Raghavendra Institute of Pharmaceutical Education and Research (RIPER)-Autonomous

Accorded under Sections 2 (f) and 12 (B) of UGC act 1956 and accredited by NBA (UG) & NAAC-A Grade, Approved by PCI & AICTE, New Delhi

Academic regulations

Program structure

&

Effective from AY 2023

Bachelor of Pharmacy



Applicable for the batch admitted from 2023-2024 Awarding University

Jawaharlal Nehru Technological University Anantapur (JNTUA)

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Introduction to the Document

The guidelines published in this document are official guidelines by the Board of studies (BoS) and Academic council of Raghavendra Institute of Pharmaceutical Education and Research (RIPER) - Autonomous, sponsored by Raghavendra Educational and Rural Development Society (RERDS), Anantapur, Andhra Pradesh. The document is a fusion product based on recommendations and guidelines stipulated for syllabus structure by UGC, PCI, New Delhi.

- Academic regulations stipulated by Jawaharlal Nehru Technological University Anantapur (JNTUA), Ananthapuramu, Andhra Pradesh.
- Experts' opinion from the Board of Studies, Academic Council constituting approved Advisory boards members includes both academicians and researchers from reputed organizations at national and international levels.
- Suggestions and inputs from members of academic council and Board of studies.
- Recommendations based on feedback from alumni, employers, faculty, students, parents and other experts from allied area.

This *academic regulations, Program structure & Syllabus document* has been prepared to ensure quality system in teaching and learning process, examination, assessment, and functioning of other academic related matters to the satisfaction of stakeholders, such as students, parents, alumni, employers, faculty, etc. This document provides core principles of academic regulations duly approved by academic council and board of studies of this institution. The Implementation of these academic regulations shall lead to be considered in the institute and thereby enrich the quality of education and research in the field of pharmaceutical sciences. The guidelines shall aid the transparency and accountability in the administration set up. The list of objectives for implementing academic regulations and course structure through these guidelines are listed below,

- To improve the academic regulations and course structure.
- To strengthen the Industry-Institute interaction.
- To comply with rules and regulations of regulatory bodies like UGC, JNTUA, PCI etc.,
- To meet the requirements of accreditation council and board.
- To enhance the quality of teaching-learning process and assessments.
- To provide career support programs, training for enhancing quality in placements and higher education.
- To place improved systems for feedback, self-appraisal of faculty and staff.
- To create bench marking with other institutes of repute.

Preamble

The regulations stated herein below shall be called as a document of "**Academic regulations**, **Program structure & Syllabus for B. Pharm**" for Raghavendra Institute of Pharmaceutical Education and Research (RIPER)-Autonomous.

- These regulations shall be in force from the batch admitted from 2023 -2024 by the date of ratification by the Academic council and Board of studies (BoS) of the institute.
- In the event of any doubt about the interpretation of these regulations, the matter shall be referred to Board of studies (BoS) and Academic council and their decision shall be final.
- The Board of studies (BoS) and Academic council shall have the authority to modify, amend and repeal any of the provisions of these regulations from time to time.

Definitions

- "*College*" means "Raghavendra Institute of Pharmaceutical Education & Research (RIPER) - Autonomous, Anantapur, Andhra Pradesh".
- ii. "*Student*" means a candidate who has taken admission into B. Pharm course of this college as per the guidelines stipulated from time to time by the regulations of State Government of Andhra Pradesh and the Government of India for admissions into various courses of study and the affiliating university, i.e., Jawaharlal Nehru Technological University, Anantapur (JNTUA), Ananthapuramu, Andhra Pradesh.
- iii. "Academic Council" means the Academic council constituted as per the guidelines of UGC.
- iv. "*Board of Studies*" means Board of Studies constituted in each department as per the guidelines of UGC.
- v. "Principal" means the Head of the institution
- vi. "Head of the Department" means the Head of an Academic Department of the College.
- vii. "Faculty member" means the teacher (Assistant/Associate/Professor) working on regular or ad-hoc basis in any of the Academic Departments of the College.
- viii. "Program" means a candidate who has chosen to avail degree of B. Pharm of this college as per the marks/ rank awarded by the National/ University/ State common entrance tests, India.
- ix. "Course" individual subjects described with content for instructions to the students.
- x. "*Assessment*" means evaluation process for the outcome and grading in term of the marks.
- xi. "Credit" means a weight to the time requirements of the academic course in the institute.

Quality Policy

To formulate quality graduate through quality teaching and training regarding versatile development of professional skills for their higher learning and career.

Program Specific Outcomes

PSO 1: Accomplish a successful professional career in pharmaceutical industries, health care sector and health system research.

PSO 2: Adopt their higher learning for innovative and widening horizons in pharmaceutical and health care system to global standards.

PSO 3: Facilitate support to design and manufacture of pharmaceuticals and community services to public health.

PSO 4: Possess team based and multidisciplinary approach to broaden social contact and to resolve and manage issues in relation to public health.

Program Outcomes

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.

PO3: Problem Analysis – Utilize the principles of scientific enquiry, thinking analytically, clearly, and critically, while solving problems and making decisions during daily practice. Find, analyse, 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, analyse, 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.

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

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

Academic Regulations for Bachelor of Pharmacy (R23)

1. Short Title and Commencement

These regulations shall be called as "Academic Regulations for the Bachelor of Pharmacy (R23) Degree Program - Choice Based Credit System (CBCS) of the Raghavendra Institute of Pharmaceutical Education & Research (RIPER)-Autonomous, Anantapur". They shall come into effect from the Academic Year 2023-24. The regulations framed are subject to modifications from time to time by Board of studies & Academic Council of RIPER-Autonomous.

2. Minimum qualification for admission

- 2.1 First year B. Pharm: Admission to this programme shall be made subject to the eligibility and qualifications prescribed by the awarding university (JNTUA), State government of Andhra Pradesh/Govt. of India and as per regulatory bodies like All India Council for Technical Education (AICTE) and Pharmacy Council of India (PCI), New Delhi, from time to time.
- i. 10+2 examination with Physics and Chemistry as compulsory subjects along with one of the two subjects: Mathematics or Biology.
- ii. Any other qualification approved by the Pharmacy Council of India as equivalent to any of the above examinations.
- Provided that a student should complete the age of 17 years on or before 31st
 December of the year of admission to the course.
- iv. Provided that there shall be reservation of seats for the students belonging to the Scheduled Castes, Scheduled Tribes, and other Backward Classes in accordance with the instructions issued by the Central Government/State Government/Union Territory Administration as the case may be from time to time.
 - 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 Board of studies & Academic Council of RIPER-Autonomous.

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 student shall be eligible to appear for the semester end examinations, if the student acquires a minimum of 75% of attendance in aggregate of all the subjects and not less than 50% in any of the subject.
- Shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each semester may be condoned by the college academic committee on genuine and valid grounds, based on the student's representation with supporting evidence.
- A stipulated fee shall be payable for condoning of shortage of attendance. Shortage of attendance below 65% in aggregate shall in no case be condoned.
- Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester.

7. Program/Course credit structure

As per the philosophy of Choice Based Credit System (CBCS), certain quantum of academic work viz. theory classes, tutorial hours, practical classes, etc. are measured in terms of credits. On satisfactory completion of the courses, a candidate earns credits. The amount of credit associated with a course is dependent upon the number of hours of instruction per week in that course. Similarly, the credit associated with any of the other academic, co/extra-curricular activities is dependent upon the quantum of work expected to be put in for each of these activities per week.

7.1 Credit assignment

7.1.1. Theory and Laboratory courses

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

carries a credit of 4. Similarly, a practical having four laboratory hours per week throughout semester carries a credit of 2.

7.2 Minimum credit requirements

The minimum credit points required for award of a B. Pharm. degree is 220[§]/221[#] ([#]Applicable ONLY for the students who have studied Mathematics / Physics / Chemistry at Intermediate/HSC and appearing for Remedial Biology (RB)course. [§]Applicable ONLY for the students who have studied Physics / Chemistry / Botany / Zoology at Intermediate/HSC and appearing for Remedial Mathematics (RM)course). These credits are divided into Theory courses, Tutorials, Practical, Practice School and Project, extra/co-curricular activities 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.

7.3 Audit Courses

All the students of II & IV Semester shall choose any one out of five audit courses. A candidate is required to submit report at the end of the semester to the examining authority of the RIPER Autonomous. Satisfactory report from the concerned faculty is required to declare him/her as pass. However, Universal Human Values audit course is introduced by JNTUA in III semester. The student must get a minimum of 50% in internal examination to declare him/her as pass. The maximum marks for this audit course (Universal Human Values) are 50.

8. Academic work

A regular record of attendance both in Theory and Practical shall be maintained by the teaching staff of respective courses. A faculty advisor/mentor shall be assigned to advise students on the programme, its Course Structure and Curriculum, Choice of Courses, based on his competence, progress, pre-requisites and interest.

9. Course structure: The course of study for B. Pharm shall include Semester Wise Theory & Practical as given in Table – I to VIII. The number of hours to be devoted to each theory,

tutorial and practical course in any semester shall not be less than that shown in Table – I to VIII.

B. Pharmacy Curriculum – R23

Course Structure

Year I-I

Table-I: Course of study for Semester I

Course code	Name of the course	L	T	Р	Credit points
BP101T	Human Anatomy and Physiology I–Theory	3	1		4
BP102T	Pharmaceutical Analysis – Theory	3	1		4
BP103T	Pharmaceutics I – Theory	3	1		4
BP104T	Pharmaceutical Inorganic Chemistry – Theory	2	1		3
BP105T	Communication skills – Theory	2	-		2
BP106RBT BP106RMT	Remedial Biology/ Remedial Mathematics – Theory	2/3	-		2/3
BP101P	Human Anatomy and Physiology – Practical		-	3	1.5
BP102P	Pharmaceutical Analysis – Practical		-	3	1.5
BP103P	Pharmaceutics I – Practical		-	3	1.5
BP104P	Pharmaceutical Inorganic Chemistry – Practical		-	3	1.5
BP105P	Communication skills – Practical		-	2	1
BP106RBP	Remedial Biology – Practical ^{\$}		-	2	1
BP107CE	Comprehensive Online Exam	-	-	-	-
	Total	15/16	4	16	27

^{\$}Applicable ONLY for the students who have studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology (RB)course.

Course	Nome of the course	L	т	Р	Credit
Code	Name of the course		1		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	Computer Applications in Pharmacy – Theory	3	1		4
BP205T	Environmental sciences – Theory	2	-		2
BP206T	Social and Preventive Pharmacy– Theory	2	-		2
BP201P	Human Anatomy and Physiology II – Practical		-	3	1.5
BP202P	Pharmaceutical Organic Chemistry I- Practical		-	3	1.5
BP203P	Biochemistry – Practical		-	3	1.5
BP204P	Computer Applications in Pharmacy – Practical		-	3	1.5
BP207CE	Comprehensive Online Exam	-	-	-	-
	Total	16	4	12	26

Year I-II Table-II: Course of study for Semester II

* For exit certificate candidate must additionally complete the following training course:

Hospital/Community Training

for 12 weeks (4 credits)

Year II-I	Table-III:	Course of study for semester III

Course code	Name of the course	Т	Р	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	2	1	-	3
BP305T	Pathophysiology – Theory	2	1	-	3
BP301P	Pharmaceutical Organic Chemistry II – Practical	-	-	3	1.5
BP302P	Physical Pharmaceutics I – Practical	-	-	3	1.5
BP303P	Pharmaceutical Microbiology – Practical	-	-	3	1.5
BP 304P	Pharmaceutical Engineering – Practical	-	-	3	1.5
BP306CE	Comprehensive Online Exam	-	-	-	-
BP305PSO	Skill Oriented course 1	1	-	2	2
	Preparation of cosmetics (any five)				
	Non-Credit Mandatory Course (Universal Human	3	-	-	-
	values and Professional ethics)				
	Total	19	3	14	26

Course	Name of the course	L	т	Р	Credit
Code	Name of the course		•		points
BP401T	Medicinal Chemistry I – Theory	3	1	-	4
BP402T	Physical Pharmaceutics II – Theory	3	1	-	4
BP403T	Pharmacology I – Theory	3	1	-	4
BP404T	Pharmacognosy and Phytochemistry I- Theory	2	1	-	3
BP405T	Pharmaceutical Jurisprudence– Theory	2	1	-	3
BP401P	Medicinal Chemistry I – Practical	-	-	3	1.5
BP402P	Physical Pharmaceutics II – Practical	-	-	3	1.5
BP403P	Pharmacology I – Practical	-	-	3	1.5
BP404P	Pharmacognosy and Phytochemistry I – Practical	-	-	3	1.5
BP406CE	Comprehensive Online Exam	-	-	-	-
BP405PSO	Skill Oriented course-II	1	-	2	2
	Synthesis of API drugs (minimum five)				
	Total	16	3	14	26

Year II-II Table-IV: Course of study for semester IV

Mandatory community service internship for a minimum of four-week duration during summer vacation

* For exit Diploma in pharmacy certificate candidate must secure additional four credits from the following courses:

- **1.** Pharmacotherapeutics
- 2. Hospital and clinical Pharmacy

Or

Any course offered by MOOCs / NPTEL/ Swayam/ college/ Govt. agencies equivalent to the above four credits, approved by JNTUA

3. Hospital Training not less than mandatory

500 hrs

2 credits

2 credits

Course	Nome of the course	L	т	Р	Credit
Code	Ivanie of the course		I		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	Professional Elective-I1. Dietary Supplements and Nutraceuticals2. Pharmaceutical Marketing3. Generic Drug Development	2	1	-	3
BP506T	Open Elective-I 1. AI/ML Tools in Health care 2. Pharmaceutical entrepreneurship 3. Basic Principles of Toxicology	2	1	-	3
BP501P	Industrial Pharmacy I – Practical	-	-	3	1.5
BP502P	Pharmacology II – Practical	-	-	3	1.5
BP503P	Pharmacognosy and Phytochemistry II – Practical	-	-	3	1.5
BP507CE	Comprehensive Online Exam	-	-	-	-
BP504PSO	Skill Oriented course-III Any course offered by Central / State Govt. skill development corporation / approved by JNTUA	1	-	2	2
BP505PCS	Summer Internship: Evaluation of community service				1.5
	Non-Credit Mandatory Course (Social responsibility & Gender sensitization)	3	-	-	-
	Total	22	4	11	30

Year III-I Table-V: Course of study for semester V

Year III-II

Course of study for semester VI

Course	Nome of the course	No. of	Tutorial		Credit		
Code	Name of the course	hours	Tutoriai		points		
BP601T	Medicinal Chemistry III – Theory	3	1		4		
BP602T	Pharmacology III – Theory	3	1		4		
BP603T	Quality Assurance – Theory	3	-		3		
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	2	1		3		
BP605T	Pharmaceutical Statics-Theory	2	1		3		
BP606T	Professional Elective-II 1. Herbal Drug Technology 2. Pharmaceutical Regulatory sciences 3. Pharmacoinformatics	2	1	_	3		
BP601P	Medicinal chemistry III – Practical		-	3	1.5		
BP602P	Pharmacology III – Practical		_	2	1		
BP603P	Biopharmaceutics and Pharmacokinetics – Practical			3	1.5		
BP607CE	Comprehensive Online Exam	-	-	-	-		
BP604PSO	Skill Oriented course-IV Any course offered by Central / State Govt. skill development corporation / approved by JNTUA	1	-	2	2		
	Total	19	2	10	26		
Mandatory industry internship for a minimum of four weeks duration during summer vacation							

* For exit certificate of Advance Diploma certificate, candidate has to secure additional four

credits from the

- 1. Pharmaceutical and Medical Devices
- 2. Pharmacoeconomics

2 credits 2 credits Year IV-I

Course of study for semester VII

Course	Nome of the course	L	Т	P	Credit
code	Name of the course		1		Points
BP701T	Instrumental Methods of Analysis – Theory	3	1	-	4
BP702T	Industrial Pharmacy II – Theory	3	1	-	4
BP703T	Pharmacy Practice – Theory	3	-	-	3
BP704T	Novel Drug Delivery System – Theory	3	1	-	4
BP705T	Pharmaceutical Biotechnology-Theory	2	1	-	3
BP706T	Professional Elective-III	2	1	-	3
	1. Experimental Pharmacology Techniques				
	2. Bioavailability and bioequivalence (BA/BE)				
	studies and regulations				
	3. Quality by Design techniques in formulation				
	development				
BP701P	Instrumental Methods of Analysis – Practical	-	-	4	2
BP702PSO	Skill Oriented course V	1	0	2	2
	Pharmaceutical Waste Management				
BP703PS	Practice School*	-	-	4	2
BP704PII	Evaluation of Industry Internship				3
BP707CE	Comprehensive Online Exam	-	-	-	-
	Total	19	3	10	30

* Non-University Examination (NUE)

Year IV-II

Course of study for semester VIII

Course Code	Name of the course	L	Т	Р	Credit points
BP801T	Open Elective-II	3	-	-	3
	1. Pharmacovigilance				
	2. Cell and Molecular Biology				
	3.Pharmaceutical and Medical devices				
BP802T	Professional Elective-III	3	-	-	3
	1. Quality Control and Standardization of				
	Herbals				
	2. Computer Aided Drug Design				
	3. Cosmetic Science				
BP803PW	Project Work	-	-	24	12
BP804CE	Comprehensive online examination	-	-	-	-
	Total	6	-	24	18

Honors

Year & Sem	Course code	Name of the course	L	Т	Р	Credit Points
III-I	BP507T	Modern Spectroscopic analysis of drugs and Pharmaceuticals	3			3
III-II	BP607T	Medical Writing & Coding	3			3
IV-I	BP707T	Statistical analysis software	3			3
IV-II	BP803T	Impurity Profiling of Pharmaceuticals	3			3
		Total				12

Research

Year & Sem	Course code	Name of the course	L	Т	Р	Credit Points
III-I	BP508T	Research methodology	3	-	-	3
III-II	BP608T	Intellectual Property Rights	3	-	-	3
IV-I	BP708T	Principles of OECD GLP	3	-	-	3
IV-II	BP804T	Molecular docking techniques	3	-	-	3
		Total				12

Minor I&II

Minor-I C	linical Phar	macy				
Year & Sem	Course code	Name of the course	L	Т	Р	Credit Points
III-I		Hospital & Clinical Pharmacy	3	-	-	3
III-II		Clinical and Applied Therapeutics	3	-	-	3
IV-I		Clinical Data Management	3	-	-	3
IV-II		Evidence based Medicine & critical Appraisal	3	-	-	3
Minor-II	Health Care	Management				
Year & Sem	Course code	Name of the course	L	Т	Р	Credit Points
III-I		Principles of Hospital Administration	3	-	-	3
III-II		Human Resource Management	3	-	-	3
IV-I		Digital Marketing	3	_	-	3
IV-II		Health Economics	3	-	-	3
		Total				12

Table-IX: Semester wise credits distribution

Semester	Credit Points	Credit Points (Hons/Research)
Ι	26	26
II	26	26
III	26	26
IV	26	26
V	30	33
VI	26	29
VII	30	33
VIII	18	21
Total credit points for the program	208	220

^{\$} For students who study remedial biology

Extracurricular/ Co-curricular activities - 5 Credits

Rules and Regulations:

Categories

- 1. Add on courses (1 credit)
- 2. NSS, NCC and other social service activities (1 credit)
- 3. Achievements (2 credits)
- 4. 5th credit can be any one of the above three categories.

