/75[§]/80[#]	115/125[§]/130[#]	23/24[§]/26[#] Hrs.	185/200[§]/210[#]	490/525[§]/ 540[#]	31.5/33[§]/ 35[#] Hrs.	675/725[§]/ 750[#]

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

[§]Applicable ONLY for the students studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics (RM) course.

*Non University Examination (NUE). Internal assessment only.

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

*Non University Examination (NUE). Internal assessment only

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	Physical Pharmaceutics-I –Theory	10	15	1 Hr.	25	75	3 Hrs.	100
BP303T	Pharmaceutical Microbiology – Theory	10	15	1 Hr.	25	75	3 Hrs.	100
BP304T	Pharmaceutical Engineering – Theory	10	15	1 Hr.	25	75	3 Hrs.	100
BP305P	Pharmaceutical Organic Chemistry II – Practical	5	10	4 Hr.	15	35	4 Hrs.	50
BP306P	Physical Pharmaceutics I – Practical	5	10	4 Hr.	15	35	4 Hrs.	50
BP307P	Pharmaceutical Microbiology – Practical	5	10	4 Hr.	15	35	4 Hrs.	50
BP308P	Pharmaceutical Engineering – Practical	5	10	4 Hr.	15	35	4 Hrs.	50
Total		60	100	20	160	440	28Hrs.	600

Semester IV

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

Semester V

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

Semester VI

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

Semester VII

Course code	Name of the course	Internal Assessment					Duration	Total Marks
		Continuous Mode	Sessional Exams					
				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

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
BP803T	Advanced Instrumentation Techniques	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 Standardization of Herbals – Theory							
BP807ET	Computer Aided Drug Design – Theory							
BP808ET	Cell and Molecular Biology – Theory							
BP809ET	Cosmetic Science – Theory							
BP810ET	Experimental Pharmacology – Theory							
BP812PW	Project Work	-	-	-	-	150	4 Hrs.	150
	Total	50	75	5 Hrs.	125	525	19 Hrs.	650

11.1 Internal assessment: Continuous mode

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

Table-XII: Scheme for awarding internal assessment:

Theory		
Criteria	Maximum Marks	
Attendance (Refer Table – XIII)	4	2
Academic activities (Average of any 3 activities e.g. quiz, assignment, open book test, field work, group discussion and seminar)	3	1.5
Student – Teacher interaction	3	1.5
Total	10	5
Practical		
Attendance (Refer Table – XIII)	2	
Based on Practical Records, Regular viva voce, etc.	3	
Total	5	

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

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

11.2 Sessional Exams

Two sessional exams shall be conducted for each theory and practical course as per the schedule fixed by the college. However: an extra sessional examination may be conducted in case the student has any genuine health reasons. The Principal, Amrutvahini College of Pharmacy, Sangamner will decide the retest to be conducted based on the health reasons. 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 Table-XIV. 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.

Table-XIV-Average and Computed Marks for Sessional Exams

Exam Type	Marks allotted	Marks Computed	Duration
Theory	30	15	1.5 Hr.
Practical	40	10	04 Hr.

12 Improvement of internal assessment

A student shall have the opportunity to improve his/her performance only once 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.

Question paper pattern for end semester theory examinations (ESE)

For 75 marks paper

I. Objective Type Questions (Answer all the questions)	10Q x 2M= 20M
II. Long Answers (Answer 2 out of 3)	2 Q x 10 M= 20M
III. Short Answers (Answer 7 out of 09)	7Q x 5M = 35M
Total	75 marks

For 50 marks paper

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

For 35 marks paper

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

Question paper pattern for end semester practical examinations

I. Synopsis	05M
II. Experiments	25M
III. Viva voce	05M
Total	35 marks

13. 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% of the maximum marks (IA + End Semester Examination marks put together) allotted for a course. 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. Hence, a student shall be declared PASS, if the student secures D-Grade and above, in the course concerned, on Grading-Scheme.

14. Award of performance grades

The marks obtained in the end semester and internal assessment in a course is added together and a Grading-Scheme is used to allot an appropriate grade to the student's performance in that course.

a. Grading-Scheme

Final evaluation of the performance of a student in each course (theory and practical separately) will be carried out on a Grading-Scheme corresponding to the marks obtained in that course. Eventually each letter grade of the course is converted into a specific grade point associated with the letter grade as given in the Table XV for SGPA calculations

Table-XV: Grading-Scheme		
Letter Grade	Grade Points	Performance
O	10	Outstanding
A	9	Excellent
B	8	Good
C	7	Fair
D	6	Average
F	0	Fail
DT/AB	0	Fail
PP	-	Passed (Only for Extra course)
NP	-	Not passed (Only for extra course)

DT: Detained, AB: Absent

Note the following:

1. Internal assessment marks and end semester examination marks put together are taken into account for the Grading-Scheme in each course separately.
2. Appropriate letter grades, from D to O, are awarded, in each theory and lab courses, to only such candidate who has passed the course in first attempt. However, grades D to B are only awarded to a student who makes multiple attempts to pass a course.
3. A candidate who is eligible and registers for the end semester examination but fails to appear in the end semester examination gets a grade 'AB', indicating failure.
4. The grade DT is given to a candidate who fails to put in the minimum required attendance for appearing the end semester examination for a course.
5. A student, who appears for the end semester examination could not secure 'D' or above grade in the grading scheme in a course is granted 'F' grade indicating failure in a course (subject) concerned.
5. A student who earns a grade 'D' or above in a course is declared to have successfully completed the course and earns the credits assigned to that particular course. A course successfully completed cannot be repeated for the purpose of improving the grade.

15. Carry forward of marks

In case, a student fails to secure D-grade in any theory or practical courses, he/she shall reappear for the supplementary end semester examination of that course. However, the candidates with DT-grade will be allowed to take only end semester examination provided they meet the eligibility criteria laid for the candidates to appear in the end semester examinations of the courses of the programs.

Important to note: In case a candidate with DT-grade re-registers for the course to repeat the entire education process in the subsequent academic year, after paying the required course fee, the DT status in that particular course is removed and he/she is allowed to retain the grades that he/she secures in the end semester examination. After the results are declared, Marks statements will distributed to students, which will contain the list of courses for that semester and the grades obtained by the student.

16. Academic Progression

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. Academic progression rules are applicable as follows:

1. 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 IV semester until all the courses of I and II semesters are successfully completed.
2. 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.
3. 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.
4. 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.
5. 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.
6. 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.
7. 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 following norm, 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.
8. 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.

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 – XVI.

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.

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

Percentage of Marks Obtained			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/DT	0	Fail
-	PP	-	Passed (Only for Extra course)
-	NP	-	Not passed (Only for Extra course)

17.2 The Semester grade point average (SGPA)

Note: For the SGPA/ CGPA calculation, the credit points of the courses that are having university examinations are only considered.

However, a candidate has to earn the credit points of non-university examination and extracurricular activities along with the credit points of the courses of the university examination to qualify for the award of degree.

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

$$\text{SGPA} = \frac{C1G1 + C2G2 + C3G3 + C4G4 + C5G5}{C1 + C2 + C3 + C4 + C5}$$

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

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

17.3 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:

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

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

17.4 Conversion of GPA/CGPA into percentage

The performance of students who are pursuing pharmacy programs in Amrutvahini College of Pharmacy, Sangamner Dist. Ahilyanagar is awarded on a Grading-Scheme. In this system, the top band (top 10%) of students who score highest marks are placed at O which is equivalent to 10 grade point (maximum). Thus, 10 GPA or CGPA is equivalent to 100%. Accordingly, 1 GPA or CGPA is equivalent to 10%. Based on this, the following formula is applied to convert GPA or CGPA to an appropriate percentage:

Percentage secured by the candidate = GPA or CGPA \times 10

17.5 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

18. 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/modules 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.

19. 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.

20. Project work

All the students shall undertake a project under the supervision of a teacher and submit a report. The area of the project shall directly relate any one of the elective subjects opted by

the student in semester VIII. The project shall be carried out in group not exceeding 5 in number. The project report shall be submitted in triplicate (typed & bound copy not less than 25 pages). The internal and external examiner appointed by the **Institute** shall evaluate the project at the time of the Practical examinations of other semester(s). Students shall be evaluated in groups for four hours (i.e., about half an hour for a group of five students). The projects shall be evaluated as per the criteria given below

Evaluation of Dissertation Book:

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

Evaluation of Presentation:

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

Explanation: The 75 marks assigned to the dissertation book shall be same for all the students in a group. However, the 75 marks assigned for presentation shall be awarded based on the performance of individual students in the given criteria. The Controller of Examinations shall receive a recommended list of examiner panel identified as the External Project Evaluation Committee for a candidate from the BoS Chairperson of the concerned discipline at least two weeks before the submission of the second stage of project work. The Controller of Examinations shall receive a recommended list of examiner panel identified as the External Project Evaluation Committee for a candidate from the BOS Chairperson of the concerned discipline at least two weeks before the submission of the project work. The internal examiner and the external examiner should be appointed by the respective BOS.

21. 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.

22. Award of degree

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

23. 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.

24. 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 college 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.

25. Addendum

Wherever an issue has not been covered by these Autonomy Rules of the College, the Rules and Statutes of the Savitribai Phule Pune University, Pune would apply, as long as the latter does not go against the spirit of the College Autonomy arrangements.

