Shree Sahkar Education Trust

SHREE DHANVANTARY PHARMACY COLLEGE, KIM

(An Autonomous College U/s UGC Act 1956)

NBA-UG & NAAC Accredited, Accorded Status under UGC Sec 2 (f) of UGC Act 1956, Recognized as SIRO by DSIR, Govt. of India. Awarding University GTU, Ahmedabad, Approved by PCI, AICTE, New Delhi.

Academic Regulations (AR-23)

"Program Structure and Syllabus"

Effective from AY 2023-24

Bachelor of Pharmacy

Applicable for the batch admitted from AY 2023-24 onwards

Awarding University

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD

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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 Shree Dhanvantary Pharmacy College, Kim (SDPC) - Autonomous, sponsored by Shree Sahkar Education Trust, Surat, Gujarat. The document is a fusion product based on recommendations and guidelines stipulated for syllabus structure by UGC, AICTE New Delhi and PCI.

- Academic regulations stipulated by Gujarat Technological University (GTU), Ahmedabad Gujarat.
- 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 andother 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, GTU, PCI, AICTE 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 Shree Dhanvantary Pharmacy College, Kim (SDPC) - 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

1) "***College***" means "Shree Dhanvantary Pharmacy College, Kim (SDPC) - Autonomous, Kim, Surat, Gujarat".

2) "***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 Gujarat and the Government of India for admissions into various courses of study and the affiliating university, i.e., Gujarat Technological University, (GTU), Ahmedabad, Gujarat.

3) "***Academic Council***" means the Academic council constituted as per the guidelines of UGC.

4) "***Board of Studies***" means Board of Studies constituted in each department as per the guidelinesof UGC.

5) ***"Principal"*** means the Head of the institution

6) ***"Head of the Department"*** means the Head of an Academic Department of the College.

7) ***"Faculty member"*** means the teacher (Assistant/Associate/Professor) working on regular or ad-hoc basis in any of the Academic Departments of the College.

8) *"**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.

9) *"**Course**" individual subjects described with content for instructions to the students.*

10) *"**Assessment"*** means evaluation process for the outcome and grading in term of the marks.

11) ***"Credit"*** means a weight to the time requirements of the academic course in the institute.

Vision of the Institution:

1) Shree Dhanvantary Pharmacy College will lead the way toward effective global health care by developing innovative teaching practices, advancing research and practice, and merging true entrepreneurial spirit with care and compassion.
2) We are committed to build quality professionals to contribute to profession and to bring about social transformation.

Mission of the Institution:

1) The Shree Dhanvantary Pharmacy College fosters a learning-centered, research oriented educational environment that encourages individuals to make positive lifelong contributions to global health. We prepare professional degree students to provide compassionate pharmacist-delivered patient care, and inspire our students through innovative problem-based learning, rich experiential curricula, and inter-professional collaboration.

1) We foster a community of scholars who will further the body of knowledge in pharmaceutical, biomedical, and clinical sciences.
2) We strive to improve quality of life locally, nationally, and globally.

Program Educational Objectives (PEOs):

The three Program Educational Outcomes is in high consistency with our Mission Statements. The outcome of this alignment helps to produce theoretically and practically competent pharmacists in terms of domain knowledge, research motivation and competency, continuous learning capabilities and high ethical standards. To formulate quality graduate through quality teaching and training in regard to versatile development of professional skills for their higher learning and career.

- Domain Knowledge
- Core Competency
- Research and Innovation

Program Educational Outcome		
PEO1	**Domain Knowledge**	Post Graduates of the program will be having strong theoretical background along with necessary skill set in pharmaceutical sciences and able to use these tools in Pharmaceutical industry, CRO's, Government laboratories and institutes or where ever in the area of profession they choose necessary for success. To prepare graduates with a solid foundation in pharmacy for a successful career in Pharmaceutical field
PEO2	**Core Competence**	To provide students with a solid foundation ofanalytical and practical skill sets in Pharmaceutics, Pharmaceutical Chemistry, Pharmacology, Quality Assurance and Regulatory affairs which isfundamentals requirement of Pharmaceutical Industries, Community and Hospital Pharmacy, Government laboratories and where ever in the area of profession they choose necessary for success.
PEO3	**Research and Innovations**	To prepare graduates to become effective researchers/collaborators/ innovators in efforts to address social, technical and pharmacy challenges.