Award of Credits

Add on courses (1 credit Compulsory) (In campus/Off campus) (Offline/online)

One credit -Each short-term course certificate as per UGC norms for add on courses.

(30hrs Duration/8 weeks).

Two credits- Diploma course certificate as per UGC norms for add on courses

(60hrs Duration/16 weeks).

Others discretion of Director of Academics/CE/Principal.

NSS, NCC and other social activities (1 Credit Compulsory)

(30 hours for One credit. 60 hours for Two credits)

Calculation of Hours

- A. Three Commemoration Day celebrations/Any other day celebration participation=1 hr.
 (i.e.- Independence Day, Republic Day, Gandhi Jayanti, etc.)
- B. One Participation in Rally = 2 hrs.
- C. For one day camp participation= 3 hrs.
- D. One day Yoga/training involving learn and practice participation =2 hrs.
- E. One session of Plantation Day- 2 hrs.
- F. Donating blood donation at Blood donation camp at college or hospital- 5 hrs. (Maximum one per year allowed. Certificate is required in case in outside of the college)
- G. One day participation in Clean India like activities at outside -5 hrs.
- H. Three Awareness program participation-1hrs
- I. One Street play performance/flash mob performance -3 hrs.
- J. Four audience participation in programs (Discretion of NSS Officer/CE/Principal)- 1 hr.
- K. Any performance in any of the events which are not listed here (Discretion of NSS officer/CE/Principal)-2 hrs.
- L. One Social service merit certificate (Lion's club/Rotary club/Traffic police/Police volunteers/Other Govt. Organizations)-1 credit
- M. Others discretion of NSS officer/CE/Principal.

Achievements (Compulsory Credits 2):

Note: (One credit is compulsory from listed research Scholar Initiative activities Only one credit can be obtained from own institute for any of the clause of the "Achievement" Category).

Research Scholarly Activities

- A. One publication 1 credit
- B. One indexed Publication- 2 credits
- C. One IPC Participation-1 credit
- D. One IPC presentation (Oral/Poster)-2 Credits

- E. Local chapters like IPA/ISPOR/RSC publications or presentations-1 credit
- F. One Presentations at seminars/conferences at india-1 credit
- G. One Presentations at seminars/conferences at outside India-2 credits
- H. Four Conferences/seminars/workshops Participation national level -1 credit
- I. Three International level Conferences/seminars/workshops Participation at India 1 credit
- J. Two International Conferences/seminars/workshops Participation at outside India -2 credit
- K. Others discretion of R&D Director/CE/Principal.

Certificates for Achievements (Sports/cultural/others)

- A. One National/State/District/University level certificate-2 credits (winner/runner)
- B. One National/State/District/University level certificate-1 credit (only when Participation certificate received).
- C. One non-government/affiliated institution merits/own institute level certificate-1 credit (winner/runner).
- D. Others discretion of NSS officer/CE/Principal.

Evaluation of Extracurricular/Co-curricular activities

A detailed report must be prepared by the student, consisting of Extracurricular/Co-curricular activities (Proofs/Certificates of Add on courses, Research scholarly activities, Participation in social service activities like NSS & NCC). All these certificates shall be duly verified, signed and forwarded by the project guide to the internal & external evaluator along with their project work

at the time of Project Viva Voce. Final award of credits shall be done by the internal & external evaluator.

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.
- The composition of the Program Committee shall be as follows: A senior teacher/Principal shall be the Chairperson; One Teacher from each department handling B. Pharm courses/HODs of the departments; senior faculty.
- 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 twice in a semester preferably at the end of each Sessional exam.

11. Examinations/Assessments

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

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

Course			Internal As	sessment	End Semes	Total		
code	Name of the course	Continuous	Sessiona	l Exams	Total	Marks	Duration	Marks
		Mode	Marks	Duration			(Hrs.)	
				(Hrs.)				
BP101T	Human Anatomy and Physiology I– Theory	10	20	1	30	70	3	100
BP102T	Pharmaceutical Analysis I – Theory	10	20	1	30	70	3	100
BP103T	Pharmaceutics I – Theory	10	20	1	30	70	3	100
BP104T	Pharmaceutical Inorganic Chemistry – Theory	10	20	1	30	70	3	100
BP105T	Communication skills – Theory	10	20	1	30	70	1.5	100
BP106RBT BP106RMT	Remedial Biology/ Mathematics – Theory	10	20	1	30	70	1.5	100
BP101P	Human Anatomy and Physiology – Practical	10	20	3	30	70	3	100
BP102P	Pharmaceutical Analysis I – Practical	10	20	3	30	70	3	100
BP103P	Pharmaceutics I – Practical	10	20	3	30	70	3	100
BP104P	Pharmaceutical Inorganic Chemistry – Practical	10	20	3	30	70	3	100
BP105P	Communication skills – Practical	10	20	2	30	70	2	100
BP106RBP	Remedial Biology – Practical	10	20	2	30	70	2	100
BP107CE	Comprehensive online examination	-	-	-	-	100	1	100
	Total							1300

-II

Course]	Internal			End	Semester	Total
code	Name of the course	Assessment				Exams		Marks
		Continuous	Sessiona	al Exams	Total	Marks	Duration	
		Mode	Marks	Duration			(Hrs.)	
DDOO1T		10	•	(Hrs.)	2.0			100
BP201T	Human Anatomy and	10	20	1	30	70	3	100
	Theory							
DD202T	- Theory	10	20	1	20	70	2	100
DF 202 I	Chemistry I	10	20	1	30	/0	5	100
	– Theory							
BP203T	Biochemistry – Theory	10	20	1	30	70	3	100
BP204T	Computer Applications in	10	20	1	30	70	2	100
	Pharmacy		-					
	– Theory							
BP205T	Environmental sciences –	10	20	1	30	70	2	100
	Theory							
BP206T	Social and Preventive	10	20	1	30	70	3	100
	Pharmacy– Theory							
BP201P	Human Anatomy and	10	20	3	30	70	3	100
	Physiology II							
DDOOD	-Practical	10	20	2	20	70	2	100
BP202P	Chamistry	10	20	3	30	/0	3	100
	L Practical							
BP203P	Biochemistry – Practical	10	20	3	30	70	3	100
BP204P	Computer Applications in	10	20	2	30	70	2	100
	Pharmacy-Practical		20	-	20	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	-	
BP207CE	Comprehensive online	-	-	_	-	100	1	100
	examination							
	Total							1100

Year II-I

Course code	Name of the course	Inter	nal Asse	essment		End Exams	Total Marks	
		Continuous	Session	al Exams	Total	Marks Duration		1,1,1,1,1,1,5
		Mode	Marks	Duration (Hrs.)			(Hrs.)	
BP301T	Pharmaceutical Organic Chemistry II – Theory	10	20	1	30	70	3	100
BP302T	Physical Pharmaceutics I –Theory	10	20	1	30	70	3	100
BP303T	Pharmaceutical Microbiology – Theory	10	20	1	30	70	3	100
BP304T	Pharmaceutical Engineering – Theory	10	20	1	30	70	3	100
BP305T	Pathophysiology - Theory	10	20	1	30	70	3	100
BP301P	Pharmaceutical Organic Chemistry II – Practical	10	20	3	30	70	3	100
BP302P	Physical Pharmaceutics I – Practical	10	20	3	30	70	3	100
BP303P	Pharmaceutical Microbiology – Practical	10	20	3	30	70	3	100
BP304P	Pharmaceutical Engineering – Practical	10	20	3	30	70	3	100
BP305PSO	Skill Oriented course 1 Preparation of cosmetics (any five)	10	20	3	30	70	3	100
BP306CE	Comprehensive online examination (AECC)	-	-	-	-	100	1	100
	Non-Credit Mandatory Course (Universal Human values and Professional ethics) Total							1100

Course code	Name of the course		End Exams	Semester	Total Marks			
		Continuous Mode	Session: Marks	al Exams Duration (Hrs.)	Total	Marks	Duration (Hrs.)	
BP401T	Medicinal Chemistry I – Theory	10	20	1	30	70	3	100
BP402T	Physical Pharmaceutics II – Theory	10	20	1	30	70	3	100
BP403T	Pharmacology I – Theory	10	20	1	30	70	3	100
BP404T	Pharmacognosy and Phytochemistry I– Theory	10	20	1	30	70	3	100
BP405T	Pharmaceutical Jurisprudence– Theory	10	20	1	30	70	3	100
BP401P	Medicinal Chemistry I – Practical	10	20	3	30	70	3	100
BP402P	Physical Pharmaceutics II – Practical	10	20	3	30	70	3	100
BP403P	Pharmacology I – Practical	10	20	3	30	70	3	100
BP404P	Pharmacognosy and Phytochemistry I – Practical	10	20	3	30	70	3	100
BP406CE	Comprehensive Online Exam	-	-	-	-	100	1	100
BP405PSC	Skill Oriented course-II Synthesis of API drugs (minimum five)	10	20	3	30	70	3	100
	10181							1100

Year III-I

Course		Internal Assessment			End	Total		
code	Name of the course	~	~ •			Exams	-	Marks
		Continuous	Session	al Exams	Total	Marks	Duration	
		Niode	Marks	Duration			(Hrs.)	
BP501T	Medicinal Chemistry II –	10	20	1	30	70	3	100
	Theory							
BP502T	Industrial Pharmacy I– Theory	10	20	1	30	70	3	100
BP503T	Pharmacology II – Theory	10	20	1	30	70	3	100
BP504T	Pharmacognosy and Phytochemistry II– Theory	10	20	1	30	70	3	100
BP505T	Professional Elective-I 1. Dietary Supplements and Nutraceuticals 2. Pharmaceutical Marketing 3. Generic Drug Development	10	20	1	30	70	3	100
BP506T	Open Elective-I 1. AI/ML Tools in Health care 2. Pharmaceutical entrepreneurship 3. Basic Principles of Toxicology	10	20	1	30	70	3	100
BP501P	Industrial Pharmacy I – Practical	10	20	3	30	70	3	100
BP502P	Pharmacology II – Practical	10	20	3	30	70	3	100
BP503P	Pharmacognosy and Phytochemistry II – Practical	10	20	3	30	70	3	100
BP507CE	Comprehensive Online Exam					100	1	100
BP504PSC	Skill Oriented course-III Any course offered by Central / State Govt. skill development corporation / approved by JNTUA	10	20	3	30	70	3	100
BP505PCS	Summer Internship: Evaluation of community service							
	Non-Credit Mandatory Course (Social responsibility & Gender sensitization)							1100

Year III-II

Course	Name of the course	Internal Assessment				Internal Assessment End Semeste		Total Morks
coue	Name of the course	Continuous	Session	al Exams	Total	Exams Marks	Duration	IVIALKS
		Mode	Marks	Duration	100001	1,100 110	(Hrs.)	
				(Hrs.)				
BP601T	Medicinal Chemistry III – Theory	10	20	1	30	70	3	100
BP602T	Pharmacology III – Theory	10	20	1	30	70	3	100
BP603T	Quality Assurance – Theory	10	20	1	30	70	3	100
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	10	20	1	30	70	3	100
BP605T	Pharmaceutical Statics-Theory	10	20	1	30	70	3	100
BP606T	Professional Elective- II 1. Herbal Drug Technology 2. Pharmaceutical Regulatory sciences 3.Pharmacoinformatics	10	20	1	30	70	3	100
BP601P	Medicinal chemistry III – Practical	10	20	3	30	70	3	100
BP602P	Pharmacology III – Practical	10	20	3	30	70	3	100
BP603P	Biopharmaceutics and Pharmacokinetics – Practical	10	20	3	30	70	3	100
BP607CE	Comprehensive Online Exam	-	-	-	-	100	1	100
BP604PSC	Skill Oriented course- IV Any course offered by Central / State Govt. skill development corporation / approved by JNTUA	10	20	3	30	70	3	100
	10tai							1100

Year IV-I

		Internal End Sem					ester	
Course	Name of the course	Assessment				Exams		Total
code		Continuous	Session	al Exams	Total	Marks	Duration	Marks
		Mode	Marks	Duration			(Hrs.)	
				(Hrs.)				
BP701T	Instrumental Methods of	10	20	3	30	70	3	100
	Analysis – Theory							
BP702T	Industrial Pharmacy II -	10	20	3	30	70	3	100
	Theory							
BP703T	Pharmacy Practice –	10	20	3	30	70	3	100
	Theory							
BP704T	Novel Drug Delivery	10	20	3	30	70	3	100
	System – Theory							
BP705T	Pharmaceutical	10	20	3	30	70	3	100
	Biotechnology-Theory							
BP706T	Professional Elective-III	10	20	3	30	70	3	100
	1. Experimental							
	2 Bioavailability and							
	bioequivalence (BA/BE)							
	studies and regulations							
	3. Quality by Design	L						
	techniques in formulation	L						
	development							
BP701P	Instrumental Methods of	10	20	3	30	70	3	100
	Analysis – Practical							
BP702PSO	Skill Oriented course V	10	20	3	30	70	3	100
	Pharmaceutical Waste							
	Management	10	• •	-	• •			100
BP703PS	Practice School*	10	20	3	30	70	3	100
BP704PII	Evaluation of Industry	r						
	Internship							
BP707CE	Comprehensive Online					100	1	100
	Exam							
	Total							1000

Course code	Name of the course	Internal Assessment				End Exams	Semester	Total Marks
		Continuous Sessional Exams Mode Marks Duration		Total	Marks	Duration (Hrs.)		
			1,1001110	(Hrs.)				
BP801T	Open Elective-II 1.Pharmacovigilance 2. Cell and Molecular Biology 3.Pharmaceutical and Medical devices	10	20	3	30	70	3	100
BP802T	Professional Elective-III 1. Quality Control and Standardization ofHerbals 2. Computer Aided Drug Design 3. Cosmetic Science	10	20	3	30	70	3	100
BP803PW	Project Work	-	-	-	-	150	4	150
BP804CE	Comprehensive online examination	-	-	-	-	100	1	100
Total								450

Honors

Year &	Course code	Name of the course	Internal Assessment				End Exams	Semester	Total Marks
Sem			Continuous	Sessional Exams		Total	Marks	Duration	
			Mode	Marks	Duration			(Hrs.)	
					(Hrs.)				
III-I	BP507T	Modern	10	20	3	30	70	3	100
		Spectroscopic							
		analysis of drugs and							
		Pharmaceuticals							
III-II	BP607T	Medical Writing &	10	20	3	30	70	3	100
		Coding							
IV-I	BP707T	Statistical analysis	10	20	3	30	70	3	100
		software							
IV-II	BP803T	Impurity Profiling	10	20	3	30	70	3	100
		of Pharmaceuticals							
		Total							400

Research									
Year &	Course code	Name of the course]	Internal Assessment			End Exams	Semester	Total Marks
Sem			Continuous Mode	Sessio Marks	nal Exams Duration	Total	Marks	Duration (Hrs.)	
					(Hrs.)				
III-I	BP508T	Research	10	20	3	30	70	3	100
		methodology							
III-II	BP608T	Intellectual Property	10	20	3	30	70	3	100
		Rights							
IV-I	BP708T	Principles of OECD GLP	10	20	3	30	70	3	100
IV-II	BP804T	Molecular docking	10	20	3	30	70	3	100
		techniques							
		Total							400

11. Sessional Exams

Two Sessional exams shall be conducted for each theory / practical course as per the Academic colander schedule. The scheme of question paper for theory and practical Sessional examinations is given below. Final sessional marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage to the better mid examination and 20% to the other.

Sessional exam shall be conducted for 30 marks for theory and shall be computed for 20 marks. Similarly, Sessional exam for practical shall be conducted for 30 marks and shall be computed for 20 marks. In addition to marks obtained for 20 marks of sessional exam, marks obtained in continuous assessment (10 Marks) will be added. So that Internal assessment will be for 30 marks.

Question paper pattern for theory sessional examinations

- I. Short answers (Compulsory) : $5 \times 2=10$
- II. Long answer (Answer 2 out of 3) $: 2 \times 10 = 20$

: 30 Marks (Will be computed to 20 marks)

Question paper pattern for practical sessional examinations

Total

	Total	: 30 Marks (Will be computed to 20 marks)
III.	Viva	: 05
II.	Experiment	: 20
I.	Synopsis	: 05

11.1. Internal assessment: Continuous mode

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

	Гheory
Criteria	Maximum Marks
Assignment	5
Student – Teacher interaction	3
i. Seminarii. Group Discussion	2
Fotal	10
Р	ractical
Regular Attendance and Viva Voice	10

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

The End examinations shall be conducted as per the requirements given in tables – X.

Question paper pattern for end semester theory examinations

For 70 marks paper

I. Short answer Questions $(10 \times 2) = 10 \times 2 = 20$

(Answer all the questions)

II. Long Answers (From 5 units of syllabus, from each unit, 1 out of 2 questions have to be answered) = $5 \times 10 = 50$

	Total =	70 marks
Ouestion naner nattern for end semester practical exami	inations	
For 35 Marks paper		
I. Synopsis	=	= 10
II. Experiments	=	= 45
III. Viva voce	=	= 15
To	otal =	= 70 marks

12. Promotion and award of grades

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

13. Carry forward of marks

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

14. Improvement of internal assessment

- A candidate shall be given one chance to re-register for each subject provided the internal marks secured by a candidate are less than 50% and has failed in the end examination.
- The candidate should have passed all the subjects for which the Internal Evaluation marks secured are more than 50%. Out of the subjects, if the candidate has failed in the examination due to Internal Evaluation marks secured being less than 50%, the candidate shall be given one chance for each Theory subject and for a maximum of three Theory subjects for Improvement of Internal evaluation marks.
- The candidate has to re-register for the chosen subjects and fulfil the academic requirements.
- For reregistration the candidates must apply to the college by paying the requisite fees and get approval before the start of the semester in which re-registration is required
- In the event of availing the Improvement of Internal evaluation marks, the internal evaluation marks as well as the End Examinations marks secured in the previous attempt(s) for the reregistered subjects stand cancelled.

15. Academic Progression:

No student shall be admitted to any examination unless he/she fulfils the norms given in

6. Academic progression rules are applicable as follows:

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

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

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

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

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

A lateral entry student shall be eligible to carry forward all the courses of V, VI and VII semesters till the VIII semester examinations. However, he/she shall not be eligible to get the course completion certificate until all the courses of III, IV, V and VI semesters are successfully completed. A lateral entry student shall be eligible to get his/her CGPA upon successful completion of the courses of III to VIII semesters within the stipulated time period as per the norms specified in 26.

Any student who has given more than 4 chances for successful completion of I / III semester courses and more than 3 chances for successful completion of II / IV semester courses shall be permitted to attend V / VII semester classes ONLY during the subsequent academic year. 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.