Abbreviations

- **SGPA-Semester Grade Point average**
- **CGPA- Cumulative Grade Point Average**
- **Course Code**
- **BP101T*-BP-B.Pharm-1-First Year- 01-First subject- T-Theory**
- **BP107P*-BP-B.Pharm -1-First Year -07-Sevent -subject -P-Practical**
(*Applicable to all subject codes likewise)

Syllabus

Semester-I

Human Anatomy and Physiology-I

Course Code : BP101T **Credits** : 4 **Contact Hours**: 60 Hrs. (45 TH & 15 TU)

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 the course, student shall be able to understand

1. Explain the gross morphology, structure and functions of various organs of the human body.
2. Describe the various homeostatic mechanisms and perform tests like WBC and RBC counts, bleeding and clotting time, blood group and estimation of Hemoglobin.
3. Identify the various tissues and organs of different systems of human body.
4. Perform the various experiments like, determination of blood pressure, heart rate, pulse rate, and body mass index.
5. Appreciate coordinated working pattern of different organs of each system.

Course Outcome (CO):

Upon completion of course student will able to

CO number	Course Outcome (CO) statement
BP101T.1	Illustrate the basic organization of human body, and describe the maintenance of homeostasis, and basic anatomical terminologies.
BP101T.2	Explain and illustrate the Integumentary system, Skeletal system, Joints, and Muscular System.
BP101T.3	Describe the composition and function of Body fluids and Blood, and explain the anatomy and physiology of Lymphatic system.
BP101T.4	Explain and illustrate the anatomy and physiology of Digestives system.
BP101T.5	Describe and illustrate the anatomy and physiology of Cardiovascular system.

Course Content:

Unit	Topic	Hours
I	Introduction to human body <ul style="list-style-type: none"> ▪ Definition and scope of human anatomy and physiology. ▪ Levels of structural organization in the human body. ▪ Basic life processes. ▪ Homeostasis and Feedback systems. ▪ Basic anatomical terminologies. Cellular level of organization <ul style="list-style-type: none"> ▪ Structure and functions of cell and organelles. ▪ Transport mechanisms operating across cell membrane. 	10 Hrs

	<ul style="list-style-type: none"> ▪ Somatic cell division and the cell cycle. ▪ General principles of cell communication, intracellular signaling pathway activation by extracellular signal molecule. ▪ Forms of intracellular signaling: <ul style="list-style-type: none"> a) Contact-dependent b) Paracrine c) Synaptic d) Endocrine. <p>Tissue level of organization</p> <ul style="list-style-type: none"> ▪ Classification of tissues. Structure, location and functions of epithelial, muscular, nervous, and connective tissues. 	
II	<p>Integumentary system</p> <ul style="list-style-type: none"> ▪ Structure and functions of skin. <p>Skeletal system</p> <ul style="list-style-type: none"> ▪ Types of bone. ▪ Divisions of skeletal system. ▪ Salient features and functions of bones of axial and appendicular skeletal system. <p>Joints</p> <ul style="list-style-type: none"> ▪ Structural and functional classification. ▪ Types of joint movements and its articulation. <p>Muscular System</p> <ul style="list-style-type: none"> ▪ Organization of skeletal muscle, and physiology of muscle contraction. Neuromuscular junction. 	10 Hrs
III	<p>Body fluids and blood</p> <ul style="list-style-type: none"> ▪ Body fluids, composition and functions of blood. ▪ Hemopoiesis, formation of hemoglobin. ▪ Mechanisms of coagulation and clotting factors. ▪ Blood grouping and Rh factor. ▪ Transfusion, its significance and <p>Lymphatic system.</p> <ul style="list-style-type: none"> ▪ Lymphatic organs and tissues. ▪ Lymphatic vessels. ▪ Lymph circulation and functions of lymphatic system. <p>Reticuloendothelial system.</p>	10 Hrs
IV	<p>Digestive system</p> <ul style="list-style-type: none"> ▪ Anatomy of GI Tract. ▪ Anatomy of stomach and mechanism of acid production in the stomach. ▪ Regulation of acid production through parasympathetic nervous system. pepsin role in protein digestion. ▪ Anatomy and physiology of small and large intestine. ▪ Movements of GIT, digestion and absorption of nutrients. ▪ Anatomy and functions of salivary glands, pancreas and liver. ▪ Energetics: Formation and role of ATP, Creatinine Phosphate and BMR. 	08 Hrs
V	<p>Cardiovascular system</p> <ul style="list-style-type: none"> ▪ Heart: Anatomy of heart, elements of conduction system of heart, its regulation by autonomic nervous system, cardiac output, and cardiac cycle. ▪ Vascular system: Blood circulation, blood vessels, structure and functions of artery, vein and capillaries, Regulation of blood pressure and study of Electrocardiogram (ECG). 	07 Hrs

Recommended Books (Latest Editions)

1. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York.
2. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee Brothers Medical Publishers, New Delhi.

Reference Books (Latest Editions)

1. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
2. Text book of Medical Physiology- Arthur C, Guyton and John.E. Hall. Miamisburg, OH, U.S.A.
3. Human Physiology (Vol 1 and 2) by Dr. C.C. Chatterrje , Academic Publishers Kolkata.

Human Anatomy and Physiology-I**Course Code :** BP107P**Credits :** 2**Contact Hours:** 4hrs/Week**Course Outcome (CO):**

Upon completion of course student will able to

CO number	Course Outcome (CO) statement
BP107.1	Identify various human tissues by using the compound microscope.
BP107P.2	Identify and describe the anatomy of the axial and appendicular bones
BP107P.3	Determine hematological parameters like RBC, WBC, blood groups, Hb, bleeding and clotting time.
BP107P.4	Determine clinical parameters like BP, heart rate, pulse rate, and BMI
BP107P.5	Give emergency medical care to the patient like First Aid and CPR.

Course Content:

Sr. No.	List of Experiments
1.	Study of compound microscope.
2.	Microscopic study of epithelial and connective tissue
3.	Microscopic study of muscular and nervous tissue
4.	Identification of axial bones
5.	Identification of appendicular bones
6.	Introduction to hemocytometry.
7.	Enumeration of white blood cell (WBC) count.
8.	Enumeration of total red blood corpuscles (RBC) count
9.	Determination of bleeding time and clotting time
10.	Estimation of hemoglobin content and O ₂ carrying capacity
11.	Determination of blood group
12.	Determination of erythrocyte sedimentation rate (ESR).
13.	Determination of blood pressure, heart rate and pulse rate.
14.	Determination of body mass index (BMI).
15.	Demonstration of First Aid and Cardiopulmonary Resuscitation (CPR).

* Minimum 10 case studies of disease or disorder relevant to practical topic must be discussed and assigned to the students. The data should be reported as per the regulatory requirements and guidelines. All tools should be used wherever applicable.

Recommended Books (Latest Editions)

1. Textbook of Medical Laboratory Technology by Praful B. Godkar and Darshan P. Godkar Bhalani Publishing House; Mumbai.
2. di Fiore's Atlas of Histology with Functional Correlations by Victor P. Ereoshenko. Lippincott Williams & Wilkins.
3. Textbook of Human Histology by Inderbir Singh, Jaypee brothers medical publishers, New Delhi.
4. Textbook of Practical Physiology by C.L. Ghai, Jaypee brothers medical publishers, New Delhi.
5. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma,
6. Jaypee brother's medical publishers, New Delhi.
7. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York.
8. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
9. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
10. Human Physiology (Vol 1 and 2) by Dr. C.C. Chatterrje ,Academic Publishers Kolkata

PHARMACEUTICAL ANALYSIS-I (THEORY)**Course Code:** BP102T**Credits:** 4**Contact Hours:** 45Hrs

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

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

- Understand the principles of volumetric and electro chemical analysis
- Carryout various volumetric and electrochemical titrations
- Develop analytical skills

Course Outcome (CO):

Upon completion of course student will able to

CO number	Course Outcome (CO) statement
BP102T.1	Describe the basic concepts of analytical chemistry, principles of volumetric analysis, methods of expressing concentration, and sources of analytical errors.
BP102T.2	Explain the theories and principles involved in aqueous and non-aqueous acid-base titrations.
BP102T.3	Perform the procedures and apply precipitation titrations, complexometric titrations, and gravimetric analysis
BP102T.4	Learn redox titration reactions and interpret the underlying chemical principles and their pharmaceutical relevance.
BP102T.5	Analyze the pharmaceuticals by applying electrochemical methods (potentiometry, conductometry)

Course Content:

Unit	Topic	Hours
I	Introduction to Analytical Chemistry- Review of fundamental aspects- qualitative, quantitative analysis, Types of quantitative analysis, Normality, Molarity, Molality, Mole fraction, Molecular weight, Equivalent weight, Expression of concentration and strength of solution, Primary and secondary standards. Introduction to Statistical Treatment of Analytical Data Accuracy and precision, errors and their types, significant figures, standard deviation, confidence limit, test of significance, rejection of a result, correlation coefficient and coefficient of determination, Dissociation Constant	10 Hrs.
II	Acid base titration: Theories of acid, base and acid, base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves, applications of acid base titrations Non aqueous titration: Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl	10 Hrs.
III	Precipitation titrations: Introduction and theory of precipitation, Mohr's method, Volhard's and Modified Volhard's method, Fajan's method, estimation of sodium chloride, Argentometric titration	10 Hrs.

	<p>Complexometric titration: Introduction, classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate.</p> <p>Gravimetry: Introduction, principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate</p>	
IV	<p>Redox titrations</p> <p>(a) Concepts of oxidation and reduction</p> <p>(b) Types of redox titrations (Principles and applications) Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate</p>	08 Hrs.
V	<p>Electrochemical methods of analysis</p> <p>Conductometry- Introduction, Conductivity cell, Conductometric titrations, applications</p> <p>Potentiometry - Electrochemical cell, construction and working of reference (Standard hydrogen, silver chloride electrode and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications.</p> <p>Polarography - Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum electrode, applications</p>	07 Hrs.