Consistency of PEOs with Mission of the Institute

MISSION / PEO	M1: Innovative Problem based learning	M2: Knowledgeable scholars	M3:Improve Quality of life
PEO1	2	3	3
PEO2	3	3	2
PEO3	3	3	3

Program Specific Outcome (PSO)

The graduate of pharmacy will attain the following PSO

Program Specific Outcome (PSO)	
PSO1	To understand, remember and apply the knowledge and skills related to drug development process, pharmacological evaluation, Formulation design & development, Quality assurance and Regulatory assessments.
PSO2	To develop capabilities of analyzing, evaluation and creating the solutions for research problems through systematic process of projects and experimental work under guidance of learned faculty and publishing the reports**.**

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; behavioral, 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, analyses 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 – Honor personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication, and lifestyles. Use ethical Frameworks apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.

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 (AR-23)

1. Short Title and Commencement

These regulations shall be called as "Academic Regulations for the Bachelor of Pharmacy (AR-23) Degree Program - Choice Based Credit System (CBCS) of the Shree Dhanvantary Pharmacy College, Kim (SDPC) - Autonomous,". 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 SDPC-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 (GTU), State government of Gujarat 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.

iii. 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.

2.1. 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 SDPC-Autonomous.

4. Medium of instruction and examinations: Medium of instruction and examination shall be inEnglish.

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) 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.

b) 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.

c) A stipulated fee shall be payable for condoning of shortage of attendance. Shortage of attendance below 65% in aggregate shall be condoned only in consent with management of the institute.

d) 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.

Credit assignment

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.

Minimum credit requirements

The minimum credit points required for award of a B. Pharm. degree is 221[$]/222[#] ([#]Applicable ONLY for the students who have studied Mathematics / Physics / Chemistry at Intermediate/HSC and appearing for Remedial Biology (RB)course**.** [$]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. Thecredits 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.

Audit Courses

All the students of III & VI 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 SDPC-Autonomous. Satisfactory report from the concerned faculty is required to declare him/her as pass. However, Universal Human Values audit course suggested by AICTE is introduced in III semester. The student has to get a minimum of 50% in internal examination to declare him/her as pass. The maximum marks for this audit course (Universal Human Values) is 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 L, T and P course in any semester shall not be less than that shown in Table – I to VIII.

Table-I: Course of study for semester I

							Hours			Credit
S.No	Subcode	Branch code	Eff_from	Subject Name	Category	Sem /Year	L.	T.	P.	Total
1	BP101T	90	2023-24	Human Anatomy and Physiology I	Compulsory	1	3	1	-	4
2	BP102T	90	2023-24	Pharmaceutical Analysis I	Compulsory	1	3	1	-	4
3	BP103T	90	2023-24	Pharmaceutics I	Compulsory	1	3	1	-	4
4	BP104T	90	2023-24	Pharmaceutical Inorganic Chemistry	Compulsory	1	3	1	-	4
5	BP105T	90	2023-24	Communication Skills*	Compulsory (SEC)	1	2	-	-	2
6	BP106T	90	2023-24	Remedial Biology*	Compulsory (AECC)	1	2	-	-	2
7	BP107T	90	2023-24	Remedial Mathematics*	Compulsory (AECC)	1	2	-	-	2
8	BP108P	90	2023-24	Human Anatomy and Physiology I	Compulsory	1	-	-	4	2
9	BP109P	90	2023-24	Pharmaceutical Analysis I	Compulsory	1	-	-	4	2
10	BP110P	90	2023-24	Pharmaceutics I	Compulsory	1	-	-	4	2
11	BP111P	90	2023-24	Pharmaceutical Inorganic Chemistry	Compulsory	1	-	-	4	2
12	BP112P	90	2023-24	Communication Skills*	Compulsory (SEC)	1	-	-	2	1
13	BP113P	90	2023-24	Remedial Biology*	Compulsory (AECC)	1	-	-	2	1
14	BP114CE	90	2023-24	Comprehensive Online Examination	Compulsory (AECC)	1	-	-	-	-
					Total	-	16/18	4	20	$29^{\$}/30^{\#}$