16. Grading of performances

17.1. Letter grades and grade points allocations:

Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course. The letter grades and their corresponding grade points are given in Table – XII.
Percentage of Marks Obtained	Letter Grade	Grade Point	Performance
90.00 - 100	О	10	Outstanding
80.00 - 89.99	А	9	Excellent
70.00 - 79.99	В	8	Good
60.00 - 69.99	С	7	Fair
50.00 - 59.99	D	6	Average
Less than 50	F	0	Fail
Absent	AB	0	Fail

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

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.

17. The Semester grade point average (SGPA)

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

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:

$$C_1 + C_2 + C_3 + C_4 + C_5$$

18. 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:

 $C_1S_1 + C_2S_2 + C_3S_3 + C_4S_4 + C_5S_5 + C_6S_6 + C_7S_7 + C_8S_8$

where C₁, C₂, C₃... is the total number of credits for semester I, II, III and S₁, S₂, S₃... is the SGPA of semester I, II, III....

19. 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

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

Evaluation of Dissertation Book:

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

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

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

22. Industrial training (Desirable)

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

23. Practice School

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

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

24. Award of Ranks

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

25. Withholding of results:

If the candidate has any dues not paid institute or if any case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld, and he will not be allowed / promoted into the next higher semester. The issue of awarding a degree is liable to be withheld in such cases.

26. Award of degree

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

27. 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.

Program	B. Pharmacy
Semester	I-I
Name of the course	Human anatomy and Physiology-I (Theory)
Course Code	BP101T
Credits	4
Hours /week	3hours (lectures) & 1hour (Tutorial)
Pre / co-requisite/s	Nil

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 basic knowledge required to understand the various disciplines of pharmacy.

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

CO1: Use anatomical knowledge to predict physiological consequences and use knowledge of function to predict the features of anatomical structures.

CO2: Synthesize ideas to make a connection between knowledge of anatomy and physiology and real-world situations, including healthy lifestyle decisions and homeostatic imbalances.

CO3: Describe the structure and functions of various organs of the human body

course contents:

Unit	Торіс	No. of hours
Ι	Introduction to human body	12
	Definition and scope of anatomy and physiology, levels of structural	
	organization and body systems, basic life processes, homeostasis,	
	basic anatomical terminology.	
	Cellular level of organization	
	Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication.	
	Tissue level of organization	
	Classification of tissues, structure, location, and functions of epithelial, muscular and nervous and connective tissues	
II	Integumentary system	12
	Structure and functions of skin	
	Skeletal system	
	Divisions of skeletal system, types of bone, salient features and	
	functions of bones of axial and appendicular skeletal system.	

	Total	60
	Regulation of blood pressure, pulse, electrocardiogram and disorders of heart. Disorders of Heart (Only Definitions)	
	system, cardiac output, cardiac cycle.	
	system of heart and heartbeat, its regulation by autonomic nervous	
	and functions of artery, vein and capillaries, elements of conduction	
	Heart – anatomy of heart, blood circulation, blood vessels, structure	
V	Cardiovascular system	12
	and their disorders. Disorders (Only Definitions)	
	of sympathetic and parasympathetic nervous system.	
	Classification of peripheral nervous system: Structure and functions	
	Peripheral nervous system	
	Nervous system Organization of nervous system, neuron, neuroglia, classification and properties of nerve fiber, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters.	
IV	Introduction Nervous System	12
	Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system.	
	Lymphatic system	
	disorders of blood (Only Definitions), Reticulo endothelial system.	
	blood grouping, Rh factors, transfusion, its significance and	
	formation of hemoglobin, anemia, mechanisms of coagulation,	
	Body fluids, composition and functions of blood, hemopoeisis,	
III	Body fluids and blood	12
	Structural and functional classification, types of joints movements and its articulation.	
	Joints	
	neuromuscular junction.	
	Organization of skeletal muscle, physiology of muscle contraction,	

Learning Resources/Recommended Texts/Reference books/web resources

 Tortora Gerard J, Derrikson Bryan. Principles of anatomy and physiology. 11th ed. Wiley: 2006.

- Wilson K JW. Ross and Wilson's foundations of anatomy and physiology. 5th ed. Churchill Livingstone: Edinburg; 1981.
- 3. Guyton arthur C. Physiology of human body.6 th ed. Brooks coole Publisher: 1983.
- 4. Chatterjee C C. Human physiology. Volume I & II. Medical allied agency: Calcutta; 2004.
- Anne Waugh and Alon Grant. Ross and Wilson Anatomy & Physiology. 11th ed. Churchill Livingstone: 2010.
- Guyton Arthur C. Text book of Medical Physiology. 10 thed. Harcot Publishers: Singapore; 2000.
- Inderbir Singh. Textbook of Human Histology. Jaypee Brother's Medical Publishers: New Delhi.

Program	B. Pharmacy
Semester	I-I
Name of the course	Pharmaceutical Analysis I – Theory
Course Code	BP 102T
Credits	4
Hours /week	3hours (lectures) & 1hour (Tutorial)
Pre / co-requisite/s	Nil

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

Course Description:

The pharmaceutical analysis I course provides the knowledge of sources of errors, impurities and titrimetric analysis in quantitative pharmaceutical analysis and aid opportunity to develop awareness of drug quality and its control. It also covers different analytical techniques like Potentiometry, Conductometry, and Polarography techniques.

Course Outcomes: Upon successful completion of this course, the student should be able to **CO 1:** Know the different types of errors, its minimization and sources of impurities in pharmaceuticals.

CO 2: Understand the principles of volumetric and electro chemical analysis methods.

CO 3: Develop analytical skills in the determination of percentage purity of the various pharmaceuticals.

Course Content

Unit	Торіс	No. of hours
Ι	(a) Pharmaceutical analysis- Definition and scope	16
	Different techniques of analysis	
	Methods of expressing	
	concentration Primary and	
	secondary standards.	
	Preparation and standardization of various molar and normal solutions-	
	Oxalic acid, sodium hydroxide, Hydrochloric acid, sodium thiosulphate, sulphuric acid, potassium permanganate and ceric ammonium sulphate.	
	(b) Errors: Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures	

	(c) Calibration of Glassware's.	
II	Acid base titration: Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves	08
	Non-aqueous titration : Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl	
III	Precipitation titrations : Mohr's method, Volhard's, Modified Volhard's, Fajans method, estimation of sodium chloride.	12
	Complexometric titration : Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate.	
	Gravimetry: Principle and steps involved in gravimetric analysis.	
	Purity of the precipitate: co-precipitation and post precipitation,	
	Estimation of barium sulphate.	
	Basic Principles, methods and application of diazotisation titration.	
IV	Redox titrations	12
	Concepts of oxidation and reduction	
	Types of redox titrations (Principles and applications)	
	Cerimetry, Iodimetry, Iodometry, Bromatometry,	
	Dichrometry, Titration with potassium iodate	
V	Electrochemical methods of analysis	12
	Conductometry- Introduction, Conductivity cell, Conductometric titrations, applications.	
	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.	
	Polarography - Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum electrode, applications.	
	Total	60

Learning Resources/Recommended Texts/Reference books/web resources

1. Vogel AI. Textbook of quantitative chemical analysis. Fifth ed. Newyork: Longman Scientific & Technical; 1989. ISBN 0582446937

2. Indian pharmacopeia. (2014). Government of India, Ministry of health and family welfare. Vol 1, 2, 3. Ghaziabad: Published by Indian Pharmacopeial commission.

3. The British Pharmacopoeia. (2014). The commission of human medicines pursuant to the medicines act 1968, Vol 1 to 5, London: Published by stationery office on behalf of the medicines and health care products regulatory agency (MHRA).

4. The United states pharmacopoeia-National formulary. (USP 37-NF 32). Rockville: Published by the United States Pharmacopeial convention.

5. The European pharmacopoeia. (2008). sixth ed., Strasbourg: Published by the council of Europe.

6. The Japanese Pharmacopoeia. (2006). 13th ed., Japan: Published by the society of Japanese Pharmacopoeia, under the supervision of the R & D division, Pharmaceutical affairs bureau, Ministry of health & welfare.

7. Skoog DA, James HF, Crouch SR. Principles of Instrumental Analysis. Sixth ed. India: Cengage Learning; 2007. ISBN-13: 978-0495012016, ISBN-10: 0495012017.

 Connors KA. A textbook of Pharmaceutical Analysis. Third ed. India: Wiley India Pvt. Ltd; 1982. ISBN: 8LGYW9TY5P8.

Program	B. PHARMACY
Semester	I-I
Name of the course	Pharmaceutics-1
Course Code	BP103T
Credits	4
Hours/week	3hours(lectures) and 1 hour (Tutorial)
Pre/ co-requisite/s	Nil

Course Description

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

Course outcome

At the end of the theory course, the student will be able to

CO 1: Define various medical and pharmaceutical terms

CO 2: Explain various principles and procedures involved in formulation of different types of

dosage forms

CO 3: Demonstrate professional way of handling the prescription and pharmaceutical incompatibilities

CO 4: Calculate different pharmaceutical calculations involved in formulation

Course c	ontent
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Unit	Topics	Hours
I	Historical background and development of profession of pharmacy:	16
(4 Weeks)	History of profession of Pharmacy in India in relation to pharmacy education, industry and organization, Pharmacy as a career,	
	Pharmacopoeias: Introduction to IP, BP, USP and Extra Pharmacopoeia.	
	Pharmaceutical calculations: Weights and measures – Imperial & Metric system, Calculations involving percentage solutions, allegation, proof spirit and isotonic solutions based on freezing point and molecular weight	
	Posology: Definition, Factors affecting posology. Pediatric dose calculations based on age, body weight and body surface area.	

II (3	Dosage forms: Introduction to dosage forms, classification and definitions.,	12
weeks)	Prescription: Definition, Parts of prescription, handling of Prescription and	
	Errors in prescription	
	Solid Dosage forms:	
	Powders: Definition, classification, advantages and disadvantages, Simple & compound powders – official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions.	
	Liquid dosage forms: Advantages and disadvantages of liquid dosage forms. Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques.	
III (3 weeks)	Monophasic liquids: Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments and Lotions.	12
	Biphasic liquids:	
	Suspensions: Definition, advantages and disadvantages, classifications, Preparation of suspensions; Flocculated and Deflocculated suspension & stability problems and methods to overcome.	
	Emulsions: Definition, classification, emulsifying agent, test for the identification of type of Emulsion, Methods of preparation & stability problems and methods to overcome.	
IV (2 Weeks)	ppositories: Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories.	10
	Pharmaceutical incompatibilities: Definition, classification, physical, chemical and therapeutic incompatibilities with examples.	
V (2	Semisolid dosage forms: Definitions, classification, mechanisms and factors influencing dermal penetration of drugs.	10
Weeks)	Preparation of ointments, pastes, creams and gels. Excipients used in semi solid dosage forms. Evaluation of semi solid dosages forms	
	Total	60

Recommended reference Books:

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

Program	B. Pharmacy
Semester	I-I
Name of the course	Pharmaceutical Inorganic Chemistry – Theory
Course Code	BP 104T
Credits	4
Hours /week	3hours (lectures) & 1hour (Tutorial)
Pre / co-requisite/s	Nil

Scope: This subject deals with the monographs of inorganic compounds and pharmaceuticals. **Course description**: Pharmaceutical Inorganic chemistry course mainly deals with fundamentals of chemical composition, preparation methods, properties, identification tests, storage, assay & medicinal uses of various inorganic pharmaceuticals according to their monographs mentioned in the various pharmacopoeias. This course provides knowledge on sources of impurities, methods to determine the impurities in inorganic drugs and gives the importance of radiopharmaceuticals in the various fields.

Course Outcomes: Upon successful completion of this course, the student should be able to: CO 1: State the concept & content of specifications mentioned in monograph for various categories of inorganic pharmaceuticals along with their medicinal uses.

CO 2: Demonstrate the knowledge of various types of errors and various sources of impurities in the pharmaceuticals.

CO 3: Apply the suitable principles in determination of purity by limit tests and percentage purity by assay methods as per the pharmacopoeias (Indian Pharmacopeia, British Pharmacopoeia, United States Pharmacopoeia).

Course	content:
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Unit	Topics	Hours
I (3 Weeks)	Impurities in pharmaceutical substances: Sources and types ofimpurities, History of PharmacopoeiaPrinciple involved in the limit test for Chloride, Sulphate, Iron, LeadPrinciple involved in the limit test for Arsenic, Heavy metals, andmodified limit test for Chloride and Sulphate.	12
General me	thods of preparation, assay for the compounds superscripted with aste	risk (*),
properties d	und medicinal uses of inorganic compounds belonging to the following c	lasses

	Acids, Bases and Buffers: Concepts of acid and bases – Arrhenius,	
	Bronsted-Lowry and Lewis. Concept of pH and buffer, types of	
	buffers with examples	
	Major extra and intracellular electrolytes: Functions of major	
	physiological ions, Electrolytes used in the replacement therapy:	
11	Sodium chloride*, Potassium chloride,	16
(4 Weeks)	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.	
	Gastrointestinal agents	
	Acidifiers: Ammonium chloride* and Dil. HCl	
	Antacid: Ideal properties of antacids, combinations of antacids,	
	Sodium Bicarbonate*,	
ш	Aluminum hydroxide gel, Magnesium hydroxide mixture	12
(3 Weeks)	Cathartics: Magnesium sulphate, Sodium orthophosphate, Kaolin	12
	and Bentonite	
	Antimicrobials: Mechanism, classification, Potassium	
	permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*,	
	I lodine and its preparations	
	Misaallanaaus aamnaunds	
	Expectorants: Potassium iodide. Ammonium chloride*	
	English Comments in the state of the state o	
IV	Emetics : Copper sulphate [*] , Sodium potassium tartarate	
(2 Wooks)	Haematinics: Ferrous sulphate*, Ferrous gluconate	10
(S weeks)	Poison and Antidote: Sodium thiosulphate*, Activated charcoal,	
	Sodium nitrite	
	Astringents: Zinc Sulphate, Potash Alum	
	Dadianharmagauticalar Datia activity Margaret	
V	radioactivity Properties of a B a redictions Helf life	10
	radioactivity, Properties of α , p, γ radiations, Half-life,	

(3 Weeks)	Radioisotopes and study of radioisotopes - Sodium iodide I ¹³¹ , Storage conditions, precautions & pharmaceutical application of radioactive substances.	
	Revision	
	Total	60

Learning Resources/Recommended Texts/Reference books/web resources Textbooks:

- 1. A.H.Beckett and J.B.Stenlake. Practical pharmaceutical chemistry. Part-I. The Athtone press: University of London; 1968.
- J.H Block, E.Roche, T.O Soine and C.O. Wilson. Inorganic Medical and Pharmaceutical Chemistry. Lea & Febiger Philadelphia PA; 1974.
- 3. G.R. Chatwal. Pharmaceutical Chemistry Inorganic. Fifth edition. Himalaya Publishing House: Mumbai, India; 2014.
- 4. A.A. Napoleon. Pharmaceutical Titrimetric Analysis Theory and Practical. Second ed. Kalaimani Publishers & Distributers: Kanchipuram; 2013.
- 5. J. Mendham, R.C. Denney, J. D. Barnes and M.J.K. Thomas. Vogel's Quantitative Chemical Analysis. Sixth edition. Pearson education Delhi; 2000.

References:

- Gary L. Miessler, Paul J. Fischer and Donald A. Tarr. Inorganic chemistry. Fifth edition. Pearson education New Delhi; 2014.
- 2. P. Gundu Rao. Pharmaceutical and Medicinal Inorganic Chemistry. First edition. Vallabh Prakashan Delhi; 2008.
- 3. G.D. Tuli, R.D. Madan, S.K. Basu and Satya Prakash. Advanced Inorganic Chemistry. Volume 1. Published by S. Chand & Company Ltd; 2014.
- 4. William L. Jolly. Modern Inorganic Chemistry. Second edition. Mc Graw-Hill: New York; 1984.
- 5. A.H.Beckett and J.B.Stenlake. Textbook of Pharm. Analysis. CBS Publishers, Delhi. Indian Pharmacopoeia.

Program	B. Pharm
Semester	I-I
Name of the course	Communication Skills
Course Code	BP105T
Credits	2
Hours /week	2
Pre / co-requisite/s	Nil

Course Description: 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.

Course Learning Outcomes: Upon completion of this course, the student shall be able to: CO1: Understand the behavioral needs for a Pharmacist to function effectively in the areas of pharmaceutical operation.

CO2: Communicate effectively (Verbal and Non-Verbal)

CO3: Effectively manage the team as a team player.

CO4: Develop interview skills, Leadership qualities and essentials.

Course content:

UNIT	Торіс	Hours
I	 Communication Skills: Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context. Barriers to Communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional Barriers. Perspectives in Communication: Introduction, Visual Perception, Language, Other factors affecting our Perspective – Past Experiences, Prejudices, Feelings, Environment. 	07
Π	Elements of Communication: Introduction, Face to Face Communication – Tone of Voice, Body Language (Non – Verbal communication), Verbal Communication, Physical Communication. Communication Styles: Introduction, The Communication Styles Matrix with example for each – Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style.	07
	Communication Style.	

III	Basic Listening Skills: Introduction, Self - Awareness, Active	07
	Listening, Becoming an Active Listening in Difficult Situations.	
	Effective Written Communication: Introduction, When and When	
	Not to Use Written Communication – Complexity of the Topic,	
	Amount of Discussion' Required, Shades of Meaning, Formal Communication.	
	Writing Effectively: Subject Line, Put the Main Point First, Know	
	Your Audience, Organization of the Message.	
IV	Interview Skills: Purpose of an interview, Do's and Don't's of an interview.	05
	Giving Presentations: Dealing with Fears, planning your	
	Presentation, Structuring Your Presentation, Delivering Your	
	Presentation, Techniques of Delivery.	
V	Group Discussion: Introduction, Communication skills in group	04
	discussion, Do's and Don't's of group discussion.	
	Total	30

Recommended Books: (Latest Editions)

- Basic communication skills for Technology, Andreha.J. Ruther Ford, 2nd Edition, Pearson Education, 2011.
- 2. Communication skills, Sanjay Kumar, Pushpalata, 1st Edition, Oxford Press, 2011.
- 3. Organizational Behaviorur, Stephen . P. Robbins, 1st Edition, Pearson, 2013
- 4. Brilliant Communication skills, Gill Hasson, 1st Edition, Pearson Life, 2011
- The Ace of soft skills : Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5th Edition, Pearson, 2013
- Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010
- Communication skills for professionals, Konar nira, 2nd Edition, New arrivals PHI, 2011.
- 8. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning India Pvt.Ltd, 2011
- 9. Soft skills and professional communication, Francis Peters SJ, 1st Edition, Mc Graw Hill Education, 2011
- 10. Effective communication, John Adair, 4th Edition, Pan Mac Millan, 2009.