Recommended Books: (Latest Editions)

1. Vogel's Text Book of Quantitative Chemical Analysis, 6/Ed., Pearson Education.
2. Quantitative analysis by V. Alexyev, Student Edition, CBS Publisher & Distributors.
3. Fundamentals of Analytical Chemistry by Skoog, West, Holler, Harvest, 8/Ed., Thomson Brookscole.
4. Pharmaceutical Analysis by Higuchi, Reprint 2004, CBS Publisher & Distributors.
5. The quantitative analysis of drugs by Garrat DC, 3/Ed., CBS Publisher & Distributors.
6. Quantitative Analysis by Day R A & Underwood A L. 5/Ed., Prentice Hall of India Pvt. Ltd. New Delhi.
7. Analytical Chemistry by Christian G D, 6/Ed., John Wiley & Sons.
8. A Textbook of Pharmaceutical Analysis by Connors KA, 4/ed., John Wiley & Sons.
9. Practical Pharmaceutical Chemistry Part-I by Beckett A H & Stanlake J B, 4/Ed., CBS Publisher & Distributors.
10. Pharmaceutical Analysis Vol. II & K. R. Mahadik, S.G. Wadodkar, H. N, More, Nirali Prakashan.
11. Pharmaceutical Drug Analysis by Ashutosh Kar, First Print, 2001, Minerva Press, New Delhi.
12. Indian Pharmacopoeia, 6th Edition, 2010, The Indian Pharmacopoeia Commission, Ghaziabad.

PHARMACEUTICAL ANALYSIS-I (PRACTICAL)**Course Code:** BP108P**Credits:** 2**Contact Hours:** 04 Hrs./ Week (Practical)

Scope : This practical course reinforces the basic principles of conventional volumetric and gravimetric analysis. Students get hands on experience in preparing standard solutions and assaying selected compounds official in the Pharmacopoeia

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

- Understand basic lab operations and documentation
- Learn the preparation and standardization of primary and secondary standard solutions
- Learn the assay and differential analysis of selected compounds official in the Pharmacopoeia

Course Outcome (CO):

Upon completion of course student will able to

CO number	Course Outcome (CO) statement
BP108P.1	Explain the basic concepts involved in the preparation and standardization of chemical solutions
BP108P.2	Perform acid-base, non-aqueous, and precipitation titrations, and demonstrate proper analytical techniques
BP108P.3	Interprete and execute complexometric, cerimetric, and iodometric titration methods
BP108P.4	Determine the normality of unknown solutions using electro-analytical techniques such as potentiometry and conductometry

Course Content: Total 60 Hrs. (04 hrs./ week)

I a) Introduction to calibration, care and use of balances, methods of weighing and errors in weighing, Calibrated weight box
b) Cleaning, care and calibration of volumetric apparatus

II Preparation and standardization of

- (1) Aq.Sodium hydroxide I.P.
- (2) Aq.Sulphuric acid I.P./Aq. Hydrochloric Acid I. P.
- (3) Aq.Sodium thiosulfate I.P.
- (4) Aq.Potassium permanganate I.P.
- (5) Aq.Ceric ammonium sulphatel.P.

III Assay of the following compounds along with Standardization of Titrant

- (1) Aspirin tablet by acid base titration
- (2) Ferrous sulphate tabletl.P.by Cerimetry
- (3) Copper sulphatel.P. by Iodometry
- (4) Calcium gluconateinjection by Complexometry
- (5) Hydrogen peroxide I.P./ B. P. by Permanganometry
- (6) Sodium benzoate I.P. by Non-aqueous titration
- (7) Sodium Chloride I.P. by precipitation titration

IV Determination of Normality by electro-analytical methods

- (1) Conductometric titration of strong acid against strong base
- (2) Conductometric titration of strong acid and weak acid against strong base
- (3) Potentiometric titration of strong acid against strong base

Recommended Books: (Latest Editions)

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

Pharmaceutics - I

Course Code : BP103T **Credits :** 4 **Contact Hours:** L 45 (3 Hr/wk), T 15 (1 Hr/wk)

Scope : This course provides fundamental knowledge of the history, development, and principles of pharmacy, with emphasis on dosage forms, pharmaceutical calculations, and formulation techniques.

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

- ✓ To understand the history, evolution, and scope of pharmacy profession along with the significance of various pharmacopoeias.
- ✓ To learn the classification of dosage forms, role of excipients, and fundamentals of prescription handling and posology.
- ✓ To develop accuracy in pharmaceutical calculations and preparation of solid and liquid dosage forms.
- ✓ To identify and resolve pharmaceutical incompatibilities.
- ✓ To acquire practical skills in compounding, formulation, and evaluation of different dosage forms for professional practice.

Course Outcome (CO):

Upon completion of course student will able to

CO number	Course Outcome (CO) statement
BP103T.1	Explain the historical background & development of the pharmacy profession, classify various dosage forms, Describe the components of a prescription & apply the principles & factors influencing posology.
BP103T.2	Implement pharmaceutical calculations to accurately prepare formulations in a pharmacy. Demonstrate the powder dosage forms used in pharmaceutical practice. Identify Pharmaceutical Incompatibility.
BP103T.3	Identify & describe monophasic liquid dosage forms
BP103T.4	Identify & describe biphasic liquid dosage forms.
BP103T.5	Summarized types & preparation of semisolid dosage form & prepared suppositories.

Course Content:

Unit	Topic	Hours
I	<p>Historical background and development of profession of pharmacy: History of profession of Pharmacy in India in relation to pharmacy education, industry and organization, Pharmacy as a career. Introduction of IP, BP, USP, EP, NF & Ayurvedic Pharmacopoeia of India.</p> <p>Dosage forms: Introduction to dosage forms including sterile products, classification and definitions</p> <p>Excipients: Introduction to excipients.</p> <p>Prescription: Definition, Latin term & Parts of prescription, handling of Prescription and Errors in prescription.</p> <p>Posology: Definition, Factors affecting posology. Pediatric dose</p>	10 Hr

	calculations based on age, body weight and body surface area.	
II	<p>Pharmaceutical calculations: Weights and measures – Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point and molecular weight.</p> <p>Powders: Definition, classification, advantages and disadvantages, Simple & compound powders – official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions.</p> <p>Pharmaceutical incompatibilities: Definition, classification, physical, chemical and therapeutic incompatibilities with examples.</p>	8 Hr
III	<p>Liquid dosage forms: Advantages and disadvantages of liquid dosage forms. Excipients used in formulation of liquid dosage forms. Preparation of solution.</p> <p>Monophasic liquids: Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Aromatic waters.</p>	9 Hr
IV	<p>Biphasic liquids:</p> <p>Suspensions: Definition, advantages and disadvantages, classification, Preparation of suspensions; Principle of Stokes law, Flocculated and Deflocculated suspension. Stability problems and methods to overcome.</p> <p>Emulsions: Definition, classification, emulsifying agent, test for the identification of type of Emulsion, Methods of preparation & stability problems and methods to overcome.</p>	9 Hr
V	<p>Suppositories: Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories.</p> <p>Semisolid dosage forms: Definitions, classification, Ointment bases, mechanisms and factors influencing dermal penetration of drugs. Preparation of ointments, pastes, creams, gels jellies. Excipients used in semi solid dosage forms. Evaluation of semisolid dosage form</p>	9 Hr

References:

1. Indian Pharmacopoeia Commission. Indian Pharmacopoeia. Ninth edition. Ghaziabad: Indian Pharmacopoeia Commission; 2022.
2. British Pharmacopoeia Commission. British Pharmacopoeia. Twenty-fifth edition. London: The Stationery Office; 2025.
3. United States Pharmacopoeial Convention. United States Pharmacopoeia and National Formulary (USP–NF). Twenty-sixth edition. Rockville (MD): United States Pharmacopoeial Convention; 2025.
4. Council of Europe. European Pharmacopoeia. Eleventh edition. Strasbourg: European Directorate for the Quality of Medicines & HealthCare (EDQM); 2022.
5. Government of India, Ministry of Health and Family Welfare, Department of AYUSH. The Ayurvedic Pharmacopoeia of India. Latest amendment. New Delhi: The Controller of Publications; 2023.
6. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.
7. Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker, Inc., New York, 1992.
8. Encyclopedia of controlled delivery, Editor- Edith Mathiowitz, Published by Wiley Interscience Publication, John Wiley and Sons, Inc, New York! Chichester/Weinheim

9. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).
10. S.P. Vyas and R.K. Khar, Controlled Drug Delivery - concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002
11. Lachman L, Lieberman HA, Kanig JL. The Theory and Practice of Industrial Pharmacy. Third edition. Philadelphia: Lea & Febiger; 1986.
12. Gennaro AR, editor. Remington: The Science and Practice of Pharmacy. Twenty-first edition. Philadelphia: Lippincott Williams & Wilkins; 2005.
13. Carter SJ, editor. Cooper and Gunn's Dispensing for Pharmaceutical Students. Twelfth edition. New Delhi: CBS Publishers & Distributors; 1987.
14. Banker GS, Rhodes CT. Modern Pharmaceutics. Fourth edition. New York: Marcel Dekker; 2002.
15. Aulton ME, Taylor KMG. Aulton's Pharmaceutics: The Design and Manufacture of Medicines. Fifth edition. London: Elsevier; 2017.