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

[$] **Non University** Applicable ONLY for the students who have studied Physics / Chemistry / Botany / Zoology atIntermediate/HSC and appearing for Remedial Mathematics (RM) course**.**

CC: Core Course/ Compulsory Course

AECC: Ability Enhancement Compulsory Course

SEC: Skill Enhancement Course

DSE: Discipline Specific Elective

GE: General Elective

Table-II: Course of study for semester II

							Hours			Credit
S.No	Subcode	Branch code	Eff from	Subject Name	Category	Sem /Year	L.	T.	P.	Total
15	BP201T	90	2023-24	Human Anatomy and Physiology II	Compulsory	2	3	1	-	4
16	BP202T	90	2023-24	Pharmaceutical Organic Chemistry I	Compulsory	2	3	1	-	4
17	BP203T	90	2023-24	Biochemistry	Compulsory	2	3	1	-	4
18	BP204T	90	2023-24	Patho Physiology	Compulsory	2	3	1	-	4
19	BP205T	90	2023-24	Computer Applications in Pharmacy*	Compulsory (SEC)	2	3	-	-	3
20	BP206T	90	2023-24	Environmental Sciences*	Compulsory (SEC)	2	3	-	-	3
21	BP207P	90	2023-24	Human Anatomy and Physiology II	Compulsory	2	-	-	4	2
22	BP208P	90	2023-24	Pharmaceutical Organic Chemistry I	Compulsory	2	-	-	4	2
23	BP209P	90	2023-24	Biochemistry	Compulsory	2	-	-	4	2
24	BP210P	90	2023-24	Computer Applications in Pharmacy*	Compulsory (SEC)	2	-	-	2	1
25	BP211CE	90	2023-24	Comprehensive Online Examination	Compulsory (AECC)	2	-	-	-	-
					Total	-	18	4	14	29

* Non University Exam

CC: Core Course/ Compulsory Course

AECC: Ability Enhancement Compulsory Course

SEC: Skill Enhancement Course

DSE: Discipline Specific Elective

GE: General Elective

Table-III: Course of study for semester III

							Hours			Credit
S.No	Subcode	Branch code	Eff from	Subject Name	Category	Sem /Year	L.	T.	P.	Total
26	BP301T	90	2023-24	Pharmaceutical Organic Chemistry II	Compulsory	3	3	1	-	4
27	BP302T	90	2023-24	Physical Pharmaceutics I	Compulsory	3	3	1	-	4
28	BP303T	90	2023-24	Pharmaceutical Microbiology	Compulsory	5	3	1	-	4
29	BP304T	90	2023-24	Pharmaceutical Engineering	Compulsory	3	3	1	-	4
30	BP305P	90	2023-24	Pharmaceutical Organic Chemistry II	Compulsory	3	-	-	4	2
31	BP306P	90	2023-24	Physical Pharmaceutics I	Compulsory	3	-	-	4	2
32	BP307P	90	2023-24	Pharmaceutical Microbiology	Compulsory	3	-	-	4	2
33	BP308P	90	2023-24	Pharmaceutical Engineering	Compulsory	3	-	-	4	2
34	BP309AC	90	2023-24	Universal Human Value#	Audit Course	3	2	0	0	-
35	BP310CE	90	2023-24	Comprehensive Online Examination	Compulsory (AECC)	3	-	-	-	-
					Total	-	14	4	16	24