Program	B. Pharm
Semester	I-I
Name of the course	Remedial Biology (Theory)
Course Code	BP 106RBT
Credits	2
Hours /week	2 Hours (Lectures)
Pre / co-requisite/s	Nil

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

Course Learning Outcomes:

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

CO1: Know the classification and salient features of five kingdoms of life

CO2: Understand the basic components of anatomy & physiology of plant

CO3: Know understand the basic components of anatomy & physiology animal with special reference to human

Course contents:

UNIT	Торіс	Hours
Ι	Living world:	07
	Introduction to Biology, a brief introduction to plant kingdom and its	
	classification.	
	Study of plant cell, structure and functions of cell organelles, cell division.	
Π	Types of tissues and tissue systems	07
	Introduction and elaborative study on plant growth regulators.	
	Morphology of different parts offlowering plants – Root, stem, inflorescence, flower, leaf, fruit, seed.	
III	General Anatomy of Root, stem, leaf of monocotyledons &	07
	Dicotyledons.Taxonomy of umbelliferae, solanaceae, leguminaceae,	
	and liliaceae. Introduction to animal kingdom and classification. Study	
	of fungi, yeast, bacteria and virus.	

IV	Body fluids and circulation: composition of blood blood groups	05	
	coagulation of blood. composition and functions of lymph. human		
	circulatory system. Structure of heart and blood vessels cardiac cycle cardiac		
	output and ECG. Digestion and absorption: human elementary canal and		
	digestive glands role of digestive enzymes digestion absorption and		
	assimilation of digested food. Breathing and respiration human		
	respiratory system mechanism of breathing and its regulation. Exchange of		
	gases transport of gases and regulation of respiration respiratory volume hey		
V	Excretory products and their elimination	04	
	Modes of excretion, Human excretory system- structure and function		
	Urine formation, Rennin angiotensin system		
	Neural control and coordination: Definition and classification of nervous system		
	Structure of a neuron Generation and conduction of nerve		
	impulse, Structure of brain and spinal cord		
	Functions of cerebrum, cerebellum, hypothalamus and medulla		
	oblongata		
	Chemical coordination and regulation Endocrine glands and their secretions		
	Functions of hormones secreted by endocrine glands		
	Human reproduction		
	Parts of female reproductive system		
	Parts of male reproductive system		
	Spermatogenesis and Oogenesis Menstrual cycle		

Textbooks

- 1. Textbook of Biology by S. B. Gokhale
- 2. Textbook of Biology by Dr. Thulajappa and Dr. Seetaram.

Reference Books:

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

Program	B. Pharm
Semester	I-I
Name of the course	Remedial Mathematics
Course Code	BP106RMT
Credits	2
Hours /week	2 hours (lectures)
Pre / co-requisite/s	Nil

Course Description: This is an introductory course in mathematics. This subject deals with the Introduction to Algebra, Trigonometry, Co-Ordinate geometry, Differential Calculus, Integral Calculus, Differential Equations, Laplace Transforms.

Course Learning Outcomes: Upon successful completion of this course, the student should be able to:

CO 1: Define Algebra, Trigonometry, Co-Ordinate geometry, Differential Calculus, Integral

Calculus, Differential Equations, Laplace Transforms and their applications.

CO 2: Solve the problems of different types by applying theory.

CO 3: Appreciate the important applications of Mathematics in Pharmacy.

Course c	ontent:
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Unit	Topics	Hours
Ι	Algebra: Arithmetic Progression –Geometric Progression, Logarithms: Logarithm of a real number to an arbitrary base, theorems on Logarithms, application of logarithms in Pharmaceutical computations and Partial fractions.	5
Π	Trigonometry: Trigonometric ratios and the relations between them, Sin (A+B), Cos (A+B), Tan (A+B) formulae only, Trigonometric ratios of multiple and submultiple angles.	5
III	Co-Ordinate Geometry Distance between points, Area of a Triangle, Co-Ordinates of a point dividing a given line segment in a given ratio, equation to a straight line in different forms.	5
IV	Differential calculus: Limit of a function differentiation, derivatives of trigonometric functions, logarithmic and partial differentiation, Maxima and minima (elementary).	4
V	Integration: Definition of integration, indefinite of integrals, standard integrals, fundamental rules of Integration, Integration by substitution, integration by parts and definite Integrals, properties of definite Integrals	5

VI	Differential Equations: Order and degree, formation of the differential	6
	equation, solutions of the first order and first-degree differential equations	
	(variable separable).	
	Applications of first order and first-degree differential equation: law of natural growth and decay, Newton's law of cooling.	
VII	Laplace transforms: Definition, elementary functions, Properties of linearity and shifting, transforms of multiplication by tn	2
	Total	30

Learning Resources/Recommended Texts/Reference books/web resources

1. Intermediate first and second year mathematics text books printed and

published by Telugu Academy.

2. P. Seshagiri Rao. A Text book of Remedial Mathematics. Pharma med press; 2008.

Program	B. Pharm
Semester	I-I
Name of the course	Human Anatomy & Physiology – I Practical
Course Code	BP101P
Credits	1.5
Hours /week	3 hours (Practical)
Pre / co-requisite/s	Nil

Course outcomes

CO 1: Identify the various tissues and organs of different systems of human body.

CO 2: Perform the various experiments related to special senses and nervous system.

CO 3: Appreciate coordinated working pattern of different organs of each system.

Week	Topics
1	Introduction to laboratory safety techniques and Study of compound microscope
2	Microscopic study of epithelial tissue and connective tissue, muscular tissue and nervous tissue
3	Identification of axial bones and appendicular bones
4	Demonstration of total blood count by cell analyser
5	Enumeration of total red blood corpuscles (RBC) count
6	Determination of bleeding time
7	Determination of clotting time
8	Estimation of hemoglobin content
9	Determination of blood group
10	Determination of erythrocyte sedimentation rate (ESR)
11	Determination of heart rate and pulse rate
12	Recording of Blood pressure.
13	Revision

Learning Resources/Recommended Texts/Reference books/web resources

1. Tortora Gerard J, Derrikson Bryan. Principles of anatomy and physiology. 11th ed. Wiley: 2006.

- Wilson K JW. Ross and Wilson's foundations of anatomy and physiology. 5th ed. Churchill Livingstone: Edinburg; 1981.
- 3. Guyton arthur C. Physiology of human body.6 th ed. Brooks coole Publisher: 1983.
- 4. Chatterjee C C. Human physiology. Volume I & II. Medical allied agency: Calcutta; 2004.
- Anne Waugh and Alon Grant. Ross and Wilson Anatomy & Physiology. 11th ed. Churchill Livingstone: 2010.
- Guyton Arthur C. Text book of Medical Physiology. 10 thed. Harcot Publishers: Singapore; 2000.
- 7. Kale S R,Kale R R.practical human anatomy and physiology.19 th ed. Pune. Nirali prakashan;2009.
- Goyal R K, Natvar M P, Shah S A. Practical anatomy, Physiology and biochemistry,1st ed Publisher: B S Shah Publisher: Ahmadabad; 1988.
- 9. C.L. Ghai. Textbook of Practical Physiology. Jaypee brother's medical publishers.
- 10. K. Srinageswari Rajeev Sharma. Practical workbook of Human Physiology. Jaypee brother's medical publisher.

Program	B. Pharmacy
Semester	I-I
Name of the course	Pharmaceutical Analysis I – Practical
Course Code	BP 102P
Credits	1.5
Hours /week	3 Hours
Pre / co-requisite/s	Nil

Course Description: The Pharmaceutical Analysis – I practical course describes the fundamental skills of limit tests, standardization and assay methods for the various pharmaceutical products. It also provides the awareness of determinate and indeterminate errors while performing the analysis like Potentiometry, Conductometry.

Course Outcomes: Upon successful completion of this course, the student should be able to

CO 1: Illustrate the limits of chloride, sulphate & heavy metals content in various pharmaceuticals.

CO 2: Understand the quantitative standardization and assay methods by volumetric analysis.

Week	Торіс		
I. Preparation and standardization of			
1	Sodium hydroxide		
2	Sulphuric acid		
3	Sodium thiosulfate		
4	Potassium permanganate		
5	Ceric ammonium sulphate		
II A	II Assay of the following compounds along with Standardization of Titrant		
6	Ammonium chloride by acid base titration		
7	Ferrous sulphate by Cerimetry		
8	Copper sulphate by Iodometry		
9	Calcium gluconate by Complexometry		
10	Hydrogen peroxide by Permanganometry		
11	Sodium benzoate by non-aqueous titration		
12	Sodium Chloride by precipitation titration		
III. Deter	rmination of Normality by electro-analytical methods		
13	Conductometric titration of strong acid against strong base		

CO 3: Adapt various electrochemical techniques to quantify the acids & bases.

14	Conductometric titration of strong acid and weak acid against strong base
15	Potentiometric titration of strong acid against strong base

Learning Resources/Recommended Texts/Reference books/web resources

- Vogel AI. Textbook of quantitative chemical analysis. Fifth ed. New York: Longman Scientific & Technical; 1989. ISBN 0582446937
- Indian pharmacopeia. (2014). Government of India, Ministry of health and family welfare.
 Vol 1, 2, 3. Ghaziabad: Published by Indian Pharmacopeial commission.
- 3. The British Pharmacopoeia. (2014). The commission of human medicines pursuant to the medicines act 1968, Vol 1 to 5, London: Published by stationery office on behalf of the medicines and health care products regulatory agency (MHRA).
- 4. The United States pharmacopoeia-National formulary. (USP 37-NF 32). Rockville: Published by the United States Pharmacopeial convention
- Skoog DA, James HF, Crouch SR. Principles of Instrumental Analysis. Sixth ed. India: Cengage Learning; 2007. ISBN-13: 978-0495012016, ISBN-10: 0495012017.
- Connors KA. A textbook of Pharmaceutical Analysis. Third ed. India: Wiley India Pvt. Ltd; 1982. ISBN: 8LGYW9TY5P8.
- 7. Napoleon AA. Pharmaceutical titrimetric analysis, India: Kalaimani publishers and distributors; 2013.

Program	B. Pharm
Semester	I-I
Name of the course	Pharmaceutics I – Practical
Course Code	BP103P
Credits	1.5
Hours /week	3 hours

Course Description: The General Pharmacy and Dosage forms practical course is aimed to train the students on formulation of different types of dosage forms. This course also deals with pharmaceutical calculations which are essential in compounding and utilization of dosage forms. This course also provides the skills to identify various incompatibilities in handling of prescriptions.

Course Learning Outcomes: Upon successful completion of this course, the student should be able to:

CO 1: Identify various incompatibilities in handling of Prescriptions

CO 2: Calculate different pharmaceutical calculations involved in formulation.

CO 3: Formulate different types of dosage forms.

S. No	Experiments
1	Syrups
	Syrup IP'66
	Orange Syrup
2	Elixirs
	Piperazine citrate elixir
	Paracetamol pediatric elixir
3	Linctus
	Terpin Hydrate Linctus IP'66
	Iodine Throat Paint (Mandles Paint)
4	Solutions
	Strong solution of ammonium acetate
	Cresol with soap solution
	Lugol's solution
5	Suspensions
	Calamine lotion
	Magnesium Hydroxide mixture

	Aluminimum Hydroxide gel
6	Emulsions
	Turpentine Liniment
	Liquid paraffin emulsion
7	Powders and Granules
	ORS powder (WHO)
	Effervescent granules
	Dusting powder
	Divided powders
8	Suppositories
	Glycero gelatin suppository
	Coca butter suppository
	Zinc Oxide suppository
9	Semisolids: Sulphur ointment, Non staining-iodine ointment with methyl salicylate
10	Gargles and Mouthwashes: Iodine gargle, Chlorhexidine mouthwash
	Phenol Gargel
-	

Recommended Books: (Latest Editions)

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

Program	B. Pharmacy
Semester	I-I
Name of the course	Pharmaceutical Inorganic Chemistry – Practical
Course Code	BP 104P
Credits	1.5
Hours /week	3 hours
Pre / co-requisite/s	Nil

Course Description: Pharmaceutical inorganic chemistry laboratory course aimed to train the students on experimental techniques for the determination of impurities and their limits as per the pharmacopoeias. This course also deals with identification of various cations & anions of inorganic compounds by their chemical tests. This course also provides laboratory skills related to calibration and percentage purity analysis by volumetric titrations as per monographs specified in various pharmacopoeias.

Course Outcomes: Upon successful completion of this course, the student should be able to **CO 1:** Perform the limit tests, assay methods to know the impurities limit, and percentage purity of the pharmaceuticals.

CO 2: Differentiate various cations and anions by chemical tests.

Week	TOPICS	
Limit to	Limit tests for the following ions	
1	Limit test for Chlorides	
2	Limit test for Sulphates	
3	Modified limit test for Chlorides and Sulphates	
4	Limit test for Iron	
5	Limit test for Arsenic	
Identifi	Identification tests for the following	
6	Identification tests for Ferrous sulphate	
7	Identification tests for Sodium bicarbonate	
8	Identification tests for Potassium chloride	
Test for purity		
9	Swelling power of Bentonite	
10	Acid Neutralizing capacity of aluminum hydroxide gel	

CO 3: Identify the purity of the various pharmaceuticals by suitable methods

11	Estimation of Sodium carbonate and sodium hydroxide in mixture	
12	Estimation of borax and boric acid mixture	
Preparation of inorganic pharmaceuticals		
13	Boric acid	
14	Potesh alum	

Recommended Books (Latest Editions)

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

Program	B. Pharm
Semester	I-I
Name of the course	Communication Skills
Course Code	BP106P
Credits	1
Hours /week	2
Pre / co-requisite/s	Nil

Course Description: 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 students will get the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business.

Course Learning Outcomes: Upon completion of this course, the student shall be able to:

CO 1: Understand the behavioural needs for a pharmacist to function effectively in the areas of pharmaceutical operation.

CO 2: Communicate effectively (Verbal and Non-Verbal).

Course Contents:

S. No	Торіс
1	Basic communication covering the following topics
	• Meeting people
	Asking questions
	Making friends
	What did you do
	• Do's and Don'ts
2	Pronunciations covering the following topics
	Pronunciation (Consonant Sounds)
	Pronunciation and Nouns
	Pronunciation (Vowel Sounds)
3	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

Recommendation Books:

- 1. Basic communication skills for Technology, Andreha.J. Ruther Ford, 2nd Edition, Pearson Education, 2011.
- 2. Communication skills, Sanjay Kumar, Pushpalata, 1st Edition, Oxford Press, 2011.
- 3. Organizational Behaviour, Stephen. P. Robbins, 1st Edition, Pearson, 2013.
- 4. Brilliant Communication Skills, Gill Hasson, 1st Edition, Pearson Life, 2011.
- 5. The Ace of soft skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5th Edition, Pearson, 2013.
- 6. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green Hall, 1st Edition Universe of Learning LTD, 2010.
- 7. Communication skills for professionals, Konar nira, 2nd Edition, New arrivals PHI, 2010.
- 8. Soft skills for everyone, Butter Field, 1st Edition, Cengage Learning India Pvt. Ltd, 2011.
- 9. Soft skills and Professional communication, Francis Peters SJ, 1st Edition, MC Graw Hill Education, 2011.
- 10. Effective communication, John Adair, 4th Edition, Pan Mac Millan, 2009.

Program	B. Pharm
Semester	I-I
Name of the course	Remedial Biology
Course Code	BP106RBP
Credits	1
Hours /week	2
Pre / co-requisite/s	Nil

Course Description:

Focus on the biology experiments like study of cell wall constituents, inclusions, root, stem, leaf modifications and study of morphology of fruits, seeds and animals.

Course Learning Outcomes: Upon the successful completion of this course, the student should be able to:

CO 1: Learn procedures that are standard practice in biology laboratory.

CO 2: Study the different organs of the human with anatomical features.

Course Content:

Week	Topics
1	Introduction to Biological Experiments
2	Study of microscope
3	Study of cell wall constituents and cell inclusions
4	Anatomy of monocot leaf
5	Anatomy of dicot leaf
6	Anatomy of monocot root
7	Anatomy of dicot root
8	Anatomy of monocot stem
9	Anatomy of dicot stem
10	Study of morphology of fruits
11	Study of morphology of seeds
12	T.S of Senna or Datura
13	T. S of Cassia or Cinnamon
14	T. S of Ephedra
15	T. S of Ginger
16	Study of Permanent slides of plants and Human

17	Human Respiratory System – Demo
18	Human Digestive System – Demo
19	Human Cardiovascular System – Demo
20	Anatomical features of different organs of Human using charts
21	Computer based tutorials – Videos on above experiments

Program	B. Pharmacy
Semester	I-II
Name of the course	Human anatomy and Physiology-II (Theory)
Course Code	BP201T
Credits	4
Hours /week	3hours (lectures) & 1hour (Tutorial)
Pre / co-requisite/s	Nil

Scope: This course aimed to provide fundamental knowledge on the structure and functions of the human body. This course deals with the role of hormones and its regulation. This course describes the structure and functions of various organ systems of the human body like nervous, digestive, respiratory, urinary, endocrine, reproductive systems. This course describes about basics of genetics.

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

CO1. Describe the structure and functions of various organs of the human body.

CO2. Explain the various hormones and their imbalances.

CO3. Synthesize ideas to make a connection between knowledge of anatomy and physiology and real-world situations, including healthy lifestyle decisions and homeostatic imbalances.

Unit	Topics	No. of hours
Ι	Central nervous system: Meninges, ventricles of brain and cerebrospinal	12
	fluid. Structure and functions of brain (cerebrum, brain stem, cerebellum),	
	spinal cord (gross structure, functions of afferent and efferent nerve tracts,	
	reflex activity)	
	Origin and functions of spinal and cranial nerves.	
II	Digestive system: Anatomy of GI Tract with special reference to anatomy	12
	and functions of stomach, (Acid production in the stomach, regulation of	
	acid production through parasympathetic nervous system, pepsin role in	
	protein digestion) small intestine and large intestine, anatomy and	
	functions of salivary glands, pancreas and liver, movements of GIT,	
	digestion and absorption of nutrients and disorders of GIT.	
	Disorders of GIT (Only definitions)	
III	Respiratory system Anatomy of respiratory system with special reference	12
	to anatomy of lungs, mechanism of respiration, regulation of respiration.	

	Total	60
	Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition.	
V	Reproductive system Anatomy of male and female reproductive system,	12
	parathyroid gland, adrenal gland, pancreas, pineal gland, thymus and their disorders. Disorders (Only definitions)	
	action, structure and functions of pituitary gland, thyroid gland,	
IV	Endocrine system Classification of hormones, mechanism of hormone	12
	Disorders of kidney (Only definitions)	
	acid base balance, role of RAS in kidney and disorders of kidney.	
	physiology of urine formation, micturition reflex and role of kidneys in	
	anatomy of kidney and nephrons, functions of kidney and urinary tract,	
	Urinary system Anatomy of urinary tract with special reference to	
	respiration, and resuscitation methods.	
	Lung Volumes and capacities transport of respiratory gases, artificial	

Learning Resources/Recommended Texts/Reference books/web resources

1. Tortora Gerard J, Derrikson Bryan. Principles of anatomy and physiology. 11th ed. Wiley: 2006.

2. Wilson K JW. Ross and Wilson's foundations of anatomy and physiology. 5th ed. Churchill Livingstone: Edinburg; 1981.

3. Guyton arthur C. Physiology of human body.6 th ed. Brooks coole Publisher: 1983. 72

4. Chatterjee C C. Human physiology. Volume I & II. Medical allied agency: Calcutta; 2004.5. Anne Waugh and Alon Grant. Ross and Wilson Anatomy & Physiology. 11th ed. Churchill

Livingstone: 2010.