Pharmaceutics I - Practical**Course Code :** BP109P**Credits :** 2**Contact Hours:** P 60 (4 Hr/wk)

Scope : This course provides practical training in the preparation, dispensing, and evaluation of common pharmaceutical dosage forms such as powders, solutions, suspensions, emulsions, semisolids, and suppositories, helping students apply theoretical knowledge in real-world pharmacy practice.

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

- ✓ Prepare various dosage forms using standard formulas.
- ✓ Acquire skills in packaging, labeling, and quality control of formulations.
- ✓ Learn enhance problem-solving, calculations, and handling of pharmaceutical materials.
- ✓ Promote safe and ethical practices in pharmaceutical preparation.

Course Outcome (CO):

Upon completion of course student will able to

CO number	Course Outcome (CO) statement
BP109P.1	Prepare and evaluate powders, granules, and divided powders with accuracy.
BP109P.2	Formulate monophasic systems like solutions, syrups, and elixirs, ensuring clarity.
BP109P.3	Develop biphasic systems such as suspensions and emulsions, ensuring proper dispersion and therapeutic action.
BP109P.4	Prepare semisolid dosage forms such as ointments and gels, ensuring proper consistency and spreadability.
BP109P.5	Formulate suppositories using suitable bases, ensuring correct melting behavior and uniformity.

Course Content:

Preparation & Evaluation of following dosage forms

- 1. Powders and Granules** (Any three experiments)
 - a) ORS powder (WHO)
 - b) Effervescent granules
 - c) Dusting powder
 - d) Divided powders
 - e) Preparation of Granules by wet granulation
- 2. Solution**
 - a) Strong solution of ammonium acetate
 - b) Lugol's solution
- 3. Syrups**
 - a) Syrup IP'66
 - b) Compound syrup of Ferrous Phosphate BPC'68

4. **Elixirs** (Any one experiment)
 - a) Piperazine citrate elixir
 - b) Paracetamol pediatric elixir
5. **Linctus** (Any one experiment)
 - a) Terpin Hydrate Linctus IP'66
 - b) Iodine Throat Paint (Mandles Paint)
6. **Gargles and Mouthwashes** (Any one experiment)
 - a) Iodine gargle
 - b) Chlorhexidine mouthwash
7. **Suspensions** (Any two experiments)
 - a) Calamine lotion
 - b) Magnesium Hydroxide mixture
 - c) Aluminium Hydroxide gel
8. **Emulsions** (Any two experiments)
 - a) Turpentine Liniment
 - b) Liquid paraffin emulsion
 - c) Cresol with soap solution
9. **Suppositories** (Any two experiments)
 - a) Glycero gelatin suppository
 - b) Cocoa butter suppository
 - c) Zinc Oxide suppository
- 10 **Semisolid** (Any two experiments)
 - a) Sulphur ointment
 - b) Non-staining iodine ointment with methyl salicylate
 - c) Carbopol gel

References:

1. Indian Pharmacopoeia Commission. Indian Pharmacopoeia. Ninth edition. Ghaziabad: Indian Pharmacopoeia Commission; 2022.
2. British Pharmacopoeia Commission. British Pharmacopoeia. Twenty-fifth edition. London: The Stationery Office; 2025.
3. Lachman L, Lieberman HA, Kanig JL. The Theory and Practice of Industrial Pharmacy. Third edition. Philadelphia: Lea & Febiger; 1986.
4. Gennaro AR, editor. Remington: The Science and Practice of Pharmacy. Twenty-first edition. Philadelphia: Lippincott Williams & Wilkins; 2005.
5. Carter SJ, editor. Cooper and Gunn's Dispensing for Pharmaceutical Students. Twelfth edition. New Delhi: CBS Publishers & Distributors; 1987.
6. Banker GS, Rhodes CT. Modern Pharmaceutics. Fourth edition. New York: Marcel Dekker; 2002.
7. Aulton ME, Taylor KMG. Aulton's Pharmaceutics: The Design and Manufacture of Medicines. Fifth edition. London: Elsevier; 2017.

PHARMACEUTICAL INORGANIC CHEMISTRY (THEORY)**Course Code:** BP104T**Credits:** 4**Contact Hours:** 45 Hrs

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

Objectives : Upon completion of course student shall be able to

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

Course Outcome (CO):

Upon completion of course student will able to

CO number	Course Outcome (CO) statement
BP104T.1	Recall history of pharmacopoeia and explain the sources of pharmaceutical impurities, principles of limit tests, and official standards for water
BP104T.2	Explain the principles of acids, bases and buffers and isotonicity, functions of key electrolytes, and the role of common agents in dental care.
BP104T.3	Describe the types, properties, and uses of gastrointestinal agents, cathartics, protectives and adsorbents and antimicrobials used in pharmaceutical practice.
BP104T.4	Recall and explain the uses and actions of commonly used pharmaceutical compounds such as expectorants, emetics, Haematinics, poison and antidotes, and astringents.
BP104T.5	Recall the properties and measurement methods of radioactivity, and explain their applications, storage conditions, and safety precautions.

Course Content:

Unit	Topic	Hours
I	Impurities in pharmaceutical substances: History of Pharmacopoeia, Sources and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate Water: Water as universal pharmaceutical vehicle. Hardness of water, methods to remove hardness of water, different official waters and official control tests for water.	12 Hrs.
General methods of preparation and assay for compounds superscripted with asterisk (*). Properties and Medicinal uses of Inorganic Compounds belonging to the following classes		
II	Acids, Bases and Buffers: Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, Concept of Isotonicity Major extra and intracellular electrolytes: Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride*, Potassium chloride, Calcium gluconate* and Oral Rehydration Salt (ORS), Physiological acid base balance Dental products: Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement.	08 Hrs.
III	Gastrointestinal agents Acidifiers: Ammonium chloride* and Dil. HCl Antacid: Ideal properties of antacids, combinations of antacids, Sodium Bicarbonate*, Aluminum hydroxide gel, Magnesium	10 Hrs.

	hydroxide mixture Cathartics: Magnesium sulphate, Sodium orthophosphate Protective and adsorbents: Kaolin and Bentonite Antimicrobials: Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*, Iodine and its preparations	
IV	Miscellaneous compounds Expectorants: Potassium iodide, Ammonium chloride* Emetics: Copper sulphate*, Sodium potassium tartarate Haematinics: Ferrous sulphate*, Ferrous gluconate Poison and Antidote: Sodium thiosulphate*, Activated charcoal, Sodium nitrite Astringents: Zinc Sulphate, Potash Alum	08 Hrs.
V	Radiopharmaceuticals: Radio activity, Measurement of radioactivity, Properties of α , β , γ radiations, Half-life, radio isotopes and study of radio isotopes - Sodium iodide I^{131} , Storage conditions, precautions & pharmaceutical application of radioactive substances.	07 Hrs.

Recommended books (Latest editions):-

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

PHARMACEUTICAL INORGANIC CHEMISTRY (PRACTICAL)**Course Code:** BP110P**Credits:** 2**Contact Hours:** 4Hrs/ week**Course Outcome (CO):**

Upon completion of course student will able to

CO number	Course Outcome (CO) statement
BP110P.1	Explain & perform the principles and procedures of limit tests for chloride, sulphate, iron, arsenic, lead, and heavy metals
BP110P.2	Recall and perform identification tests for selected inorganic pharmaceutical compounds
BP110P.3	Explain and perform purity tests for pharmaceutical substances like bentonite, aluminum hydroxide gel, and potassium iodide
BP110P.4	Explain the preparation methods, properties, and pharmaceutical applications of selected inorganic pharmaceuticals such as boric acid, potash alum, aluminium hydroxide gel, and ferrous sulphate

Course Content:**I a. Introduction to GHS (Globally Harmonized System of Classification and Labelling of Chemicals)****b. Limit tests for following ions as per I. P.**

- Limit test for Chlorides and Sulphates
- Modified limit test for Chlorides and Sulphates
- Limit test for Iron
- Limit test for Heavy metals

II Identification test as per I. P.

- Magnesium hydroxide
- Ferrous sulphate
- Sodium bicarbonate
- Calcium gluconate
- Copper sulphate

III Test for purity

- Swelling power of bentonite
- Neutralizing capacity of aluminium hydroxide gel
- Determination of potassium iodate and iodine in potassium iodide

IV Preparation of inorganic pharmaceuticals (Any three)

- Boric acid
- Potash alum
- Aluminium hydroxide gel
- Ferrous sulphate

V Demonstration

Water Quality Testing- Basic Parameters of Water, Measurement of BOD and COD

Recommended books (Latest editions):-

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

Communication Skills

Course Code : BP105T **Credits :** 2 **Contact Hours:** L 30 (2 Hr/wk)

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 this course the student should be able to:

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

Course Outcome (CO):

Upon completion of course student will able to

CO number	Course Outcome (CO) statement
BP105T.1	Understand the fundamentals of communication by explaining its definition, importance, process, elements, and barriers, and how these influence interpersonal and professional interactions.
BP105T.2	Analyze perspectives in communication by identifying factors such as visual perception, language, cultural differences, and emotional aspects that affect interpretation and response.
BP105T.3	Apply effective verbal and non-verbal communication techniques, including face-to-face interaction, body language, tone of voice, and appropriate communication styles for various situations.
BP105T.4	Demonstrate proficiency in listening and written communication, by practicing active listening strategies, recognizing challenges in listening, and composing clear, audience-appropriate written messages for formal and informal contexts.
BP105T.5	Develop interview, presentation, and group discussion skills, by preparing for interviews, structuring and delivering presentations confidently, and engaging constructively in group discussions using appropriate communication methods.