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Audit Course

CC: Core Course/ Compulsory Course

AECC: Ability Enhancement Compulsory Course

SEC: Skill Enhancement Course

DSE: Discipline Specific Elective

GE: General Elective

Table-IV: Course of study for semester IV

							Hours			Credit
S.No	Subcode	Branch code	Eff_from	Subject Name	Category	Sem /Year	L.	T.	P.	Total
36	BP401T	90	2023-24	Pharmaceutical Organic Chemistry III	Compulsory	4	3	1	-	4
37	BP402T	90	2023-24	Medicinal Chemistry I	Compulsory	4	3	1	-	4
38	BP403T	90	2023-24	Physical Pharmaceutics II	Compulsory	4	3	1	-	4
39	BP404T	90	2023-24	Pharmacology I	Compulsory	4	3	1	-	4
40	BP405T	90	2023-24	Pharmacognosy and Phytochemistry I	Compulsory	4	3	1	-	4
41	BP406P	90	2023-24	Medicinal Chemistry I	Compulsory	4	-	-	4	2
42	BP407P	90	2023-24	Physical Pharmaceutics II	Compulsory	4	-	-	4	2
43	BP408P	90	2023-24	Pharmacology I	Compulsory	4	-	-	4	2
44	BP409P	90	2023-24	Pharmacognosy and Phytochemistry I	Compulsory	4	-	-	4	2
45	BP410CE	90	2023-24	Comprehensive Online Examination	Compulsory (AECC)	4	3	1	-	4
					Total	-	15	5	16	28

CC: Core Course/ Compulsory Course

AECC: Ability Enhancement Compulsory Course

SEC: Skill Enhancement Course

DSE: Discipline Specific Elective

GE: General Elective

Table-V: Course of study for semester V

							Hours			Credit
S.No	Subcode	Branch code	Eff_from	Subject Name	Category	Sem /Year	L.	T.	P.	Total
46	BP501T	90	2023-24	Medicinal Chemistry II	Compulsory	5	3	1	-	4
47	BP502T	90	2023-24	Pharmacology II	Compulsory	5	3	1	-	4
48	BP503T	90	2023-24	Pharmacognosy and Phytochemistry II	Compulsory	5	3	1	-	4
49	BP504T	90	2023-24	Industrial Pharmacy I	Compulsory	5	3	1	-	4
50	BP505T	90	2023-24	Pharmaceutical Jurisprudence	Compulsory	5	3	1	-	4
51	BP506P	90	2023-24	Pharmacology II	Compulsory	5	-	-	4	2
52	BP507P	90	2023-24	Pharmacognosy and Phytochemistry II	Compulsory	5	-	-	4	2
53	BP508P	90	2023-24	Industrial Pharmacy I	Compulsory	5	-	-	4	2
54	BP509ET	90	2023-24	Pharma Marketing Management	Elective (GE)	5	3	1	-	4
55	BP510ET	90	2023-24	Healthcare Dietary supplement	Elective (GE)	5				
56	BP511ET	90	2023-24	Entrepreneurship Development	Elective (GE)	5				
57	BP512CE	90	2023-24	Comprehensive Online Examination	Compulsory (AECC)	5	-	-	-	-
					Total	-	18	6	12	30

GE: General Elective: Any one elective has to be taken

CC: Core Course/ Compulsory Course

AECC: Ability Enhancement Compulsory Course

Table-VI: Course of study for semester VI

							Hours			Credit
S.No	Subcode	Branch code	Eff_from	Subject_Name	Category	Sem /Year	L.	T.	P.	Total
58	BP601T	90	2023-24	Medicinal Chemistry III	Compulsory	6	3	1	-	4
59	BP602T	90	2023-24	Pharmacology III	Compulsory	6	3	1	-	4
60	BP603T	90	2023-24	Herbal Drug Technology	Compulsory	6	3	1	-	4
61	BP604T	90	2023-24	Biopharmaceutics and Pharmacokintetics	Compulsory	6	3	1	-	4
62	BP605T	90	2023-24	Pharmaceutical Biotechnology	Compulsory	6	3	1	-	4
63	BP606P	90	2023-24	Medicinal Chemistry III	Compulsory	6	-	-	4	2
64	BP607P	90	2023-24	Pharmacology III	Compulsory	6	-	-	4	2
65	BP608P	90	2023-24	Herbal Drug Technology	Compulsory	6	-	-	4	2
66	BP609AC1	90	2023-24	Integrated Personality Development	Audit Course	6	2	-	-	-
67	BP610AC2	90	2023-24	English Research Paper Writing	Audit Course	6	2	-	-	-
68	BP611AC3	90	2023-24	Industrial Waste Management	Audit Course	6	2	-	-	-
69	BP612AC4	90	2023-24	Drug abuse : Problem, Prevention and Management	Audit Course	6	2	-	-	-
70	BP613CE	90	2023-24	Comprehensive Online Examination	Compulsory (AECC)	6	-	-	-	-
					Total	-	17	5	16	26