6. Guyton Arthur C. Text book of Medical Physiology. 10 thed. Harcot Publishers: Singapore; 2000.

7. Inderbir Singh. Textbook of Human Histology. Jaypee Brother's Medical Publishers: New Delhi.
| Program | B. Pharmacy |
|----------------------|---|
| Semester | I-II |
| Name of the course | Pharmaceutical Organic Chemistry-I (Theory) |
| Course Code | BP202T |
| Credits | 4 |
| Hours /week | 3hours (lectures) & 1hour (Tutorial) |
| Pre / co-requisite/s | Nil |

Course Description: The Pharmaceutical Organic Chemistry-I course is aimed to present fundamental in chemistry of organic compounds. It emphasizes on basic nomenclature, physical and chemical properties of various organic compounds. The course will describe the pharmaceutical importance of these functional groups, isomerism and their molecular structures and properties in chemistry of drug substances. This also deals with various mechanisms involved in synthesis and reaction of chemical compounds.

Course Learning Outcomes: Upon successful completion of this course, the student should be able to:

CO1: Define the nomenclature, physical and chemical properties of a molecule in relation to the structure of organic compounds.

CO2: Write the structure, name and the type of isomerism of the organic compound

CO3: Explain the possible mechanism and the intermediate product involved in a chemical reaction

CO4: Identify and confirm the unknown organic compound

Course Content: General methods of preparation and reactions of compounds superscripted with asterisk (*) to be explained. To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences

Unit	Topics	No. of hours
Ι	Classification and Nomenclature of Organic Compounds (Common and IUPAC systems) of organic compounds. (Up to 10 Carbons open chain and carbocyclic compounds), special emphasis on Poly functional groups, biphenyls, and spiro compounds. Structural isomerism in organic compounds	12
II	Stability and order of reactivity of reaction intermediate Carbocations, Carbanions, carbene, and Free radicals. Hybridization of Alkanes, Alkenes, Alkynes and Conjugated dienes. Free radical substitution reactions of alkanes; Saytzeffs orientation and	12
	evidence, E1 and E2 reactions - mechanism, kinetics, and factors affecting. Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation.	

	SN1 and SN2 reactions - mechanism, kinetics, and factors affecting.	
III	Alcohols: Acidity of 1°, 2°, and 3° alcohols,	12
	Methods of preparation - Hydrolysis of Alkyl Halides, Hydration of	
	Alkenes, Hydrolysis of esters, Reduction of carbonyl compounds;	
	<i>Chemical reactions of alcohols</i> – Reaction with Hydrogen halides, carboxylic acids, acid halides, acid anhydrides, Grignard reagent, Dehydration to alkenes, and ethers, oxidation, and reduction.	
	Carbonyl compounds* (Aldehydes and ketones):	
	Methods of preparation - Oxidation of alcohols, Catalytic	
	dehydrogenation of alcohols, Ozonolysis, Hydration of alkynes, and	
	reduction of acid chlorides;	
	Chemical reactions of carbonyl compounds - Nucleophilic addition,	
	Electromeric effect, aldol condensation, Crossed Aldol condensation,	
	Cannizzaro reaction, Reformatsky reaction, Wittig reaction, Benzoin	
	condensation, and Perkin reaction.	
IV	Carboxylic acids:	12
	Methods of Preparation, acidity of carboxylic acids, effect of substituents on acidity, and chemical reactions.	
	Aliphatic amines- Basicity, methods of preparation (1°, 2°, and 3°), and chemical reactions.	
	Benzene and its derivatives:	
	Resonance and aromaticity (Huckle's rule), Reactions of benzene - nitration, sulphonation, halogenation - reactivity, Friedel crafts alkylation- reactivity, limitations, Friedel crafts acylation.	
V	Effect of substituents on reactivity and orientation of mono-substituted benzene compounds towards electrophilic substitution reaction.	12
	Phenols - Acidity of phenols, the effect of substituents on acidity; Aromatic Acids* – Acidity, the effect of substituents on acidity.	
	Structure and uses of Iodoform, Chlorobutanol, Glycerol, Paraldehyde, Chloral hydrate, Hexamine, Lactic acid, Tartaric acid, Citric acid, Succinic acid, amphetamine, salicylic acid, anthranilic acid, DDT, Saccharin, resorcinol, Naphthalene, Phenanthrene, Anthracene, Diphenylmethane.	
	Total	60

References:

- 1. Organic Chemistry by Morrison and Boyd
- 2. Organic Chemistry by I.L. Finar, Volume-I

- 3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
- 4. Organic Chemistry by P.L.Soni
- 5. Organic Chemistry by Vogel
- 6. Organic Chemistry by McGraw Hill
- 7. Organic reactions and mechanism by Jerry March
- 8. Organic chemistry by Solomons and Graham

Program	B. Pharmacy
Semester	I-II
Name of the course	Biochemistry (Theory)
Course Code	BP203T
Credits	4
Hours /week	3hours (lectures) & 1hour (Tutorial)
Pre / co-requisite/s	Nil

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

Course Learning Outcomes: Upon successful completion of this course, the student should be able to:

CO 1: Define enzymes, enzyme inhibitors, carbohydrates, proteins, lipids and nucleic acids,

electron transport chain and oxidative phosphorylation.

CO 2: Explain the chemistry, classification, uses and metabolism of carbohydrates, proteins, lipids and nucleic acids.

CO 3: Discuss the metabolic disorders of carbohydrates, proteins, lipids and nucleic acids.

Synthesize DNA and RNA

CO 4: Analyse the constituents present in urine.

Unit	Topics	No. of hours
Ι	Biomolecules Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins.	12
	Bioenergetics: Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy.	
	Redox potential. Energy rich compounds; classification; biological significances of ATP and cyclic AMP	
II	Carbohydrate metabolism	12
	Glycolysis - Pathway, energetics and significance, Citric acid cycle-	
	Pathway, energetics and significance, HMP shunt and its significance;	
	Glucose-6-Phosphate dehydrogenase (G6PD) deficiency.	
	Glycogen metabolism Pathways and glycogen storage diseases (GSD)	
	Gluconeogenesis- Pathway and its significance Hormonal regulation of	
	blood glucose level and Diabetes mellitus.	
	Biological oxidation Electron transport chain (ETC) and its mechanism.	
	Oxidative phosphorylation & its mechanism and substrate level	

	phosphorylation, Inhibitors ETC and oxidative phosphorylation/Uncouplers	
III	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).	16
	Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D, Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity.	
	Amino acid metabolism General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders. Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenyketonuria, Albinism, alkeptonuria, tyrosinemia).	
	Significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline. Catabolism of heme; hyperbilirubinemia and jaundice.	
IV	Nucleic acid metabolism and genetic information transfer. Biosynthesis of purine and pyrimidine nucleotides. Catabolism of purine nucleotides and Hyperuricemia and Gout disease. Organization of mammalian genome, Structure of DNA and RNA and their functions DNA replication (semi conservative model)	10
	Transcription or RNA synthesis Genetic code, Translation or Protein synthesis and inhibitors.	
V	Enzymes: Introduction, properties, nomenclature and IUB classification of enzymes Enzyme kinetics (Michaelis plot, Line Weaver Burke plot) Enzyme inhibitors with examples Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation Therapeutic and diagnostic applications of enzymes and isoenzymes.	10
	Coenzymes –Structure and biochemical functions.	
	Total	60

Reference Textbooks:

- 1. Principles of Biochemistry by Lehninger.
- 2. Harper's Biochemistry by Robert K. Murry, Daryl K. Granner and Victor W. Rodwell.
- 3. Biochemistry by Stryer.
- 4. Biochemistry by D. Satyanarayan and U.Chakrapani
- 5. Textbook of Biochemistry by Rama Rao.
- 6. Textbook of Biochemistry by Deb.
- 7. Outlines of Biochemistry by Conn and Stumpf
- 8. Practical Biochemistry by R.C. Gupta and S. Bhargavan.

- 9. Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition)
- 10. Practical Biochemistry for Medical students by Rajagopal and Ramakrishna.
- 11. Practical Biochemistry by Harold Varley.

Program	B. Pharmacy
Semester	I-II
Name of the course	Computer Applications in Pharmacy
Course Code	BP204T
Credits	3
Hours /week	3hours (lectures) & 1hour (Tutorial)
Pre / co-requisite/s	Nil

Course Description: The Computer Applications in Pharmacy course is aimed at to learn the fundamentals of computers like scope, classification of computers, their number system, software, data base, application of computer in pharmacy and role of management information system used in the organizations.

Computer is mandatory in this advanced era and pharmacy and related subjects are not exception to it. This review mainly focuses on the various applications, software's and use of computers in pharmacy. Computer science and technology is deeply utilized in pharmacy field everywhere like in pharmacy colleges, pharmaceutical industries, research centers, hospital pharmacy and many more. Computer significantly reduces the time, expenditure, and manpower required for any kind of work. Development of various software's makes it trouble-free to handle huge data. In short, computers are playing critical role in pharmacy field, without computers pharmacy research will be long-lasting and expensive.

Course Learning Outcomes: Upon successful completion of this course, the student should be able to:

CO1: Demonstrates the introduction of computers.

CO2: State importance of computers, processing the data in MS-Office.

CO3: Navigate a Windows operating system environment as well as install and operate basic software utilities

CO4: Identifies the development life cycle of system.

CO5: Demonstrates the maintenance of pharmacy drug database.

CO6: Recognize basic technologies related to an office environment

Unit	Topics	No. of hours
Ι	Introduction to Computers:	12
	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, subtraction, multiplication, division	
	One's complement, Two's complement method.	
	Concept of Information Systems and Software:	

	Information gathering, requirement and feasibility analysis, data	
	flow diagrams, process specifications, input/output design, process life	
	cycle, planning and managing the project.	
II	Web technologies:	10
	Introduction to HTML, XML, CSS and Programming	
	languages, introduction to web servers and Server	
	Products. Introduction to databases, MYSQL, MS	
	ACCESS, Pharmacy Drug database.	
III	Application of computers in Pharmacy:	10
	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.	
IV	Bioinformatics:	8
	Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery.	
V	Computers as data analysis in Preclinical development:	5
	Chromatographic dada analysis (CDS), Laboratory Information management System (LIMS) and Text Information Management System (TIMS).	
	Total	45

Recommended Books: (Latest Editions)

1. Computer Application in Pharmacy – William E.Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.

2. Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley-Interscience, A John Willey and Sons, INC., Publication, USA.

3. Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA).

4. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi - 110002

Program	B. Pharmacy
Semester	I-II
Name of the course	Environmental Sciences - Theory
Course Code	BP205T
Credits	3
Hours /week	3hours (lectures) & 1hour (Tutorial)
Pre / co-requisite/s	Nil

Course description: 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.

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

CO 1: Create the awareness about environmental problems among learners.

CO 2: Impart basic knowledge about the environment, its allied problems and develop an attitude of concern for the environment.

CO 3: Motivate learner to participate in environment protection and environment improvement.

CO 4: Acquire skills to help the concerned individuals in identifying and solving environmental problems.

Unit	Topics	No. of hours
Ι	Introduction to Environmental Studies and Natural Resources:	12
	The multidisciplinary nature of environmental studies	
	Role of an individual in the conservation of natural resources	
II	Natural Resources and Associated Problems:	12
	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.	
III	Ecosystems and Their Types:	12
	Concept of an ecosystem	
	Structure and function of an ecosystem	
	Overview of ecosystem types	
	Characteristics of different ecosystems	
IV	Detailed Study of Ecosystems:	12
	Forest ecosystem and its components	
	Grassland ecosystem and its features	

	Desert ecosystem and challenges faced.	
	Aquatic ecosystems: ponds, streams, lakes, rivers, oceans, estuaries	
V	Environmental Pollution: Air pollution; Water pollution; Soil pollution	12
	Total	

Recommended Books (Latest edition):

1. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers, Bangalore

2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.

3. Bharucha Erach, The Biodiversity of India, Mapin Pu blishing Pvt. Ltd., Ahmedabad – 380 013, India,

4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p

5. Clark R.S., Marine Pollution, Clanderson Press Oxford

6. Cunningham, W.P. Cooper, T. H. Gorhani, E & Hepworth, M.T.2001, Environmental

Encyclopedia, Jaico Publ. House, Mumbai, 1196p

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

8. Down of Earth, Centre for Science and Environment

Program	B. Pharmacy
Semester	I-II
Name of the course	Social and Preventive Pharmacy
Course Code	BP206T
Credits	3
Hours /week	3hours (lectures) & 1hour (Tutorial)
Pre / co-requisite/s	Nil

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

Course Learning Outcomes: Upon successful completion of this course, the student should be able to:

CO1: Acquire high consciousness/realization of current issues related to health and pharmaceutical problems within the country and worldwide.

CO2: Develop skills of critical way of thinking based on current healthcare development.

CO3: Evaluate alternative ways of solving problems related to health and pharmaceutical issues.

Unit	Topics	No. of hours
Ι	Concept of health and disease	13
	Definition, concepts and evaluation of public health. Understanding the concept of prevention and control of disease, social causes of diseases and social problems of the sick.	
	Social and health education	
	Food in relation to nutrition and health, Balanced diet, Nutritional deficiencies, Vitamin deficiencies, Malnutrition and its prevention.	
	Sociology and health	
	Socio cultural factors related to health and disease, Impact of urbanization on health and disease, Poverty and health	
	Hygiene and health Personal hygiene and health care; avoidable habits	
II	Preventive medicine	13
	General principles of prevention and control of diseases such as cholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse.	
III	National health programs, its objectives, functioning and outcome of the following:	13

	Total	60
V	Community services in rural, urban and school health: Functions of PHC, Improvement in rural sanitation, national urban health mission, Health promotion and education in school.	10
IV	National health intervention programme for mother and child, National family welfare programme, National tobacco control programme, National Malaria Prevention Program, National programme for the health care for the elderly, social health programme; role of WHO in Indian national program.	11
	HIV AND AIDS control programme, TB, Integrated disease surveillance program (IDSP), National leprosy control programme, National mental health program, National programme for prevention and control of deafness, Universal immunization programme, National programme for control of blindness, Pulse polio programme.	

Learning Resources/Recommended Texts/Reference books/web resources

1. Prabhakara GN. Short Textbook of Preventive and Social Medicine. 2nd Edition. 2010. Jaypee Publications. ISBN: 9789380704104.

2. Roy Rabindra Nath, Saha Indranil. Textbook of Preventive and Social Medicine (Mahajan and Gupta). 4th Edition, 2013. Jaypee Publications. ISBN: 9789350901878.

3. Jain Vivek. Review of Preventive and Social Medicine (Including Biostatistics). 6th Edition. 2014. Jaypee Publications. ISBN: 9789351522331.

4. Hiremath Lalita D, Hiremath Dhananjaya A. Essentials of Community Medicine—A Practical Approach. 2nd Edition. 2012. Jaypee Publications. ISBN: 9789350250440.

5. K Park. Park Textbook of Preventive and Social Medicine. 21st Edition. 2011. Banarsidas Bhanot Publishers. ISBN-14: 9788190128285.

6. Ramesh Adepu. Community Pharmacy Practice. BSP publishers, Hyderabad. 7. Research in Social and Administrative Pharmacy, Elsevier, Ireland. (Journal).

Program	B. Pharm
Semester	I-II
Name of the course	Human Anatomy & Physiology – II Practical
Course Code	BP201P
Credits	1.5
Hours /week	3 hours (Practical)
Pre / co-requisite/s	Nil

Scope: This course is aimed to train the students on experimental techniques and allows the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This course also aimed to expertise the students on identification of various types of tissues & organ systems of the human body.

Course Outcomes: Upon successful completion of this course, the student should be able to:

CO 1: Understand the coordinated working pattern of different organs of each system

CO 2: Explain different family planning methods.

CO 3: Estimate tidal volumes, vital capacity, temperature and basal mass index

CO 4: Demonstrate laboratory procedures used to examine anatomical structures and evaluate physiological functions of each organ system.

Week	Topics
1	Study the integumentary and special senses using specimen, models, etc.,
2	Study of the nervous system using specimen, models, etc.,
3	Study of the endocrine system using specimen, models, etc
4	Examine the different types of taste.
5	Demonstrate the visual acuity and reflex activity
6	Recording of body temperature and basal mass index
7	Demonstrate positive and negative feedback mechanism.
8	Determination of tidal volume and vital capacity.
9	Study of digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens.
10	Study of family planning devices and pregnancy diagnosis test.
11	Permanent slides of vital organs and gonads.
12	Revisions

Learning Resources/Recommended Texts/Reference books/web resources

1. Tortora Gerard J, Derrikson Bryan. Principles of anatomy and physiology. 11th ed. Wiley: 2006.

2. Wilson K JW. Ross and Wilson's foundations of anatomy and physiology. 5th ed. Churchill Livingstone: Edinburg; 1981.

3. Guyton arthur C. Physiology of human body.6 th ed. Brooks coole Publisher: 1983.

4. Chatterjee C C. Human physiology. Volume I & II. Medical allied agency: Calcutta; 2004.

5. Anne Waugh and Alon Grant. Ross and Wilson Anatomy & Physiology. 11th ed. Churchill Livingstone: 2010.

6. Guyton Arthur C. Text book of Medical Physiology. 10 thed. Harcot Publishers: Singapore; 2000.

7. Kale S R,Kale R R.practical human anatomy and physiology.19 th ed. Pune. Nirali prakashan;2009.

8. Goyal R K, Natvar M P, Shah S A. Practical anatomy, Physiology and biochemistry,1st ed. Publisher: B S Shah Publisher: Ahmadabad; 1988.

9. C.L. Ghai. Textbook of Practical Physiology. Jaypee brother's medical publishers.

10. K. Srinageswari Rajeev Sharma. Practical workbook of Human Physiology. Jaypee brother's medical publishers.

Program	B. Pharm
Semester	I-II
Name of the course	Pharmaceutical Organic Chemistry – I Practical
Course Code	BP202P
Credits	1.5
Hours /week	3 hours (Practical)
Pre / co-requisite/s	Nil

Course Description: The pharmaceutical organic chemistry I laboratory course is aimed to train the students on experimental techniques for the determination of physical constants of organic compounds. This course also deals with wet laboratory-based experiments on identification of various chemical classes of organic compounds using basic principle of organic chemistry. This course also provides the laboratory skills related to reaction design, chemical synthesis and purification process for few organic medicinal compounds.

Course Learning Outcomes: Upon successful completion of this course, the student should be able to:

CO1: Demonstrate the skills on determination of various physical properties of organic molecules.

CO2: Differentiate various classes of organic compounds by experimental techniques.

CO3: Perform chemical reaction and purification of organic compounds of pharmaceutical interest.

CO4: Analyse the identification of the organic compounds with different functional groups.