Course Content:

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

References:

1. Rutherford AJ. Basic Communication Skills for Technology. Second edition. Pearson Education; 2011.
2. Kumar S, Pushpalata. Communication Skills. First edition. Oxford Press; 2011.
3. Robbins S. Organizational Behaviour. First edition. Pearson; 2013.
4. Hasson G. Brilliant Communication Skills. First edition. Pearson Life; 2011.
5. Ramesh GR. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success. Fifth edition. Pearson; 2013.
6. Dalley D, Burton L, Greenhall M. Developing Your Influencing Skills. First edition. Universe of Learning LTD; 2010.
7. Konar N. Communication Skills for Professionals. Second edition. New Arrivals – PHI; 2011.
8. Mitra BK. Personality Development and Soft Skills. First edition. Oxford Press; 2011.
9. Butterfield. Soft Skills for Everyone. First edition. Cengage Learning India Pvt. Ltd; 2011.
10. Peters F SJ. Soft Skills and Professional Communication. First edition. McGraw Hill Education; 2011.
11. Adair J. Effective Communication. Fourth edition. Pan Macmillan; 2009.
12. Daniels A. Bringing Out the Best in People. Second edition. McGraw Hill; 1999.

Communication Skills - Practical

Course Code : BP111P	Credits : 1	Contact Hours : P 30 (2 Hr/wk)
-----------------------------	--------------------	---------------------------------------

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 this course the student should be able to:

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

Course Outcome (CO):

Upon completion of course student will able to

CO number	Course Outcome (CO) statement
BP111P.1	Communicate confidently in everyday situations like meeting people, asking questions, and making friends.
BP111P.2	Improve pronunciation of sounds and nouns for clear speech.
BP111P.3	Listen and speak effectively using direct/indirect speech and figures of speech.
BP111P.4	Write emails and messages clearly using correct formats and etiquette.
BP111P.5	Handle interviews and presentations with confidence and proper structure.

Course Content:

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

References

1. Konar N. Communication Skills for Professionals. Second edition. New Delhi: PHI Learning Pvt. Ltd.; 2011.
2. Raman M, Sharma S. Technical Communication: Principles and Practice. Third edition. New Delhi: Oxford University Press; 2011.
3. Bovee CL, Thill JV. Business Communication Today. Twelfth edition. Boston: Pearson Education; 2016.
4. Lesikar RV, Pettit JD, Flatley ME. Basic Business Communication: Skills for Empowering the Internet Generation. Eleventh edition. New York: McGraw-Hill; 2009.
5. Kaul A. Effective Business Communication. Second edition. New Delhi: PHI Learning Pvt. Ltd.; 2009.
6. Wren PC, Martin HV. High School English Grammar and Composition. Revised edition. New Delhi: S. Chand & Company Ltd.; 2016.

Remedial Mathematics (Theory)

Course Code : BP106RMT **Credits :**2 **Contact Hours:** 30 Hrs

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 Outcome (CO):

Upon completion of course student will able to

CO number	Course Outcome (CO) statement
BP106RMT.1	On completion of course the student can be able to: This course involves the definition of logarithm and apply them to solve problems. Also discusses the basics of calculus like functions and limits and continuity. Also provides knowledge an partial fractions applicable in chemical kinetics and pharmacokinetics
BP106RMT.2	This course comprises of matrices definitions and their type also imparts knowledge to solve simultaneous equations using matrix methods to solve pharmacokinetics equations
BP106RMT.3	This course introduces differential calculus it requires to apply the methods to solve the problems and also to memorize them for effective solution of problems
BP106RMT.4	This consists of analytical geometry to equations of straight line a d different form of them. Also includes integral calculus which has to be understood and use formulae to apply them in different fields
BP106RMT.5	This course includes differential equations and Laplace transforms solving differential equations require thorough knowledge of differential calculus and Integral calculus

Course Content:

Unit	Topic	Hours
I	Partial fraction Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction , Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics Logarithms Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems. Function:	06 Hrs.

	Real Valued function, Classification of real valued functions, Limits and continuity : Introduction, Limit of a function, Definition of limit of a function (ϵ - δ n definition)	
II	Matrices and Determinant: Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants , Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix , Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method, Cramer's rule, Characteristic equation and roots of a square matrix, Cayley–Hamilton theorem, Application of Matrices in solving Pharmacokinetic equations	06 Hrs.
III	Calculus Differentiation : Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function , Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula), Derivative of the quotient of two functions (Quotient formula) – Without Proof , Derivative of x^n w.r.t.x, where n is any rational number, Derivative of e^x , Derivative of $\log_e x$, Derivative of a^x Derivative of trigonometric functions from first principles (without Proof), Successive Differentiation, Conditions for a function to be a maximum or a minimum at a point. Application	06 Hrs.
IV	Analytical Geometry Introduction: Signs of the Coordinates, Distance formula, Straight Line : Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines, Slope of a line joining two points, Slope – intercept form of a straight line Integration: Introduction, Definition, Standard formulae, Rules of integration , Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application.	06 Hrs.
V	Differential Equations : Some basic definitions, Order and degree, Equations in separable form , Homogeneous equations, Linear Differential equations, Exact equations, Application in solving Pharmacokinetic equations Laplace Transform : Introduction, Definition, Properties of Laplace transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives, Application to solve Linear differential equations, Application in solving Chemical kinetics and Pharmacokinetics equations	06 Hrs.

References:-

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

REMEDIAL BIOLOGY**Course Code** : BP106RBT**Credits** : 2**Contact Hours**: 30 Hrs

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, student shall be able to

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

Course Outcome (CO):

Upon completion of course student will able to

CO number	Course Outcome (CO) statement
BP106RBT.1	Describe the living world and morphology of flowering plants.
BP106RBT.2	Explain body fluids, digestion and reparatory process.
BP106RBT.3	Conceptualize the elimination process, neural and chemical control & coordination, and human reproductive system.
BP106RBT.4	Summarize plant mineral nutrition and photosynthesis.
BP106RBT.5	Understand plant respiration and growth, cell and tissues.

Course Content:

Unit	Topic	Hours
I	Living world <ul style="list-style-type: none"> ▪ Definition and characters of living organisms ▪ Diversity in the living world ▪ Binomial nomenclature. ▪ Five kingdoms of life and basis of classification. Salient features of Monera, Protista, Fungi, Animalia and Plantae, Virus. Morphology of Flowering plants <ul style="list-style-type: none"> ▪ Morphology of different parts of flowering plants-Root, stem, inflorescence, flower, leaf, fruit, seed. ▪ General Anatomy of Root, stem, leaf of monocotyledons & Dicotyledones. 	07 Hrs
II	Body fluids and circulation <ul style="list-style-type: none"> ▪ Composition of blood, blood groups, coagulation of blood ▪ Composition and functions of lymph ▪ Human circulatory system ▪ Structure of human heart and blood vessels ▪ Cardiac cycle, cardiac output and ECG Digestion and Absorption <ul style="list-style-type: none"> ▪ Human alimentary canal and digestive glands ▪ Role of digestive enzymes ▪ Digestion, absorption and assimilation of digested food Breathing and respiration	07 Hrs

	<ul style="list-style-type: none"> ▪ Human respiratory system ▪ Mechanism of breathing and its regulation ▪ Exchange of gases, transport of gases and regulation of respiration ▪ Respiratory volumes 	
III	<p>Excretory products and their elimination</p> <ul style="list-style-type: none"> ▪ Modes of excretion ▪ Human excretory system- structure and function ▪ Urine formation ▪ Rennin angiotensin system <p>Neural control and coordination</p> <ul style="list-style-type: none"> ▪ Definition and classification of nervous system ▪ Structure of a neuron ▪ Generation and conduction of nerve impulse ▪ Structure of brain and spinal cord ▪ Functions of cerebrum, cerebellum, hypothalamus and medulla oblongata <p>Chemical coordination and regulation</p> <ul style="list-style-type: none"> ▪ Endocrine glands and their secretions ▪ Functions of hormones secreted by endocrine glands <p>Human reproduction</p> <ul style="list-style-type: none"> ▪ Parts of female reproductive system ▪ Parts of male reproductive system ▪ Spermatogenesis and Oogenesis ▪ Menstrual cycle 	07 Hrs
IV	<p>Plants and mineral nutrition</p> <ul style="list-style-type: none"> ▪ Essential mineral, macro and micronutrients ▪ Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation <p>Photosynthesis</p> <ul style="list-style-type: none"> ▪ Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis. 	05 Hrs
V	<p>Plant respiration: Respiration, glycolysis, fermentation (anaerobic).</p> <p>Plant growth and development</p> <ul style="list-style-type: none"> ▪ Phases and rate of plant growth, Condition of growth, Introduction to plant growth regulators. <p>Cell - The unit of life Structure and functions of cell and cell organelles. Cell division</p> <p>Tissues</p> <ul style="list-style-type: none"> ▪ Definition, types of tissues, location and functions. 	04 Hrs

Recommended Books (Latest Editions)

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

Reference Books (Latest Editions)

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

REMEDIAL BIOLOGY(Practical)**Course Code :** BP 112RBP**Credits :** 2**Contact Hours:** 30 Hrs**Course Outcome (CO):**

Upon completion of course student will able to

CO number	Course Outcome (CO) statement
BP 112RBP.1	Perform microscopic examination of human and plant cells by using the compound microscope.
BP 112RBP.2	Demonstrate details of frog using suitable software and identify bones.
BP 112RBP.3	Determine blood group, blood pressure and tidal volume.