Audit Course

CC: Core Course/ Compulsory Course

AECC: Ability Enhancement Compulsory Course

SEC: Skill Enhancement Course

DSE: Discipline Specific Elective

GE: General Elective

Table-VII: Course of study for semester VII

							Hours			Credit
S.No	Subcode	Branch code	Eff_from	Subject_Name	Category	Sem /Year	L.	T.	P.	Total
71	BP701T	90	2023-24	Instrumental Methods of Analysis	Compulsory	7	3	1	4	6
72	BP702T	90	2023-24	Industrial Pharmacy II	Compulsory	7	3	1	0	4
73	BP703T	90	2023-24	Pharmacy Practice	Compulsory	7	3	1	0	4
74	BP704T	90	2023-24	Novel Drug Delivery System	Compulsory	7	3	1	0	4
75	BP705T	90	2023-24	Quality Assurance	Compulsory	7	0	0	12	6
76	BP706P	90	2023-24	Instrumental Methods of Analysis	Compulsory	7	3	1	0	4
77	BP707PP	90	2023-24	Practice School	Compulsory (SEC)	7	2	-	-	2
78	BP708AC1	90	2023-24	Constitution of India	Audit Course	7	2	-	-	-
79	BP709AC2	90	2023-24	Yoga and Stress Management	Audit Course	7	-	-	-	-
80	BP710CE	90	2023-24	Comprehensive Online Examination	Compulsory (AECC)	-	-	-	-	-
					Total	7	11	5	16	28

Audit Course

CC: Core Course/ Compulsory Course

AECC: Ability Enhancement Compulsory Course

SEC: Skill Enhancement Course

DSE: Discipline Specific Elective

GE: General Elective

Table-VIII: Course of study for semester VIII

							Hours			Credit
S.No	Subcode	Branch code	Eff_from	Subject_Name	Category	Sem /Year	L.	T.	P.	Total
81	BP801T	90	2023-24	Biostatistics and Research Methodology	Compulsory	8	3	1	0	4
82	BP802T	90	2023-24	Social and Preventive Pharmacy	Compulsory	8	3	1	0	4
83	BP803PW	90	2023-24	Project Work	Compulsory	8	0	0	12	6
84	BP804ET	90	2023-24	Pharmaceutical Regulatory science[$]	Elective (DSE)	8	3+3 =6	1+1 = 2	-	4+4 =8
85	BP805ET	90	2023-24	Advanced Medicinal Chemistry (CADD) [$]	Elective (DSE)	8			-	
86	BP806ET	90	2023-24	Cell and Molecular Biology[$]	Elective (DSE)	8			-	
87	BP807ET	90	2023-24	Cosmetic Science[$]	Elective (DSE)	8			-	
88	BP808ET	90	2023-24	Advanced Instrumentation Techniques[$]	Elective (DSE)	8			-	
89	BP809ET	90	2023-24	Experimental Pharmacology[$]	Elective (DSE)	8			-	
90	BP810CE	90	2023-24	Comprehensive Online Examination	Compulsory (AECC)	8	-	-	-	-
					Total	-	12	4	12	22

[$] **DSE: Discipline Specific Elective**: Any of the 2 elective from the group is to be taken

CC: Core Course/ Compulsory Course

AECC: Ability Enhancement Compulsory Course

Table-IX: Semester wise credits distribution

Semester	Credit Points
I	29[$]/30[#]
II	29
III	24
IV	28
V	30
VI	26
VII	28
VIII	22
Extracurricular/ Co-curricular activities	05*
Total credit points for the program	**221[$]/222[#]**

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

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

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

1. **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.