Week	Topics
1	Preliminary test: Color, odour, aliphatic/aromatic compounds, saturation, and
	unsaturation, etc.
2	Detection of elements like Nitrogen, Sulphur, and Halogen by Lassaigne's
	test
3	Solubility test
4	Functional group tests like Phenols, Amides/ Urea, 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.
7	Preparation of the derivatives and confirmation of the unknown compound

	by melting point/ boiling point.
8	Minimum 5 unknown organic compounds to be analysed systematically.
9	Preparation of suitable solid derivatives from organic compounds
10	Construction of molecular models
11	Revisions

Recommended Books (Latest Editions)

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

Program	B. Pharm
Semester	I-II
Name of the course	Biochemistry – I Practical
Course Code	BP203P
Credits	1.5
Hours /week	3 hours (Practical)
Pre / co-requisite/s	Nil

Course Description: The pharmaceutical Biochemistry laboratory course is aimed to train the students on experimental techniques for the identification of carbohydrates, proteins, amino acids and lipids. This course also deals with experiments on estimation of constituents in urine and blood and their significance in diagnosis of various diseases.

Course Learning Outcomes: Upon successful completion of this course, the student should be able to:

CO 1: Identify the carbohydrates proteins and lipids based upon chemical tests.

CO 2: Quantify the sugars, proteins and lipids in blood and serum.

CO 3. Demonstrate the skills on determination of various constituents present in urine.

Week	Topics
1	Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose,
	Sucrose and starch
2	Identification tests for Proteins (albumin and Casein)
3	Determination of Glucose in sample by benedict's reagent method
4	Quantitative analysis of Proteins (Biuret method)
5	Qualitative analysis of urine for abnormal constituents
6	Qualitative analysis of urine for normal constituents
7	Determination of blood creatinine
8	Determination of blood sugar
9	Preparation of buffer solution and measurement of pH
10	Determination of chlorides in urine
11	Determination of urea in blood
12	Study the effect of Temperature on Salivary amylase activity.
13	Study the effect of Energy on Salivary amylase activity
14	Estimation of Na+/K+ levels in serum
15	Revisions

Recommended Books (Latest Editions)

- 1 Practical Biochemistry by R.C. Gupta and S. Bhargavan
- 2 Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition)
- 3 Practical Biochemistry for Medical students by Rajagopal and Ramakrishna
- 4 Practical Biochemistry by Harold Varley.

Program	B. Pharm
Semester	I-II
Name of the course	Computer Applications in Pharmacy - Practical
Course Code	BP204P
Credits	1.5
Hours /week	3 hours (Practical)
Pre / co-requisite/s	Nil

Course Description: The Pharmacognosy and Phytochemistry I laboratory course is aimed to train the students regarding practical skills of different computer technologies, programming languages and development of web pages. This course also deals with laboratory-based experiments on maintenance of database in MS-Access, formation of queries, exporting queries, tables, forms and reports to web page.

Course Learning Outcomes: Upon successful completion of this course, the student should be able to:

CO 1: Demonstrates the introduction of MS-Access, CRUD operations on data base.

CO 2: State importance of tables, queries, forms and reports.

CO 3: Demonstrate knowledge on creation of web pages, working with tables and queries.

S. No.	Торіс
1.	Design a questionnaire using a word processing package to gather information about a particular disease.
2.	Create a HTML web page to show personal information.
3.	Retrieve the information of a drug and its adverse effects using online tools.
4.	Creating mailing labels Using Label Wizard, generating label in MS WORD.
5.	Create a database in MS Access to store the patient information with the required fields Using access.
6.	Design a form in MS Access to view, add, delete and modify the patient record in the database.
7.	Generating report and printing the report from patient database.
8.	Creating invoice table using – MS Access.
9.	Drug information storage and retrieval using MS Access.
10.	Creating and working with queries in MS Access.
11.	Exporting Tables, Queries, Forms and Reports to web pages.
12.	Exporting Tables, Queries, Forms and Reports to XML pages.

Recommended Books: (Latest Editions)

1. Computer Application in Pharmacy – William E.Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.

2. Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley-Interscience, A John Willey and Sons, INC., Publication, USA.

3. Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA).

4. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi – 110002.

Program	B. Pharmacy
Semester	II-I
Name of the course	Pharmaceutical Organic Chemistry - II
Course Code	BP301T
Credits	4
Hours /week	3 (Lectures) + 1 (Tutorial)
Pre / co-requisite/s	Nil

Course Description:

This subject imparts knowledge of stereo-chemical aspects of organic compounds and organic reactions, the chemistry of important heterocyclic compounds, and important named reactions. It also emphasizes the importance of ring strain in the stability of the compound and fatty acids.

Course Learning Outcomes:

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

CO1: Know the nomenclature of heterocyclic compounds along with their preparation methods and chemical properties.

CO2: Understand the stereochemical aspects of organic compounds and gives their importance in biological activity.

CO 3: Analyze the importance of various analytical constants of fatty acids.

Course Content:

Unit	Topics	Hours
I (3 weeks)	Stereo isomerism:Optical isomerism – Optical activity, enantiomerism, diastereoisomerism, meso compounds Elements of symmetry, chiral and achiral molecules, DL system of nomenclature, sequence rules - RS system of nomenclature, Racemic modification and 	12

	Heterocyclic compounds:	
	Nomenclature and classification of 3-7 membered ring systems,	
	and fused heterocyclic compounds.	
	Synthesis, reactions, and medicinal uses of the following	
II	compounds/derivatives	
(3 Weeks)	Five membered ring systems with one hetero atom:	12
	Pyrrole, Furan, and Thiophene.	
	Relative aromaticity and reactivity of Pyrrole, Furan, and	
	Thiophene	
	Synthesis, reactions, and medicinal uses of the following	
	compounds/derivatives	
	Five membered ring systems with two hetero atoms:	
III	Pyrazole, Imidazole, Oxazole, and Thiazole.	16
(4 Weeks)	Six and seven-membered ring systems:	10
	Pyridine, Pyrimidine, Azepine	
	Fused heterocyclic ring systems:	
	Quinoline, Isoquinoline, Acridine, Indole, and Purine	
	Cycloalkanes - Baeyer's strain theory, limitation of Baeyer's strain	
	theory, Coulson and Moffitt's modification,	
IV	Sachse Mohr's theory (Theory of stainless rings), reactions of	
(2 Weeks)	cyclopropane and cyclobutane.	8
	Fatty acids: Reactions - Hydrolysis, Hydrogenation,	
	Saponification, and Rancidity of oils.	
	Analytical constants - Acid value, Saponification value, Ester	
	value, Iodine value, Acetyl value, Reichert Meissl (RM) value -	
	significance and principle involved in their determination.	
• •	Reactions of synthetic importance of	
v	Metal hydride reduction (NaBH4 and LiAlH4), Clemmensen	12
(3 Weeks)	reduction, Birch reduction, Wolff Kishner reduction,	
	Oppenauer-oxidation, Beckmann rearrangement, Hoffmann	
	rearrangement, Schmidt rearrangement, Claisen-Schmidt	
	condensation.	

Total	60

References:

1. Allyn, Bacon. Morrison and Boyd: Organic Chemistry. 7thEd. Pearson Education; New Delhi: 2011.

2. T.W. Solomons. Organic Chemistry. 8thEd. University of South Florida, John Wiley & Sons, Inc; New York: 2004.

3. Arun Bahl, B.S. Bahl. Advanced Organic Chemistry. S. Chand and limited; New Delhi: 2010.

4. I.L. Finar. Organic Chemistry. Longman, Scientific & Technical. 5thEd. Co-published in USA with John Wiley & Sons, Inc; New York: 2004.

5. Zimmerman and Zimmerman. Elements of Organic Chemistry. 2ndEd. Collier Macmillan Publishers; London: 1983.

6. O. P Agarwal. Organic chemistry Reaction and Reagents. 26th Ed. Goel Publishing House. New Delhi: 1996.

Program	B. Pharmacy
Semester	II-I
Name of the course	Physical Pharmaceutics- I
Course Code	BP302T
Credits	4
Hours /week	3 (Lectures) + 1 (Tutorial)
Pre / co-requisite/s	Nil

Course Description

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

Course outcome

At the end of the theory course, the student will be able to

CO1 Understand various physicochemical properties of drug molecules in the designing the dosage forms

CO2 Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulation

CO3 Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

Course Content:

Unit	Contents	Hours
-		10
1	States of Matter and properties of matter:	12
	State of matter, changes in the state of matter, latent heats, vapour pressure,	
	sublimation critical point, eutectic mixtures, gases, aerosols - inhalers,	
	relative humidity, liquid complexes, liquid crystals, glassy states, solid	
	crystalline, amorphous & polymorphism.	
	Physicochemical properties of drug molecules: Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations, and applications.	

2	Solubility of drugs:	12
	Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions, Phase Rule. Partially miscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications.	
3	pH, buffers and Isotonic solutions: Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions.	12
4	Surface and interfacial phenomenon: Liquid interface, surface & interfacial tensions, surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB Scale, solubilization, detergency, adsorption at solid interface.	12
5	Complexation and protein binding: Introduction, Classification of Complexation, Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants.	12
Total		60

Recommended reference Books

- 1. Sinko P.J. Martin's Physical Pharmacy and Pharmaceutical Sciences. 5th ed. New Delhi:Wolters Kluwer Health Pvt. Ltd.; 2007.
- 2. Subramanyam C.V.S. Essentials of Physical Pharmacy. 1st ed. Delhi: VallabhPrakashan; 2008.
- Manavalan. R, Ramaswamy. C. Physical pharmaceutics. 2nded. Tamilnadu: Vigneshpublisher; 2008.
- 4. Experimental Pharmaceutics by Eugene, Parott.
- 5. Tutorial Pharmacy by Cooper and Gunn.
- 6. Stocklosam J. Pharmaceutical Calculations, Lea & Febiger, Philadelphia.
- Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, MarcelDekkar Inc.

Liberman H.A, Lachman C, Pharmaceutical Dosage forms. Disperse systems, volume 1, 2, 3.

Marcel Dekkar Inc.

- 9. Laboratory Manual of Physical Pharmaceutics, C.V.S. Subramanyam, J. Thimma settee
- 10. Test book of Physical Phramacy, by Gaurav Jain & Roop K. Khar. http://www.ebooksdirectory.com 12.http://www.jblearning.com.

Program	B. Pharmacy
Semester	II-I
Name of the course	Pharmaceutical Microbiology
Course Code	BP303T
Credits	4
Hours /week	3 (Lectures) + 1 (Tutorial)
Pre / co-requisite/s	Nil

Course Description: The course deals with the various aspects of microorganisms, its classification, morphology, laboratory cultivation identification and maintenance. It also discusses with sterilization of pharmaceutical products, equipment, media etc.

Course Learning Outcomes: Upon successful completion of this course, the student should be able to:

CO1: Understand methods of identification, cultivation and preservation of various microorganisms.

CO2: To understand the importance and implementation of sterilization in pharmaceutical processing and industry

CO3: Learn sterility testing of pharmaceutical products.

CO 4: Carried out microbiological standardization of Pharmaceuticals.

CO5: Understand the cell culture technology and its applications in pharmaceutical industries.

Course Contents:

Unit	Торіс	Hours
Ι	Introduction, history of microbiology, its branches, scope and its importance.	15
	Introduction to Prokaryotes and Eukaryotes.	
	Study of different type of microscopes: Types of Light and electron microscopy	
	and their techniques.	
	Study of ultra-structure and morphological classification of bacteria, nutritional requirements and classification of bacteria based on nutrient requirement, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of aerobic and anaerobic microbes, quantitative measurement of bacterial growth (total & viable count).	

II	Identification of bacteria using staining techniques (simple, Grams' & Acidfast	15
	staining) and biochemical tests (Extra and intra cellular enzyme tests).	
	Study of principle, procedure, merits, demerits and applications of physical,	
	chemical gaseous, radiation and mechanical method of sterilization.	
	Industrial sterilization methods and equipments/setup employed for the same.	
	Sterility validation.	
III	Study of morphology, classification, reproduction/replication and	
	Cultivation of Fungi and Viruses.	10
	Classification and mode of action of disinfectants.	
	Factors influencing disinfection and antiseptics	
	Evaluation of Disinfectants, antiseptics, bactericidal & Bacteriostatic agents.	
	Sterility testing of products (solids, liquids, ophthalmic and other sterile	
	Products) according to IP, BP and USP.	
IV	Designing of aseptic area, laminar air flow equipments; study of different	10
	sources of contamination in an aseptic area and methods of prevention, Clean	
	area classification.	
	Principles and methods of microbiological assay for Standardization of	
	antibiotics, vitamins and amino acids.	
	Assessment of antimicrobial activity and MIC.	
	Sources and types of microbial contaminants in pharmaceuticals. Assessment of	10
V	microbial contamination and spoilage.	
	Preservation of pharmaceutical products using antimicrobial agents, Evaluation	
	of microbial stability of formulations.	
	Growth of animal cells in culture, general procedure for cell culture.	
	Types of animal cell cultures/	
	Application of cell cultures in pharmaceutical industry and research.	
	Total	60

Recommended Books (Latest edition)

- 1 W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
- 2 Prescott and Dunn. Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
- 3 Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.

- 4 Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
- 5 Rose: Industrial Microbiology.
- 6 Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
- 7 Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
- 8 Peppler: Microbial Technology.
- 9 I.P., B.P., U.S.P. latest editions.
- 10 Ananthnarayan : Text Book of Microbiology, Orient-Longman, Chennai
- 11 Edward: Fundamentals of Microbiology.
- 12 N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
- 13 Bergey's manual of systematic bacteriology, Williams and Wilkins- a Waverly Company

Program	B. Pharmacy
Semester	II-I
Name of the course	Pharmaceutical Engineering
Course Code	BP304T
Credits	4
Hours /week	3 (Lectures) + 1 (Tutorial)
Pre / co-requisite/s	Nil

Course Description:

This course is designed to impart a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry. This course emphasizes pharmaceutical importance of different equipment's, their construction, working applications, merits and demerits.

Course Learning Outcomes: Upon completion of this course the student should be able to:

CO 1: Define various unit operations and material handling techniques used in Pharmaceutical industries.

CO 2: Recognize significance of plant lay out design for optimum use of resources.

CO 3: Demonstrate various processes involved in pharmaceutical manufacturing process.

CO 4: Appraise the various preventive methods used for corrosion control in Pharmaceutical industries.

Course Contents:

Unit	Торіс	Hours
Ι	Size Reduction: Objectives, Mechanisms & Laws governing size reduction,	14
	factors affecting size reduction, principles, construction, working, uses, merits	
	and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill &	
	end runner mill.	
	Size Separation: Objectives, applications & mechanism of size separation,	
	Official standards of powders, sieves, size separation Principles, construction,	
	working, uses, merits and demerits of Sieve shaker, cyclone separator, Air	
	separator, Bag filter & elutriation tank.	
	Flow of fluids: Types of manometers, Reynolds number and its significance,	
	Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturi	
	meter, Pitot tube and Roto meter.	

II	Heat Transfer: Objectives, applications & Heat transfer mechanisms. Fourier's	14
	law, Heat transfer by conduction, convection & radiation. Heat interchangers &	
	heat exchangers.	
	Evaporation: Objectives, applications and factors influencing evaporation,	
	differences between evaporation and other heat process. principles,	
	construction, working, uses, merits and demerits of Steam jacketed kettle,	
	horizontal tube evaporator, climbing film evaporator, forced circulation	
	evaporator, multiple effect evaporator& Economy of multiple effect evaporator.	
	Distillation: Basic Principles and methodology of simple distillation, flash	
	distillation, fractional distillation, distillation under reduced pressure, steam	
	distillation & molecular distillation	
III	Drying: Objectives, applications & mechanism of drying process,	12
	measurements& applications of Equilibrium Moisture content, rate of drying	
	curve. principles, construction, working, uses, merits and demerits of Tray	
	dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer.	
	Mixing: Objectives, applications & factors affecting mixing, Difference	
	between solid and liquid mixing, mechanism of solid mixing, liquids mixing	
	and semisolids mixing. Principles, Construction, Working, uses, Merits and	
	Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma	
	blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson	
	Emulsifier,	
IV	Filtration: Objectives, applications, Theories & Factors influencing filtration,	10
	filter aids, filter medias. Principle, Construction, Working, Uses, Merits and	
	demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter &	
	Cartridge filter, membrane filters and Seidtz filter.	
	Centrifugation: Objectives, principle & applications of Centrifugation,	
	principles, construction, working, uses, merits and demerits of Perforated basket	
	centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge &	
	super centrifuge.	
V	Materials of pharmaceutical plant construction, Corrosion and its	10
	prevention: Factors affecting during materials selected for Pharmaceutical	
	plant construction, Theories of corrosion, types of corrosion and their	
	prevention. Ferrous and nonferrous metals, inorganic and organic nonmetals,	
	basic of material handling systems.	

Total

Recommended Books: (Latest Editions)

1. Introduction to chemical engineering – Walter L Badger & Julius Banchero, Latest edition.

2. Solid phase extraction, Principles, techniques and applications by Nigel J.K. SimpsonLatest edition.

3. Unit operation of chemical engineering – Mcabe Smith, Latest edition.

4. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition.

5. Remington practice of pharmacy- Martin, Latest edition.

6. Theory and practice of industrial pharmacy by Lachmann., Latest edition.

7. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition.

8. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition.

Program	B. Pharmacy
Semester	II-I
Name of the course	Pathophysiology
Course Code	BP305T
Credits	4
Hours /week	3 (Lectures) + 1 (Tutorial)
Pre / co-requisite/s	Nil

Scope: The Pathophysiology course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions and understanding of basic pathophysiological mechanisms. The course covers the basics of cell biology, inflammation, mechanism of body defense, abnormal cell growth and focuses on the pathophysiology of common disease processes of human body system.

Course Outcomes: Upon successful completion of this course, the student should be able to:

CO 1: Define the basic terminology related to pathophysiology.

CO 2: Describe the etiology and pathogenesis of the selected disease states.

CO 3: Name the signs, symptoms and complications of the diseases.

CO 4: Define the basic approach to diagnosis and diagnostic procedures of human diseases.

CO 5: Correlate the Pathophysiology with prognosis, medical treatment of the diseases.