Course Content:

Sr. No.	List of Experiments
16.	Introduction to experiments in biology <ul style="list-style-type: none"> ▪ Study of Microscope ▪ Section cutting techniques ▪ Mounting and staining ▪ Permanent slide preparation
17.	Study of cell and its inclusions
18.	Study of Stem, Root, Leaf, seed, fruit, flower and their modifications
19.	Detailed study of frog by using computer models
20.	Microscopic study and identification of tissues pertinent to Stem, Root Leaf, seed, fruit and flower
21.	Identification of bones
22.	Determination of blood group
23.	Determination of blood pressure
24.	Determination of tidal volume

Recommended Books (Latest Editions)

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

Syllabus

Semester-II

Human Anatomy and Physiology-II

Course Code : BP201T Credits : 4 Contact Hours: 60 Hrs (45 TH & 15 TU)

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 the course, student shall be able to understand

1. Explain the gross morphology, structure and functions of various organs of the human body.
2. Describe the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of human body.
4. Perform the hematological tests like reticulocyte, differential WBC and platelet counts, and also record respiratory volumes.
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 Outcome (CO):

Upon completion of course student will able to

CO number	Course Outcome (CO) statement
BP201T.1	Describe and illustrate the organization of nervous system, and Central nervous system.
BP201T.2	Explain and illustrate the anatomy and physiology Peripheral nervous system and Special senses.
BP201T.3	Describe and illustrate the anatomy and physiology of Respiratory system and Urinary system.
BP201T.4	Explain and illustrate the anatomy and physiology of Endocrine system.
BP201T.5	Describe and illustrate the anatomy and physiology of Reproductive system and explain the basic concepts of genetics.

Course Content:

Unit	Topic	Hours
I	Nervous system <ul style="list-style-type: none"> ▪ Organization of nervous system Neuron, neuroglia, classification and properties of nerve fiber, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters. ▪ Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid, structure and functions of brain (cerebrum, brain stem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity). 	10 Hrs

II	1. Peripheral nervous system <ul style="list-style-type: none"> ▪ Classification of peripheral nervous system: Structure and functions of sympathetic and parasympathetic nervous system. ▪ Origin and functions of spinal and cranial nerves. 2. Special senses <ul style="list-style-type: none"> ▪ Structure and functions of eye, ear, nose and tongue and their disorders. 	06 Hrs
III	1. Respiratory system <ul style="list-style-type: none"> ▪ Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration. ▪ Lung Volumes and capacities transport of respiratory gases, artificial respiration, and resuscitation methods. 2. Urinary system <ul style="list-style-type: none"> ▪ Anatomy of urinary tract with special reference to anatomy of kidney and nephrons, functions of kidney and urinary tract. ▪ Physiology of urine formation, ▪ Micturition reflex and role of kidneys in acid base balance, role of RAS in kidney and disorders of kidney. 	10 Hrs
IV	Endocrine system <ul style="list-style-type: none"> ▪ Classification of hormones, and mechanism of hormone action. Structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland, thymus and their disorders. 	10 Hrs
V	Reproductive system <ul style="list-style-type: none"> ▪ Anatomy of male and female reproductive system. ▪ Functions of male and female reproductive system. ▪ Sex hormones, physiology of menstruation, fertilization. spermatogenesis, oogenesis, pregnancy and parturition. Introduction to genetics <ul style="list-style-type: none"> ▪ Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance. 	09 Hrs

Recommended Books (Latest Editions)

3. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York.
4. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee Brothers Medical Publishers, New Delhi.

Reference Books (Latest Editions)

4. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
5. Text book of Medical Physiology- Arthur C, Guyton and John.E. Hall. Miamisburg, OH, U.S.A.
6. Human Physiology (Vol 1 and 2) by Dr. C.C. Chatterje, Academic Publishers Kolkata.

Human Anatomy and Physiology-II**Course Code :** BP207P**Credits :** 2**Contact Hours:** 4 Hrs/Week (Practical)**Course Outcome (CO):**

Upon completion of course student will able to

CO number	Course Outcome (CO) statement
BP207P.1	Perform microscopic examination and explain the histology of various organs.
BP207P.2	Describe and illustrate given systems using specimen, models, etc.
BP207P.3	To demonstrate general neurological examination, olfactory functions, feedback mechanisms and types of taste.
BP207P.4	Determine hematological parameters like reticulocytes, differential WBCs, and platelets.
BP207P.5	Record clinical parameters like body temperature and respiratory volumes and explain the use of family planning devices and cell analyzer.

Course Content:

Sr. No.	List of Experiments
25.	Microscopic examination of spinal cord, cortex of kidney, thyroid gland, pancreas, testis and ovaries.
26.	To study the nervous system using specimen, models, etc.
27.	To study the endocrine system using specimen, models, etc.
28.	To study the special senses using specimen and models, etc.
29.	To demonstrate the general neurological examination.
30.	To demonstrate the function of olfactory nerve and examine different types of taste.
31.	To demonstrate the positive and negative feedback mechanism.
32.	Determination of reticulocyte count.
33.	Determination of differential WBC count.
34.	Determination of Platelet count.
35.	Recording of body temperature.
36.	Determination of tidal volume and vital capacity.
37.	Study of nervous system, respiratory system, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens.
38.	Study of family planning devices and pregnancy diagnosis test.
39.	Demonstration of total blood count by cell analyzer.

* Minimum 10 case studies of disease or disorder relevant to practical topic must be discussed and assigned to the students. The data should be reported as per the regulatory requirements and guidelines. AI tools should be used wherever applicable.

Recommended Books (Latest Editions)

1. Textbook of Medical Laboratory Technology by Praful B. Godkar and Darshan P. Godkar Bhalani Publishing House; Mumbai.
2. di Fiore's Atlas of Histology with Functional Correlations by Victor P. Ereoshenko. Lippincott Williams & Wilkins.
3. Textbook of Human Histology by Inderbir Singh, Jaypee brothers medical publishers, New Delhi.
4. Textbook of Practical Physiology by C.L. Ghai, Jaypee brothers medical publishers, New Delhi.
5. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.
6. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York.
8. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
9. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
10. Human Physiology (Vol 1 and 2) by Dr. C.C. Chatterrje ,Academic Publishers Kolkata

PHARMACEUTICAL ORGANIC CHEMISTRY-I (THEORY)**Course Code:** BP202T**Credits:** 4**Contact Hours:** 45 Hrs.

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

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

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

Course Outcome (CO):

Upon completion of course student will able to

CO number	Course Outcome (CO) statement
BP202T.1	Write and Apply basic concepts like hybridization, bond fission, bond type intermolecular forces, and electronic effects (inductive, mesomeric, electromeric, hyperconjugation, resonance)
BP202T.2	Classify organic compounds based on functional groups and interpret their IUPAC and common nomenclature, including structural isomerism.
BP202T.3	Illustrate and compare the mechanisms and orientation of elimination and addition reactions of alkanes, alkenes, and conjugated dienes
BP202T.4	Differentiate between SN1 and SN2 mechanisms and describe the reactivity of alkyl halides and alcohols along with their uses.
BP202T.5	Apply knowledge of nucleophilic addition and condensation reactions to predict the outcome of reactions of aldehydes and ketones
BP202T.6	Describe acidity and interconversion reactions of carboxylic acids, amides, and esters, and describe their qualitative tests and pharmaceutical applications and Explain the basicity and chemical behaviour of aliphatic amines and State their pharmaceutical relevance

Course Content:

Unit	Topic	Hours
I	Basic Principles of Organic Chemistry, Concept of formal charge , Hybridization of atomic orbitals of carbon, nitrogen and oxygen to form molecular orbitals. Types of bonds, bond fission, intermolecular forces, inductive effect, steric effect, electromeric, mesomeric effect and resonance, hyperconjugation, concept and types of tautomerism	06 Hrs.
II	Classification, Nomenclature and Isomerism a) Classification of organic compounds <ul style="list-style-type: none"> • Compounds containing carbon and hydrogen atoms only: hydrocarbons (alkanes, alkenes alkynes, aromatic hydrocarbons, polynuclear aromatic hydrocarbons, aryl-alkyl hydrocarbons, alicyclic hydrocarbons) 	08 Hrs.

	<ul style="list-style-type: none"> • Compounds containing carbon, hydrogen and oxygen atoms only (alcohols, phenols, ethers and epoxides, carbonyl compounds, carboxylic acids, esters, anhydrides) • Compounds containing carbon, hydrogen and nitrogen atoms only (amines and imine, nitriles, hydrazines, nitro compounds) • Compounds containing carbon, hydrogen, and halogens with oxygen (alkyl halides, aryl halides, acyl halides) • Compounds containing carbon, hydrogen, oxygen and nitrogen atoms only (amides, imides, aldoxime and ketoxime) • Compounds containing carbon, hydrogen and sulphur with/without nitrogen, oxygen and halogen. Sulphonic acids, sulphonylhalides (At least five mono-functional examples of each class including aromatic and aliphatic compounds should be covered with their common names.) <p>b) Common and IUPAC systems of nomenclature of organic compounds</p> <ul style="list-style-type: none"> • IUPAC nomenclature of all classes of compounds: nomenclature of mono-substituted and poly-substituted compounds should be covered. <p>c) Structural isomerism in organic compounds</p>	
II	<p>Alkanes*, Alkenes* and Conjugated dienes*</p> <ul style="list-style-type: none"> • Halogenation of alkanes, uses of paraffins. • Stabilities of alkenes, E1 and E2 reactions- kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeff's orientation, Hofmann orientation and evidences. Factors affecting E1 and E2 reactions • Chemical Reactions: Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti-Markownikoff's orientation • Stability of conjugated dienes, Diel's-Alder, 1, 2 and 1, 4- electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement names. 	10 Hrs.
III	<p>a) Alkyl halides*</p> <ul style="list-style-type: none"> • 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 ethylchloride, chloroform, trichloroethylene, dichloromethane, tetrachloromethane and iodoform. <p>b) Alcohols*</p> <ul style="list-style-type: none"> • Qualitative tests, structure and uses of ethyl alcohol, chlorobutanol, cetosteryl alcohol, benzyl alcohol, glycerol, and propylene glycol. 	08 Hrs.
IV	<p>Carbonyl compounds* (Aldehydes and ketones)</p> <ul style="list-style-type: none"> • Nucleophilic addition, Aldolcondensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, and Perkin condensation. • Qualitative tests, structure and uses of formaldehyde, paraldehyde, acetone, chloral hydrate, benzaldehyde, vanillin, and cinnamaldehyde 	08Hrs.
V	<p>a) Carboxylic acids*</p> <ul style="list-style-type: none"> • Acidity of carboxylic acids, effect of substituent/s on acidity, qualitative tests for carboxylic acids, amide and ester. Reactions of inter-conversion of carboxylic acids, amides and esters. 	05Hrs.

	<ul style="list-style-type: none"> • Structure and uses of acetic acid, lactic acid, tartaric acid/s, citric acid, succinic acid, oxalic acid, salicylic acid, benzoic acid, benzyl benzoate, dimethyl phthalate, methyl salicylate and acetyl salicylic acid. <p>b) Aliphatic amines*</p> <ul style="list-style-type: none"> • Basicity, effect of substituent on basicity, qualitative test, structure and uses of ethanolamine, ethylenediamine 	
--	---	--

Recommended Books (Latest editions):-

1. Morrison, R. T. & Boyd, R. D., Textbook of Organic Chemistry, VI (ed.) ELBS, London, 1996
2. Pine, S. H, Organic Chemistry, V, Tata McGraw Hill, New Delhi, 2007
3. Finar, I. L., Organic Chemistry Vol. I, V (ed.), ELBS, Pearson Education, New Delhi, 2003
4. Finar, I. L., Organic Chemistry Vol. II, V (ed.), ELBS, Pearson Education, New Delhi, 2003
5. Eliel, E. L., "Stereochemistry of Carbon Compounds", Wiley-Interscience, 1994.
6. Bahl B.S. & Bahl A., "A Textbook of Organic Chemistry" S. Chand, 2017

PHARMACEUTICAL ORGANIC CHEMISTRY- I (PRACTICAL)**Course Code:** BP208P**Credits:** 4**Contact Hours:** 4Hrs/Week**Course Outcome (CO):**

Upon completion of course student will able to

CO number	Course Outcome (CO) statement
BP208P.1	Demonstrate safety measures and basic laboratory techniques such as calibration of thermometer, determination of melting point, boiling point, distillation, and crystallization
BP208P.2	Perform systematic qualitative analysis of organic compounds through preliminary, solubility, Lassaigne's and functional group tests
BP208P.3	Determine melting/boiling point and identify unknown organic compounds using literature data
BP208P.4	Prepare solid derivatives of organic compounds and characterize them based on melting point and physical properties
BP208P.5	Build molecular models representing organic molecules with different functional groups.

Course Content:

I Safety measures in an organic chemistry laboratory
II Introduction to laboratory techniques: Calibration of thermometer, melting point, boiling point, distillation and recrystallization
III Systematic qualitative analysis of unknown organic compounds 1. Preliminary tests: color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc. 2. Detection of elements like nitrogen, sulphur and halogen by Lassaigne's test 3. Solubility test 4. Functional group test like phenols, amides, carbohydrates, amines, carboxylic acids, aldehydes and ketones, alcohols, esters, aromatic and halogenated hydrocarbons, nitro compounds and anilides 5. Melting point/Boiling point of organic compounds. 6. Identification of the unknown compound from the literature using melting point/ boiling point.
IV Preparation of suitable solid derivatives from organic compounds
V Building of molecular models of structures containing various functional groups

Recommended Books (Latest editions):-

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

BIOCHEMISTRY (THEORY)**Course Code:** BP203T**Credits:** 4**Contact Hours:** 45 Hrs

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 hetero and autocatalytic functions of DNA.

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

- Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
- 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 Outcome (CO):

Upon completion of course student will be able to

CO number	Course Outcome (CO) statement
BP203T.1	Define, identify, and describe the structure, classification, and biological roles of biomolecules (carbohydrates, lipids, nucleic acids, amino acids, proteins and vitamin) explain key carbohydrate metabolic pathways, their regulation, and physiological significance.
BP203T.2	Recall and explain the mechanisms of electron transport, oxidative phosphorylation, and the principles of bioenergetics, including energy-rich molecules.
BP203T.3	Describe the pathways of lipid and amino acid metabolism and explain their biological significance and associated metabolic disorders.
BP203T.4	Recall the structure and functions of nucleic acids and explain their metabolic pathways and the basic processes of genetic information transfer.
BP203T.5	Describe enzyme classification, kinetics, and regulation, and explain their biological, diagnostic, and therapeutic roles, including the functions of coenzymes and cofactors.

Course Content:

Unit	Topic	Hours
I	<ul style="list-style-type: none"> • Introduction and scope of subject in Pharmaceutical sciences • Biomolecules Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids, proteins and vitamins • Carbohydrate metabolism • Glycolysis - Pathway, energetics and significance, • Citric acid cycle- Pathway, energetics and significance, • HMP shunt and its significance; Glucose-6-Phosphate 	10 Hrs.

	dehydrogenase (G6PD) deficiency, <ul style="list-style-type: none"> • Glycogen metabolism Pathways and glycogen storage diseases (GSD), • Gluconeogenesis- Pathway and its significance, • Hormonal regulation of blood glucose level and Diabetes mellitus 	
II	<ul style="list-style-type: none"> • Biological oxidation • Electron transport chain (ETC) and its mechanism. • Oxidative phosphorylation & its mechanism and substrate level. Phosphorylation Inhibitor • ETC and oxidative phosphorylation / uncouplers. • Bioenergetics • Concept of free energy, endergonic and exergonic reaction, relationship between free energy, enthalpy and entropy. • Energy rich compounds; classification; biological significances of ATP and cyclic AMP 	08 Hrs.
III	<ul style="list-style-type: none"> • Lipid metabolism • β- Oxidation of saturated fatty acid (Palmitic acid), • Formation and utilization of ketone bodies; ketoacidosis, • De novo synthesis of fatty acids (Palmitic acid), • Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D, • Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity • Amino acid metabolism • General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders, • Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenylketonuria, Albinism, Alkeptonuria, Tyrosinemia), • Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline, • Catabolism of heme; hyperbilirubinemia and jaundice 	10 Hrs.
IV	<ul style="list-style-type: none"> • Nucleic acid metabolism and genetic information transfer • Biosynthesis of purine and pyrimidine nucleotides, • Catabolism of purine nucleotides and Hyperuricemia and Gout disease, • Structure of DNA and RNA and their functions, • DNA replication (semi conservative model), • Transcription or RNA synthesis, • Genetic code, Translation or Protein synthesis and inhibitors 	10 Hrs.
V	<ul style="list-style-type: none"> • Enzymes • Introduction, properties, nomenclature and IUB classification of enzymes, • Enzyme kinetics (Michaelis plot, Line Weaver Burke plot), • Enzyme inhibitors with examples, • Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation, Therapeutic and diagnostic applications of enzymes and iso-enzymes, • Coenzymes- Structure and biochemical functions 	07 Hrs.

BIOCHEMISTRY (PRACTICAL)**Course Code:** BP209P**Credits:** 2**Contact Hours:** 4Hrs/ week**Course Outcome (CO):**

CO number	Course Outcome (CO) statement
BP209P.1	Identify, describe, and perform qualitative tests for carbohydrates, amino acids, and proteins.
BP209P.2	Identify, explain, and perform qualitative tests to detect abnormal constituents in urine.
BP209P.3	Recall, describe, and interpret the methods for estimating blood creatinine, glucose, and cholesterol.
BP209P.4	Explain the principles of buffer preparation, accurately measure pH, and perform quantitative estimation of reducing sugars and proteins.
BP209P.5	Describe the activity of salivary amylase and analyze the effects of temperature and substrate concentration on its function.

Course Content:

I	Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch)
II	Identification tests for Proteins (albumin and Casein)
III	Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method)
IV	Qualitative analysis of urine for normal and abnormal constituents
V	Determination of blood creatinine
VI	Determination of blood sugar by Glucose oxidase method
VII	Determination of serum total cholesterol
VIII	Preparation of buffer solution and measurement of pH
IX	Study of enzymatic hydrolysis of starch
X	Determination of Salivary amylase activity
XI	Study the effect of Temperature on Salivary amylase activity
XII	Study the effect of substrate concentration on salivary amylase activity

Recommended books (Latest editions):-

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

Pathophysiology

Course Code : BP 204T

Credits : 4

Contact Hours: 60 Hrs (45 TH & 15 TU)

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

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

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

Course Outcome (CO):

Upon completion of course student will able to

CO number	Course Outcome (CO) statement
BP204T.1	Explain the basic process of cell injury and adaptation and elaborate the mechanism of inflammation and repair.
BP204T.2	Describe the pathophysiology of diseases affecting cardiovascular, respiratory and renal system.
BP204T.3	Discuss the pathophysiology of hematological diseases, and diseases affecting endocrine, nervous and gastrointestinal systems.
BP204T.4	Explain pathophysiology of diseases affecting bones and joints and summarize the etiopathogenesis of cancer.
BP204T.5	Describe the pathogenesis of infectious diseases and sexually transmitted diseases.