Course contents:

Unit	Topics	Hours
	Basic principles of Cell injury and Adaptation: Introduction,	
	definitions, Causes of cellular injury, Pathogenesis (Cell membrane	
	damage, Mitochondrial damage, Ribosome damage, Nuclear	
	damage), Morphology of cell injury – Adaptive changes (Atrophy,	
T	Hypertrophy, hyperplasia, Metaplasia, Dysplasia), Morphology of	
-	reversible and irreversible cell injury, Intra cellular accumulation,	
	Calcification, Enzyme leakage and Cell Death	
	Basic mechanism involved in the process of inflammation and repair: Introduction, Clinical signs of inflammation, Different types	

	of Inflammation, Mechanism of Inflammation - Alteration in	12
	vascular permeability and blood flow, migration of WBC's,	
	Mediators of inflammation, Basic principles of wound healing in the	
	skin.	
	Cardiovascular System: Hypertension, congestive heart failure,	12
	ischemic heart disease (angina, myocardial infarction,	
II	atherosclerosis and arteriosclerosis).	
	Respiratory system: Asthma, Chronic obstructive airways	
	diseases. Renal system: Acute and chronic renal failure	
	Hematological Diseases: Iron deficiency, megaloblastic anemia	12
	(Vit B12 and folic acid), sickle cell anemia, thalassemia, hereditary	
	acquired anemia, hemophilia.	
III	Endocrine system: Diabetes, thyroid diseases, disorders of sex	
	hormones.	
	Nervous system: Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease.	
	Gastrointestinal system: Peptic ulcer, Inflammatory bowel	12
	diseases, jaundice, hepatitis (A, B, C, D, E, F) alcoholic liver	
W	disease.	
1 V	Disease of bones and joints: Rheumatoid arthritis, osteoporosis and	
	gout.	
	Principles of Cancer: Classification, etiology and pathogenesis of	
	Cancer.	
	The diseases: Meningitis, Typhoid, Leprosy,	
V	Tuberculosis, Urinary Tract Infections.	10
	Sexually transmitted diseases: AIDS, Syphilis, Gonorrhea	12
	Total	60

Learning Resources/Recommended Texts/Reference books/web resources

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

- 4 Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12th ed; united states
- 5 William and Wilkins, Baltimore;1991 [1990 printing].
- 6 Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston; Davidson's Principles and Practice of Medicine; 21st edition; London; ELBS/Churchill Livingstone; 2010.
- 7 Guyton A, John .E Hall; Textbook of Medical Physiology; 12th edition; WB Saunders Company; 2010.
- 8 Joseph DiPiro, Robert L. Talbert, Gary Yee, Barbara Wells, L. Michael Posey; Pharmacotherapy: A Pathophysiological Approach; 9th edition; London; McGraw-Hill Medical; 2014.
- 9 Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6th edition; Philadelphia; WB Saunders Company; 1997.
- 10 Roger Walker, Clive Edwards; Clinical Pharmacy and Therapeutics; 3rd edition; London; Churchill Livingstone publication; 2003.

Program	B. Pharmacy
Semester	II-I
Name of the course	Pharmaceutical Organic Chemistry II – Practical
Course Code	BP 301P
Credits	1.5
Hours /week	3 hours
Pre / co-requisite/s	Nil

Course Description: The Pharmaceutical Organic Chemistry II laboratory course aimed to train the students on laboratory techniques for purification of organic compounds. This course also deals with experiments on identification of purity and standard of the oils by their analytical constants. This course also provides the laboratory skills related to reaction design, chemical synthesis and purification process for few organic medicinal compounds.

Course Learning Outcomes: Upon successful completion of this course, the student should be able to:

CO 1: Demonstrate the skills on separation & purification of various organic molecules.

CO 2: Analyze the analytical constants (values) by different tests to find the purity of oils.

CO 3: Identify the preparation mechanism and purification process of the various organic compounds.

Week	TOPICS	
Experiments involving laboratory techniques		
1	Recrystallization	
2	Steam distillation	
Determination of following oil values (including standardization of reagents)		
3	Acid value	
4	Saponification value	
5	Iodine value	
Preparation of compounds		
6	Benzanilide/Phenyl benzoate from Aniline/ Phenol by acylation reaction.	
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7	2,4,6-Tribromo aniline/Para bromo acetanilide from Aniline/ Acetanilide by	
	halogenation (Bromination) reaction.	
8	5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by	
	nitration reaction.	
9	Benzoic acid from Benzyl chloride by oxidation reaction.	
10	Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis	
	reaction.	
11	1-Phenyl azo-2-napthol from Aniline by diazotization and coupling reactions.	
12	Benzil from Benzoin by oxidation reaction.	
13	Dibenzal acetone from Benzaldehyde by Claisen Schmidt reaction	

Recommended Books (Latest Editions)

- Vogel, A.I, Tatchell A.R, Furnis B.S, Hannaford A.J, Smith P.W.G. Practical Organic Chemistry. 5th Ed. Pearson Publishers Prentice Hall; New Delhi: 1996.
- 2. R.K. Bansal, Laboratory Manual of Organic Chemistry, 5th Ed. New Age International; New Delhi 2007.
- 3. O.P. Agarwal, Advanced Practical Organic Chemistry, 3rd Ed. Goel Publication; Meerut: 2011.
- 4. F.G.Mann & B.C. Saunders, Practical Organic Chemistry, 4th Ed. Chaman enterprises; New 5. Delhi: 2004.

Program	B. Pharmacy
Semester	11-1
Name of the course	Physical Pharmacy I – Practical
Course Code	BP 302P
Credits	1.5
Hours /week	3 hours
Pre / co-requisite/s	Nil

Course Description

The Physical Pharmacy – I laboratory course is aimed to train the students on experimental techniques for the determination of Physico - chemical properties. This course also deals with wet laboratory-based experiments on identification critical solution temperatures of binary phase systems. This course also provides the laboratory skills related to determination of pH, physical & colligative properties.

Course Outcomes

At the end of the practical course of experiments, the student will be able to

CO 1: Demonstrate the skills on determination of various physical properties of drug molecules.

Co 2: Operate equipment's like pH meter, Refractometer etc.

CO 3: Calculate the buffer capacities of pharmaceutical buffers by experimental techniques.

S. No.	Topics	Hours
1	Determination the solubility of drug at room temperature	3
2	Determination of pKa value by Half Neutralization/ Henderson Hassel Balch equation.	3
3	Determination of Partition co- efficient of benzoic acid in benzene and water	3
4	Determination of Partition co- efficient of Iodine in CCl4 and water	3
5	Determination of % composition of NaCl in a solution using phenolwater system by CST method	3
6	Determination of surface tension of given liquids by drop count and drop weight method	3

7	Determination of HLB number of a surfactant by saponification method	3
8	Determination of Freundlich and Langmuir constants using activated char coal	3
9	Determination of critical micellar concentration of surfactants	3
10	Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubility method	3
11	Determination of stability constant and donor acceptor ratio of Cupric-Glycine complex by pH titration method	3

Recommended Books: (Latest Editions)

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

Program	B. Pharmacy
Semester	II-I
Name of the course	Pharmaceutical Microbiology – Practical
Course Code	BP 303P
Credits	1.5
Hours /week	3 hours
Pre / co-requisite/s	Nil

Course Description:

The course is designed to focus on identification, nutritional requirements of microorganisms.

Since microbiology is an upcoming and fascinating branch of biological sciences, medical and

pharmaceutical sciences, the approach of performing experiments will lead to success of

learning the subject.

Course Learning Outcomes: Upon successful completion of this course, the student should be able to:

CO 1: Learn about microbial techniques related to Sterilization, Aseptic handling as well as microbial utilization in the Pharma industry

CO2: Learn procedure to cultivate and identification of the microorganisms in the laboratory

CO3: Learn about the utilization of microbes in assay of various pharmaceuticals.

Course contents:

Week	Topics
1	Introduction and study of different equipments, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.
2	Sterilation and preparation of Nutrient Broth
3	Sterilization and Preparation of Nutrient slant, Deep tube and petri plate
4	Aseptic transfer of organism into Nutrient Broth
5	Aseptic transfer of Organism into Slant.
6	Isolation of pure culture of micro-organisms by Different streak plate techniques
7	Isolation of pure culture of micro-organisms Spread and Pour plate technique
8	Simple and Negative staining

9	Grams' staining
10	Acid Fast Staining
11	Microbiological assay of antibiotics by cup plate/Disc plate method.
12	Sterility testing of pharmaceuticals
13	Bacteriological analysis of water
14	Biochemical tests (IMViC Tests/Intra and Extracellular enzyme tests)
15	Revision/Assessment

Recommended Books (Latest edition)

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

Program	B. Pharmacy
Semester	11-1
Name of the course	Pharmaceutical Engineering – Practical
Course Code	BP 304P
Credits	1.5
Hours /week	3 hours
Pre / co-requisite/s	Nil

Course Description: The Pharmaceutical Engineering Practical course is aimed to train the students on handling of equipments related to size reduction, size separation and mixing. This course also deals with determination of humidity using thermometers, rate of drying, rate of filtration, rate of evaporation and extraction by distillation.

Course Learning Outcomes: Upon successful completion of this course, the student should

be able to:

CO 1: Operate major equipments used in pharmaceutical industry

CO 2: Experiment to determine various parameters and factors effecting of unit processes.

CO3: Construct plots related to various unit operations.

S. No	Experiments
1.	Calculation of efficiency of steam distillation.
2.	Determination of overall heat transfer coefficient by heat exchanger.
3.	Construction of drying curves (for calcium carbonate and starch).
4.	Determination of moisture content and loss on drying.
5.	Determination of humidity of air by a)
	Wet and dry bulb temperatures
	b) Dew point method.
6.	Description of Construction working and application of rotary tablet machine, fluidized bed coater, fluid energy mill, de humidifier.
7.	Evaluation of size distribution of tablet granulations by sieving – Construction of various size frequency curves including arithmetic and logarithmic probability plots.
8.	Verification of the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill.

9.	Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer
10	. Study of factors affecting Rate of Filtration and Evaporation (Surface area,
	Concentration and Thickness/ viscosity)
11	. Study of effect of time on the Rate of Crystallization.
12	. Calculation of uniformity Index for given sample by using Double Cone Blender.

Recommended reference Books

1. Introduction to chemical engineering – Walter L Badger & Julius Banchero, Latest edition. 2. Solid phase extraction, Principles, techniques and applications by Nigel J.K. SimpsonLatest edition.

- 3. Unit operation of chemical engineering Mcabe Smith, Latest edition.
- Pharmaceutical engineering principles and practices C.V.S Subrahmanyam et al., Latest edition.
- 5. Remington practice of pharmacy- Martin, Latest edition.
- 6. Theory and practice of industrial pharmacy by Lachmann., Latest edition.
- 7. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition.
- 8. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition.

Program	B. Pharmacy
Semester	II-II
Name of the course	Medicinal Chemistry I – Theory
Course Code	BP 401T
Credits	4
Hours /week	3hours (lectures) & 1hour (Tutorial)
Pre / co-requisite/s	Nil

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

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

CO 1: Understand the chemistry of drugs with respect to their pharmacological activity

CO 2: Identify the drug metabolic pathways, adverse effect and therapeutic value of drugs

CO 3: Know the Structural Activity Relationship (SAR) of different class of drugs

CO 4: Write the chemical synthesis of some drugs

Instructions:

- 1. Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course.
- 2. Structure, IUPAC name, synthesis, Metabolic pathway, and side effects of drugs superscripted (*)

Course Content:

Unit	Topics	Hours
I (3 Weeks)	Introduction to Medicinal Chemistry History and development of medicinal chemistry Physicochemical properties in relation to biological action	12

	Ionization, Solubility, Partition Coefficient, Hydrogen bonding,	
	Protein binding, Chelation, Bioisosterism, Optical and Geometrical	
	isomerism.	
	Drug metabolism	
	Drug metabolism principles- Phase I and Phase II	
	Factors affecting drug metabolism including stereo chemical aspects.	
	Drugs acting on Autonomic Nervous System	
	Adrenergic Neurotransmitters:	
	Biosynthesis and catabolism of catecholamine.	
	Adrenergic receptors (Alpha & Beta) and their distribution.	
	Sympathomimetic agents: SAR of Sympathomimetic agents	
	Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine*,	
	Dopamine, Methyldopa, Clonidine, Dobutamine, Isoproterenol,	
п	Terbutaline, Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline	
(3 Wooks)	and Xylometazoline.	12
(J WEEKS)	Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine,	
	Propylhexedrine.	
	Agents with mixed mechanism: Ephedrine, Metaraminol.	
	Adrenergic Antagonists:	
	Alpha adrenergic blockers: Tolazoline*, Phentolamine,	
	Phenoxybenzamine, Prazosin.	
	Beta adrenergic blockers: SAR of beta blockers, Propranolol*,	
	Atenolol, Bisoprolol, Esmolol, Metoprolol, Labetolol.	
	Cholinergic neurotransmitters:	
	Biosynthesis and catabolism of acetylcholine.	
III	Cholinergic recentors (Muscarinic & Nicotinic) and their distribution	12
(3 Weeks)	Chomiergie receptors (ivruscarine & recomine) and then distribution.	
	Parasympathomimetic agents: SAR of Parasympathomimetic	
	agents	

	Direct acting agents: Acetylcholine, Carbachol*, Bethanechol,	l
	Methacholine, Pilocarpine.	l
	Indirect acting/ Cholinesterase inhibitors (Reversible &	l
	Irreversible):	l
	Physostigmine, Neostigmine*, Edrophonium chloride, Tacrine	l
	hydrochloride, Isofluorphate, Echothiophate iodide, Parathione,	1
	Malathion.	1
	Cholinesterase reactivator: Pralidoxime chloride.	1
	Cholinergic Blocking agents: SAR of cholinolytic agents	1
	Solanaceous alkaloids and analogues: Atropine sulphate,	1
	Hyoscyamine sulphate, Scopolamine hydrobromide, Homatropine	1
	hydrobromide, Ipratropium bromide*.	1
	Synthetic cholinergic blocking agents: Tropicamide,	1
	Cyclopentolate hydrochloride, Dicyclomine hydrochloride*,	1
	Glycopyrrolate, Propantheline bromide, Biperidine hydrochloride,	1
	Procyclidine hydrochloride*, Isopropamide iodide	1
	Drugs acting on Central Nervous System	
	A. Sedatives and Hypnotics:	1
	Benzodiazepines: SAR of Benzodiazepines, Chlordiazepoxide,	1
	Diazepam*, Oxazepam, Chlorazepate, Lorazepam, Alprazolam,	1
	Zolpidem	1
IV/	Barbiturtes: SAR of barbiturates, Barbital, Phenobarbital*,	1
	Mephobarbital, Amobarbital, Butabarbital, Pentobarbital,	12
(3 Weeks)	Secobarbital	1
	Miscelleneous:	1
	Amides & imides: Glutethmide.	1
	Alcohol & their carbamate derivatives: Meprobomate, Ethchlorvynol.	l
	Aldehyde & their derivatives: Triclofos sodium, Paraldehyde.	l
	B. Antipsychotics	l
		1

	Phenothiazeines: SAR of Phenothiazeines - Promazine			
	hydrochloride, Chlorpromazine hydrochloride*, Triflupromazine,			
Thioridazine hydrochloride, Piperacetazine hydrochloride				
Ring Analogues of Phenothiazines: Chlorprothixene, Thiothixene,				
	Loxapine succinate, Clozapine.			
	Fluro buterophenones: Haloperidol, Droperidol, Risperidone.			
	Beta amino ketones: Molindone hydrochloride.			
	Benzamides: Sulpieride.			
	C. Anticonvulsants: SAR of Anticonvulsants, mechanism of			
	anticonvulsant action			
	Barbiturates: Phenobarbitone, Methabarbital.			
	Hydantoins: Phenytoin*, Mephenytoin, Ethotoin			
Oxazolidine diones: Trimethadione, Paramethadione Succinimides: Phensuximide, Methsuximide, Ethosuximide*				
	Benzodiazepines: Clonazepam			
	Miscellaneous: Primidone, Valproic acid, Gabapentin, Felbamate			
	Drugs acting on Central Nervous System			
	General anesthetics:			
	Inhalation anesthetics: Halothane*, Methoxyflurane, Enflurane, Sevoflurane			
V	Ultra-short acting barbitutrates: Methohexital sodium*, Thiamylal			
(3 Weeks)	sodium, Thiopental sodium.	12		
(5 WEEKS)	Dissociative anesthetics: Ketamine hydrochloride. *			
	Narcotic and non-narcotic analgesics			
	Morphine and related drugs: SAR of Morphine analogues,			
	Morphine sulphate, Codeine, Meperidine hydrochloride,			
	Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl			

Anti-inflammatory agents: Aspirin, Mefenamic acid*, Indomethacin, Sulindac, Tolmetin, Diclofenac, Ketorolac, Ibuprofen*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.	
Narcotic antagonists: Nalorphine hydrochloride, Levallorphan tartarate, Naloxone hydrochloride.	
citrate*, Methadone hydrochloride*, Propoxyphene hydrochloride, Pentazocine.	

Learning Resources/Recommended Texts/Reference books/web resources

1. William O. Foye, Textbook of Medicinal Chemistry, Lea Febiger, Philadelphia.

2. Graham. L. Patrick, an Introduction to Medicinal Chemistry, Oxford University publishers.

3. JH Block & JM Beale (Eds), Wilson & Griswold's textbook of organic Medicinal Chemistry and pharmaceutical chemistry, 11th Ed, Lipcolt, Raven, Philadelphia, 2004

4. Rama Rao Nadendla, Medicinal Chemistry, Mc Millan Publishers.

5. Hansch, Comprehensive medicinal chemistry, Vol 1 – 6 Elsevier pergmon press, Oxford.

6. D. Abraham (Ed), Burger Medicinal chemistry and Drug discovery, Vol. 1 & 2, 6th Ed, John Wiley & Sons, New York 2003.

7. M. Atherden, Bentley and Driver's Textbook of Pharmaceutical Chemistry Ed: l. Oxford University Press, Delhi.

 8. Daniel lednicer, Strategies for Organic Drug Synthesis and Design, John Wiley, N. Y. 1998.

9. D. Lednicer, Organic drug synthesis, Vol, 1 - 6, J. Wiley N.Y.

Program	B. Pharmacy
Semester	11-11
Name of the course	Physical Pharmaceutics II – Theory
Course Code	BP 402T
Credits	4
Hours /week	3hours (lectures) & 1hour (Tutorial)
Pre / co-requisite/s	Nil

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

Course outcome

At the end of the theory course, the student will be able to

CO 1: Define the fundamental aspects of solubility, distribution, flow of liquids & solids.

CO 2: Recognize the importance of micromeritics, rheology & interfacial phenomenon in manufacturing of dosage form

CO 3: Apply the principles of diffusion and complexation in formulations

CO 4: Test the drug decomposition kinetics & stability of dispersed systems

Course Content:

Unit	Topics	Hours
I (3 Weeks)	Colloidal dispersions: Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles, Classification of colloids & comparative account of their general properties.	12
	Optical, kinetic & electrical properties. Stability of colloids. Effect of electrolytes, coacervation, peptization& protective action.	
II (3 Weeks)	Rheology: Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic,	12
	thixotropy, thixotropy in formulation, determination of viscosity by capillary, falling Sphere, rotational viscometers	

	Deformation of solids: Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus	
III (3 Weeks)	I Coarse dispersion: Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of flocculated and deflocculated suspensions. Emulsions and theories of amulaification microamulation and theories of amulaification.	
	emulsions; Stability of emulsions, preservation of emulsions Rheological properties of emulsions and emulsion formulation by HLB method.	
IV (3 Weeks)	Micromeritics: Particle size and distribution, mean particle size, number and weight distribution, particle number, methods for determining particle size by different methods. particle shape, specific surface, methods for determining surface area. Permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkings & flow properties	12
V (3 Weeks)	 Drug stability: Reaction kinetics: zero, pseudo-zero, first & second order, units of basic rate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific & general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention. 	12
	Total	60

Learning Resources/Recommended Texts/Reference books/web resources

- 1. Sinko P.J. Martin's Physical Pharmacy and Pharmaceutical Sciences. 5th ed. New Delhi:Wolters Kluwer Health Pvt.Ltd.,; 2007.
- 2. Subramanyam C.V.S. Essentials of Physical Pharmacy. 1st ed. Delhi: Vallabh Prakashan; 2008.
 - 3. Manavalan. R, Ramaswamy. C. Physical pharmaceutics. 2nded. Tamilnadu: Vignesh publisher; 2008.
 - 4. Experimental Pharmaceutics by Eugene, Parott.
 - 5. Tutorial Pharmacy by Cooper and Gunn.
 - 6. Stocklosam J. Pharmaceutical Calculations, Lea & Febiger, Philadelphia.