Course Content:

Unit	Topic	Hours
I	<p style="text-align: center;">Basic principles of Cell injury and Adaptation</p> <ul style="list-style-type: none"> ▪ Introduction, definitions & causes of cellular injury. ▪ Pathogenesis (Cellmembrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage), ▪ Morphology of cell injury – Adaptive changes(Atrophy, Hypertrophy, Hyperplasia, Metaplasia, Dysplasia), ▪ Cell swelling, Intracellular accumulation, Calcification, Enzyme leakageand cell death. ▪ Acidosis, alkalosis,& electrolyte imbalance. <p>Basic mechanism involved in the process of inflammation and repair</p> <ul style="list-style-type: none"> ▪ Introduction, Clinical signs of inflammation. ▪ Different types of Inflammation. 	12 Hrs.

	<ul style="list-style-type: none"> ▪ Mechanism of Inflammation: Alteration in vascular permeability and blood flow, migration of WBC's. ▪ Mediators of inflammation. ▪ Basic principles of wound healing in the skin. <p>Cancer</p> <ul style="list-style-type: none"> ▪ Classification, etiology and pathogenesis of cancer. 	
II	<p>Cardiovascular System</p> <ul style="list-style-type: none"> ▪ Hypertension, ▪ Congestive heart failure, ▪ Ischemic heart diseases (angina, myocardial infarction, atherosclerosis and arteriosclerosis). <p>Respiratory system</p> <ul style="list-style-type: none"> ▪ Asthma ▪ Chronic obstructive airways diseases. <p>Renal system</p> <ul style="list-style-type: none"> ▪ Acute and chronic renal failure 	10 Hrs.
III	<p style="text-align: center;">Haematological Diseases</p> <ul style="list-style-type: none"> ▪ Iron deficiency anaemia ▪ Megaloblastic anaemia (Vit B12 and folic acid). ▪ Sickle cell anaemia. ▪ Thalassemia. ▪ Hereditary acquired anemia. ▪ Hemophilia. <p style="text-align: center;">Endocrine system</p> <ul style="list-style-type: none"> ▪ Diabetes. ▪ Thyroid diseases (Hypothyroidism, hyperthyroidism, Goitre). ▪ Disorders of sex hormones (Amenorrhoea, polycystic ovarian syndrome, hypogonadism). <p style="text-align: center;">Nervous system</p> <ul style="list-style-type: none"> ▪ Epilepsy ▪ Parkinson's disease ▪ Stroke ▪ Psychiatric disorders: Depression, Schizophrenia and Alzheimer's disease. <p style="text-align: center;">Gastrointestinal system</p> <ul style="list-style-type: none"> ▪ Peptic Ulcer. ▪ Inflammatory Bowel Diseases. ▪ Jaundice, Hepatitis (A, B, C, D, E, F). Alcoholic liver disease 	12 Hrs.
IV	<p style="text-align: center;">Diseases of bones and joints</p> <ul style="list-style-type: none"> ▪ Rheumatoid Arthritis. ▪ Osteoporosis ▪ Gout. 	04 Hrs.
V	<p style="text-align: center;">Infectious diseases</p> <ul style="list-style-type: none"> ▪ Tuberculosis. ▪ Leprosy. ▪ Malaria. ▪ Dengue. ▪ Meningitis. ▪ Typhoid. ▪ Urinary tract infections. <p>Sexually transmitted diseases</p> <ul style="list-style-type: none"> ▪ AIDS, Syphilis, & Gonorrhoea 	07 Hrs.

Recommended Books (Latest Editions)

1. Vinay Kumar, Abul K. Abas, Jon C. Aster; Robbins & Cotran Pathologic Basis of Disease; South Asia edition; India; Elsevier; 2014.
2. Harsh Mohan; Text book of Pathology; 6th edition; India; Jaypee Publications; 2010.
3. Laurence B, Bruce C, Bjorn K. ; Goodman Gilman's The Pharmacological Basis of Therapeutics; 12th edition; New York; McGraw-Hill; 2011.
4. Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12th ed; United States.
5. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston; Davidson's Principles and Practice of Livingstone; 2010.
6. Guyton A, John .E Hall; Textbook of Medical Physiology; 12th edition; WB Saunders Company; 2010
7. Joseph DiPiro, Robert L. Talbert, Gary Yee, Barbara Wells, L. Michael Posey; Pharmacotherapy: A Pathophysiological Approach; 9th edition; London; McGraw-Hill Medical; 2014.
8. V. Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6th edition; Philadelphia; WB Saunders Company; 1997.
9. Roger Walker, Clive Edwards; Clinical Pharmacy and Therapeutics; 3rd edition; London; Churchill Livingstone publication; 2003.

Recommended Journals

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

Computer Applications in Pharmacy

Course Code : BP205T **Credits :** 3 **Contact Hours:** L 30 (2 Hr/wk)

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

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

- ✓ Know the various types of application of computers in pharmacy
- ✓ Know the various types of databases
- ✓ Know the various applications of databases in pharmacy

Course Outcome (CO):

Upon completion of course student will able to

CO number	Course Outcome (CO) statement
BP105T.1	Perform conversions and arithmetic operations using different number systems.
BP105T.2	Explain information systems, software tools, and project management concepts.
BP105T.3	Use web technologies and databases for pharmacy-related applications.
BP105T.4	Apply computer tools in drug storage, prescribing, dispensing, and patient care.
BP105T.5	Describe bioinformatics and data analysis tools used in drug discovery and preclinical development.

Course Content:

Unit	Topic	Hours
I	<p>Number system: Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One's complement, Two's complement method, binary multiplication, binary division</p> <p>Concept of Information Systems and Software: Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle,</p>	6 Hr

	planning and managing the project	
II	Web technologies: Introduction to HTML, XML, CSS and Programming languages, introduction to web servers and Server Products Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database	6 Hr
III	Application of computers in Pharmacy – Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System	6 Hr
IV	Bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery	6 Hr
V	Computers as data analysis in Preclinical development: Chromatographic data analysis (CDS), Laboratory Information management System (LIMS) and Text Information Management System (TIMS)	6 Hr

References:

1. Fassett WE. Computer Application in Pharmacy. Lea and Febiger; 600 South Washington Square, USA; (215) 922-1330.
2. Ekins S. Computer Application in Pharmaceutical Research and Development. Wiley-Interscience, A John Wiley and Sons, Inc.; USA.
3. Rastogi SCR. Bioinformatics (Concept, Skills and Applications). CBS Publishers and Distributors; 4596/1-A, 11 Darya Ganj, New Delhi – 110002, India.
4. Prague CN. Microsoft Office Access 2003: Application Development Using VBA, SQL Server, DAP and InfoPath. Wiley Dream tech India (P) Ltd.; 4435/7, Ansari Road, Darya Ganj, New Delhi – 110002.

Computer Applications in Pharmacy - Practical

Course Code : BP210P **Credits :** 1 **Contact Hours:** P 30 (2 Hr/wk)

Scope : Computers in pharmacy are widely used in drug design, manufacturing, quality control, data management, and hospital pharmacy. They help in research, regulatory documentation, e-pharmacy, and improve accuracy, speed, and communication in pharmaceutical practice.

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

- ✓ Understand the role of computers in pharmaceutical education, industry, and practice.
- ✓ To learn the use of software tools for data handling, documentation, and analysis.
- ✓ To develop skills in e-communication, database management, and regulatory documentation.

Course Outcome (CO):

Upon completion of course student will able to

CO number	Course Outcome (CO) statement
BP210P.1	Apply word processing and web development tools to create health-related documents and personal information pages.
BP210P.2	Utilize online resources and databases to retrieve drug information, including adverse effects
BP210P.3	Develop and manage pharmaceutical data using MS Access, including creating tables, forms, queries, and reports.
BP210P.4	Export and present pharmacy-related data in various formats such as web pages and XML for enhanced accessibility and sharing.

Course Content:

1. To study and practice drafting, formatting, and sending professional emails useful in the field of pharmacy.
2. Design a questionnaire using a word processing package to gather information about a particular disease
3. To Create a HTML web page to show personal information.
4. Retrieve the information of a drug and its adverse effects using online tools
5. Creating mailing labels Using Label Wizard, generating label in MS WORD

Program : B. Pharmacy (Environmental Science)

Class: First Year

Semester : 2

Environmental Science (Theory)

Course Code : BP206T

Credits : 3

Contact Hours: 30 Hrs

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 Outcome (CO):

Upon completion of course student will able to

CO number	Course Outcome (CO) statement
BP 206 T. 1	Understand the multidisciplinary nature and significance of environmental studies and natural resource management
BP206 T. 2	Describe the structure, function, and diversity of ecosystems including terrestrial and aquatic types.
BP206 T. 3	Explain different types of environmental pollution and their impacts on health and ecosystems.

Course Content:

Unit	Topic	Hours
I	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.	10 Hrs.

II	Ecosystems Concept of an ecosystem. Structure and function of an ecosystem. Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	10 Hrs.
III	Environmental Pollution: Air pollution; Water pollution; Soil pollution	10 Hrs.

References:-

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 Publishing Pvt. Ltd., Ahmedabad – 380 013, India,
4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
5. Clark R.S., Marine Pollution, Clanderson Press Oxford
6. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p
7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
8. Down of Earth, Centre for Science and Environment