Program	B. Pharmacy
Semester	II-II
Name of the course	Pharmacology I – Theory
Course Code	BP 403T
Credits	4
Hours /week	3hours (lectures) & 1hour (Tutorial)
Pre / co-requisite/s	Nil

Scope: This course aimed to provide basic knowledge on principles of general pharmacology such as sources of drug, drug development phases, routes of drug administration, mechanism of drug action and pharmacokinetic aspects like drug absorption, distribution, metabolism and excretion. Subsequently, this course also covers about the drugs acting on central and peripheral nervous system.

Course Outcomes: Upon successful completion of this course, the student should be able to:

CO.1. Appraise the different stages of drug discovery and development

CO.2. Recall the pharmacological actions of different categories of drugs

CO.3. Explain the mechanism of drug action at organ system/sub cellular/ macromolecular levels.

CO.4. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.

Course contents:

Unit	Topics	Hours
Ι	General Pharmacology	12
	Introduction to Pharmacology- Definition, historical landmarks and scope of	
	pharmacology, nature and source of drugs, essential drugs concept and routes of	
	drug administration, Agonists, antagonists (competitive and noncompetitive),	
	spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy,	
	allergy.	
	Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs. Enzyme induction, enzyme inhibition,	
II	General Pharmacology	12
	Pharmacodynamics- Principles and mechanisms of drug action. Receptor	
	theories and classification of receptors, regulation of receptors. drug receptors	

	Total	60
	Opioid analgesics and antagonists	
	stimulants and nootropics.	
	Drugs used in Parkinson's disease and Alzheimer's disease. CNS	
	agents, anti-maniacs and hallucinogens.	
	Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety	
V	Pharmacology of drugs acting on central nervous system	12
	Alcohols and disulfiram	
	Anti-epileptics	
	Sedatives, hypnotics and centrally acting muscle relaxants.	
	General anesthetics and pre-anesthetics.	
	dopamine.	
	various neurotransmitters like with GABA, Glutamate, Glycine, serotonin,	
	Neurohumoral transmission in the C.N.S. special emphasis on importance of	
IV	Pharmacology of drugs acting on central nervous system	12
	Drugs used in myasthenia gravis and glaucoma	
	Local anesthetic agents.	
	Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).	
	sympatholytics.	
	Para sympathomimetics, Parasympatholytics, Sympathomimetics,	
	neurotransmitters.	
	b. Neurohumoral transmission, co-transmission and classification of	
	a. Organization and function of ANS.	
III	Pharmacology of drugs acting on peripheral nervous system	12
	Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.	
	Drug interactions (pharmacokinetic and pharmacodynamic)	
	Adverse drug reactions.	
	factors modifying drug action.	
	dose response relationship, therapeutic index, combined effects of drugs and	
	JAK-STAT binding receptor and receptors that regulate transcription factors,	
	channel receptor, transmembrane enzyme linked receptors, transmembrane	
	interactions signal transduction mechanisms, G-protein-coupled receptors, ion	

Recommended Books (Latest Editions)

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

2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc GrawHill

3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics

4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins

5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology 6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.

7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher

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

9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.

Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.

Program	B. Pharmacy
Semester	II-II
Name of the course	Pharmacognosy and Phytochemistry I – Theory
Course Code	BP 404T
Credits	4
Hours /week	3hours (lectures) & 1hour (Tutorial)
Pre / co-requisite/s	Nil

Course Description: The fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties. The subject deals with cultivation and plant tissue culture aspects of medicinal plants.

Course Learning Outcomes: Upon successful completion of this course, the student should be able to:

CO1: Demonstrates the introduction to pharmacognosy.

CO2: State importance of Natural sources of drugs, scientific names, active constituents, uses of drugs.

CO3: Identifies the cultivation and plant tissue culture aspects of medicinal plants.

CO4: Recognize the importance of crude drugs belong to Fibers, Carbohydrates, Proteins, Lipids and marine drugs.

Course contents:

UNIT	Торіс	Hours
Ι	Introduction to Pharmacognosy:	15
	Definition, history, scope and development of Pharmacognosy	
	Sources of Drugs – Plants, Animals, Marine & Mineral source.	
	Organized drugs, unorganized drugs.	
	Classification of drugs: Alphabetical, morphological,	
	taxonomical, chemical, pharmacological, chemo taxonomical	
	classification of drugs.	
	Quality control of Drugs of Natural Origin:	
	Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties. Quantitative microscopy of crude drugs including lycopodium spore method, leaf constants, Camera Lucida and	
	diagrams of microscopic objects to scale with Camera Lucida.	

natural origin: Cultivation and Collection of drugs of natural origin. Factors influencing cultivation of medicinal plants. Plant hormones and their applications. Polyploidy, mutation and hybridization with reference to medicinal plants.12IIIPlant tissue culture: Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance. Applications of plant tissue culture in pharmacognosy.12IVPharmacognosy in various systems of medicine: Role of Pharmacognosy in Allopathy and traditional systems of medicine namely, Ayurveda, Unani, Siddha, Homeopathy and Chinese systems of medicine. Introduction to secondary metabolites: Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins, Fat, Bees Wax Marine Drugs: Novel medicinal agents from marine sources.08VPrimary metabolites: General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, therapeutic uses and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites: Carbohydrates: Acacia, Agar, Tragacanth, Honey Proteins and Enzymes: Gelatin, casein, proteolytic enzymes (Papain, bromelain, serrati peptidase, urokinase, streptokinase, pepsin). Lipids (Waxes, fats, fixed oils): Castor oil, Chaulmoogra oil, Wool	II	Cultivation, Collection, Processing and storage of drugs of	15
origin. Factors influencing cultivation of medicinal plants. Plant hormones and their applications. Polyploidy, mutation and hybridization with reference to medicinal plants.12IIIPlant tissue culture: Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance. Applications of plant tissue culture in pharmacognosy.12IVPharmacognosy in various systems of medicine: Role of Pharmacognosy in Allopathy and traditional systems of medicine namely, Ayurveda, Unani, Siddha, Homeopathy and Chinese systems of medicine. Introduction to secondary metabolites: Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins, Fat, Bees Wax Marine Drugs: Novel medicinal agents from marine sources.08VPrimary metabolites: General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, therapeutic uses and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites: Carbohydrates: Acacia, Agar, Tragacanth, Honey Proteins and Enzymes: Gelatin, casein, proteolytic enzymes (Papain, bromelain, serrati peptidase, urokinase, streptokinase, pepsin). Lipids (Waxes, fats, fixed oils): Castor oil, Chaulmoogra oil, Wool		natural origin: Cultivation and Collection of drugs of natural	
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		Total	

Recommended Books: (Latest Editions)

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

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

Program	B. Pharmacy
Semester	11-11
Name of the course	Pharmaceutical Jurisprudence – Theory
Course Code	BP 405T
Credits	4
Hours /week	3hours (lectures) & 1hour (Tutorial)
Pre / co-requisite/s	Nil

Course Description This course is designed to impart basic knowledge on important legislations related to the profession of pharmacy in India. The Drugs and Cosmetics Act, along with its amendments are the core of this course. Other acts, which are covered, include the Pharmacy Act, Narcotic Drugs and Psychotropic substances Act, Medicinal and Toilet preparation Act etc. Besides this the new drug policy, DPCO, professional ethics, Patent and design Act etc., will be discussed.

Course Outcomes: Upon completion of the subject student shall be able to-

CO1: Know the significance of pharmaceutical legislations in India and role of ethics in pharmacy profession.

CO2: Understand the import, export, manufacture, and sale regulations and pertaining schedules to the acts and rules.

CO3: Know and understand the administrative bodies, authorities, and officer's roles and responsibilities.

CO4: Know the constitution, functions of central, state councils, registration procedure and importance of education regulations.

CO5: Know the new drugs pricing policies, procedures and other legislations.

CO6: Know the amendments, other laws as prescribed by the central and state Councils from time to time including international laws.

Course content:

UNIT	Contents	Hours
I	Code of Pharmaceutical ethics: Definition, principles and	10
	significance of ethics, Code of Pharmaceutical ethics as adopted by	
	Pharmacy Council of India. Pharmacist's oath.	
	The Drugs and Cosmetics Act, 1940 and Rules 1945: Objectives,	
	Definitions to the Act and Rules.	

	Administration of the Act and Rules - Drugs Technical Advisory	
	Board (DTAB), Central drugs Laboratory (CDL), Drugs Consultative	
	Controlling authorities, Drugs Inspectors.	
II	Controlling authorities, Drugs Inspectors. The Drugs and Cosmetics Act, 1940 and Rules 1945: General Study of Schedules to the Act and Rules and detailed study of Part XII B of Schedule F, Schedules G, H, H1, K, M, M-I, M-II, M-III, N, P, Q, T, U, V, X, Y. Import of drugs and cosmetics – Types of import license, procedure and conditions for grant of import license or permit and conditions of import license. Manufacture and sale of drugs –Types of manufacturing license, procedure and conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug. Sale of drugs – Types of sale license, procedure and conditions for sale license and conditions of sale license. Classes of drugs and cosmetics prohibited from import, manufacture and sale or distribution or exhibit for sale. Offences and penalties. Labeling and packing of drugs- General labeling requirements and specimen labels for drugs and	14
	cosmetics, Offences and penalties.	
III	The Pharmacy Act, 1948: Objectives, Definitions, Pharmacy Council	12
	of India (PCI)- constitution and functions, Education Regulations,	
	State and Joint state pharmacy councils – constitution and functions,	
	Registration of Pharmacists, Offences and penalties.	
	Medicinal and Toilet Preparation Act (Excise Duties), 1955:	
	Objectives, Definitions, Licensing, Manufacture In bond and Outside	
	bond, Export of alcoholic preparations, Manufacture of Ayurvedic,	
	Homeopathic, Patent & Proprietary Preparations. Levy and collection	
	of duties. Offences and Penalties.	
	Narcotic Drugs and Psychotropic substances Act, 1985 and Rules: Objectives, Definitions, Authorities and Officers, Constitution and Functions of Narcotic and Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse. Prohibition, Control and Regulation of cultivation of Opium poppy, Cannabis plant, Coca plant and production of poppy straw, manufacture, sale and export of any narcotic drug and psychotropic substance. Offences and Penalties.	
IV	Study of Salient Features of Drugs and Magic Remedies Act, 1954	12
	and Rules: Objectives, Definitions, Prohibition of certain	
	advertisements, Classes of Exempted advertisements, Schedule to the	
	Act. Offences and Penalties.	
	Prevention of Cruelty to animals Act-1960:Objectives, Definitions,	
	Institutional Animal Ethics Committee (IAEC), The Committee for	

	the Purpose of Control and Supervision of Experiments on Animals	
	(CPCSEA) guidelines for Breeding and Stocking of Animals,	
	Performance of Experiments, Transfer and acquisition of animals for	
	experiment, Records, Power to suspend or revoke registration,	
	offences and Penalties.	
	National Pharmaceutical Pricing Authority (NPPA): Introduction,	
	National Pharmaceutical Pricing Policy (NPPP) -2012.	
V	Drugs Price Control Order (DPCO)-2013: Objectives, Definitions,	12
	Sale prices of bulk drugs, Retail price of formulations, Retail price	
	and ceiling price of scheduled formulations. Schedules to DPCO,	
	Schedule-I: National List of Essential Medicines (NLEM).	
	Study of Salient Features of Medical Termination of Pregnancy	
	Act, 1971	
	Right to Information Act, 2005: Objectives, Definitions, right to	
	information and obligations of public authorities, procedure in filing	
	RTI application and supply of information, information exempted	
	from disclosure.	
	Intellectual Property Rights (IPR): Introduction to intellectual	
	property rights - Patents and designs, Copyright, Trademarks, Trade	
	Secrets, Geographical indications, Plant variety rights etc.	
	Medical Device and Diagnostics: Medical Device Rules, 2017.	
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Learning Resources/Recommended Texts/Reference books/web resources

- 1. Mithal B.M. Text Book of Forensic Pharmacy. New Delhi: Vallabh Prakashan.
- 2. Kokate C.K, Gokhale S.B. Text Book of Forensic Pharmacy. Hyderabad:Pharma Book Syndicate.
- 3. Jain N.K. Text Book of Forensic Pharmacy. New Delhi: Vallabh Prakashan.
- 4. Agarwal S.P, Rajesh Khanna. Pharmaceutical Jurisprudence and Ethics. NewDelhi: Birla Publications.
- 5. Hand book of drug law-by M.L. Mehra.
- 6. Drugs and Cosmetics Act/Rules by Govt. of India publications.
- 7. Medicinal and Toilet preparations act 1955 by Govt. of India publications.
- 8. Narcotic drugs and psychotropic substances act by Govt. of India publications.
- 9. Drugs and Magic Remedies act by Govt. of India publication
- 10. B. S. Kuchekar. Forensic Pharmacy. Pune: Nirali Prakashan.

11. <u>https://www.indiacode.nic.in/</u> (It is a database of all Central enactments which are in force and their subordinate legislations made from time to time. It also contains Legislations enacted by the States and Union Territory Administrations along with their relevant subordinate legislations)

Program	B. Pharmacy
Semester	II-II
Name of the course	Medicinal Chemistry I – Practical
Course Code	BP 401P
Credits	1.5
Hours /week	3 hours
Pre / co-requisite/s	Nil

Course Description: The Medicinal chemistry I laboratory course is aimed to train the students on experimental techniques for the determination and Synthesis of different biologically active compound libraries and evaluation of their biological activity using cytotoxicity assays. Analysis of structure activity relationships using the data generated. This course also provides the laboratory skills related to reaction design, chemical synthesis and purification process for few medicinal compounds.

Course Outcomes: Upon successful completion of this course, the student should be able to:

CO 1: Perform chemical reaction and purification of medicinal compounds of pharmaceutical interest.

CO 2: Analyse the percentage purity of various classes of drugs as per the monographs in pharmacopoeias.

Week	TOPICS	
I. Prepa	I. Preparation of drugs / intermediates	
1	Antipyrine	
2	1,3-oxazole	
3	Benzimidazole	
4	Benztriazole	
5	2,3- diphenyl quinoxaline	
6	Benzocaine	
7	Phenytoin	
8	Phenothiazine	

9	Barbiturate		
II. Assa	UL Assay of drugs		
10	Chlorpromazine		
11	Phenobarbitone		
12	Ibuprofen		
13	Aspirin		
14	Furosemide		
15	III. Determination of Partition coefficient for any two drugs		

Learning Resources/Recommended Texts/Reference books/web resources

1. A.I. Vogel, Text Book of Practical Organic Chemistry, 5th Edition. Pearson Prentice Hall.

- 2. F.G. Mann & B.C. Saunders, Practical Organic Chemistry, 4th Edition. Pearson Publishers.
- 3. Indian Pharmacopoeia
- 4. British Pharmacopoeia

Program	B. Pharmacy
Semester	11-11
Name of the course	Physical Pharmaceutics II – Practical
Course Code	BP 402P
Credits	1.5
Hours /week	3 hours
Pre / co-requisite/s	Nil

Course Description: The Physical Pharmacy- II laboratory course aimed to train the students on experimental techniques for the determination of Physico–chemical properties of substances. This course also deals with wet laboratory that determines order of kinetics, flow of solids & liquids. This course also provides the laboratory skills related to solubility, partition &evaluation of dispersed systems.

Course Outcomes: Upon successful completion of this course, the student should be able to **CO 1:** Demonstrate the skills on determination of Physico – chemical properties.

CO2: Analyze the stability of dispersed systems by experimental techniques.

CO 3: Interpret the scientific data from graphical presentations.

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

Recommended reference Books

1. Physical Pharmacy by Alfred Martin, Sixth edition

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

Program	B. Pharmacy
Semester	11-11
Name of the course	Pharmacology I – Practical
Course Code	BP 403P
Credits	1.5
Hours /week	3 hours
Pre / co-requisite/s	Nil

Course Description: This course aimed to expertise the students on Basic needs of Pharmacology like handling of animals, Routes of drug administration, Collection of blood samples by various techniques. This course also describes about different preclinical screening models employed in drug discovery and development.

Course Learning Outcomes: Upon successful completion of this course, the student should be able to:

CO 1: Demonstrate the Basic needs and skills required for pharmacology laboratory.

CO2: Perform the experiments on isolated tissue and experimental animals

CO 3: Handle & maintain the laboratory animals as per CPCSEA guidelines

Week	Topics
1	Introduction to Experimental Pharmacology
2	Commonly used instruments in experimental pharmacology.
3	Study of laboratory animals and their handling (a. Frogs, b. Mice, c. Rats, d. Guinea pigs, e. Rabbits).
4	Maintenance of laboratory animals as per CPCSEA guidelines.
5	Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies.
6	Study of different routes of drugs administration in mice/rats
7	Effect of Psychotropic drugs on condition avoidance response
8	To study the antidepressant activity of drugs using forced swim test
9	Effect of drugs on rabbit eye.
10	Effects of skeletal muscle relaxants using Rota-rod apparatus.

Course	contents:
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11	Effect of drugs on locomotor activity using actophotometer.
12	Anticonvulsant effect of drugs by MES and PTZ method.
13	Study of stereotype and anti-catatonic activity of drugs on rats/mice.
14	Study of anxiolytic activity of drugs using rats/mice.
15	To study anti-amnesic effect by using Y- Maze
16	Revision

Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by software's and videos

Recommended Books (Latest Editions)

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

2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc GrawHill

3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics

Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K.,
 Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams
 & Wilkins

5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology 6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.

7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher

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

9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.

10. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan,

Program	B. Pharmacy
Semester	11-11
Name of the course	Pharmacognosy and Phytochemistry I – Practical
Course Code	BP 404P
Credits	1.5
Hours /week	3 hours
Pre / co-requisite/s	Nil

Course Description: The Pharmacognosy and Phytochemistry I laboratory course is aimed to train the students regarding laboratory skills of various chemical test of the drugs mentioned in theory under lipids, carbohydrates. This course also deals with laboratory-based experiments on identification of crude drugs by physical and microscopic evaluation.

Course Learning Outcomes: Upon successful completion of this course, the student should be able to:

CO 1: Evaluate crude drugs by chemical test.

CO 2: Demonstrate knowledge on evaluation of crude drugs.

Course content:

S. No.	Торіс
5.	Analysis of crude drugs by chemical tests: (i) Tragacanth (ii) Acacia (iii)Agar (iv)
	Gelatin (v) starch (vi) Honey (vii) Castor oil
6.	Determination of stomatal number and index
7.	Determination of vein islet number, vein islet termination and palisade ratio
8.	Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer
9.	Determination of Fiber length and width
10.	Determination of number of starch grains by Lycopodium spore method
11.	Determination of Ash value
12.	Determination of Extractive values of crude drugs
13.	Determination of moisture content of crude drugs
14.	Determination of swelling index and foaming

Recommended Books: (Latest Editions)

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