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

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

Calculation of Hours

1) Three Commemoration day celebrations/Any other day celebration participation=1 hr. (i.e.- Independence Day, Republic day, Gandhi Jayanti, etc.)
2) One Participation in Rally = 2 hrs.
3) For one-day camp participation= 3 hrs.
4) One-day Yoga/training involving learn and practice participation =2 hrs.
5) One session of Plantation day- 2 hrs.
6) 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)
7) One-day participation in Clean India like activities at outside -5 hrs.
8) Three Awareness program participation-1hrs
9) One Street play performance/flash mob performance -3 hrs.
10) Four audience participation in programs (Discretion of NSS Officer/CE/Principal)- 1 hr.
11) Any performance in any of the events which are not listed here (Discretion of NSS officer/CE/Principal)-2 hrs.
12) One Social service merit certificate (Lion's club/Rotary club/Traffic police/Police volunteers/Other Govt. Organizations)-1 credit
13) Others discretion of NSS officer/CE/Principal.

3. 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

1) One publication – 1 credit
2) One indexed Publication- 2 credits
3) One IPC Participation-1 credit
4) One IPC presentation (Oral/Poster)-2 Credits
5) Local chapters like IPA/ISPOR/RSC publications or presentations-1 credit
6) One Presentations at seminars/conferences at india-1 credit
7) One Presentations at seminars/conferences at outside India-2 credits
8) Four Conferences/seminars/workshops Participation national level -1 credit
9) Three International Level Conferences/seminars/workshops Participation at India - 1 credit
10) Two International Conferences/seminars/workshops Participation at outside India -2 credit
11) Others discretion of R&D Director/CE/Principal.

Certificates for Achievements (Sports/cultural/others)

1) One National/State/District/University level certificate-2 credits (winner/runner)
2) One National/State/District/University level certificate-1 credit (only when Participation certificate received).
3) One Non-government/affiliated institution Merits/own institute level certificate-1 credit (winner/runner).
4) Others discretion of NSS officer/CE/Principal.

Evaluation of Extracurricular/Co-curricular activities

A detailed report has to 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

a. 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.

b. 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.

c. 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 thesame 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 eachSessional 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

Semester I

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration (Hrs.)	
			Marks	Duration (Hrs.)				
BP101T	Human Anatomy and Physiology I– Theory	10	15	1	25	75	3	100
BP102T	Pharmaceutical Analysis I – Theory	10	15	1	25	75	3	100
BP103T	Pharmaceutics I – Theory	10	15	1	25	75	3	100
BP104T	Pharmaceutical Inorganic Chemistry – Theory	10	15	1	25	75	3	100
BP105T	Communication skills – Theory	5	10	1	15	35	1.5	50
BP106T BP107T	Remedial Biology/ Mathematics – Theory	5	10	1	15	35	1.5	50
BP108P	Human Anatomy and Physiology – Practical	5	10	4	15	35	4	50
BP109P	Pharmaceutical Analysis I – Practical	5	10	4	15	35	4	50
BP110P	Pharmaceutics I – Practical	5	10	4	15	35	4	50
BP111P	Pharmaceutical Inorganic Chemistry – Practical	5	10	4	15	35	4	50
BP112P	Communication skills – Practical	5	5	2	10	15	2	25
BP113P	Remedial Biology –Practical	5	5	2	10	15	2	25
BP114CE	Comprehensive online examination	-	-	-	-	50	1	50
Total		**75$/80#**	**125$/130#**	**24$/26#**	**200$/210#**	**575$/ 590#**	**34$/ 36#**	**775$/800#**

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

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

Semester II

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration (Hrs.)	
			Marks	Duration (Hrs.)				
BP201T	Human Anatomy and Physiology II– Theory	10	15	1	25	75	3	100
BP202T	Pharmaceutical Organic Chemistry I– Theory	10	15	1	25	75	3	100
BP203T	Biochemistry – Theory	10	15	1	25	75	3	100
BP204T	Pathophysiology – Theory	10	15	1	25	75	3	100
BP205T	Computer Applications in Pharmacy– Theory	10	15	1	25	50	2	75
BP206T	Environmental sciences – Theory	10	15	1	25	50	2	75
BP207P	Human Anatomy and Physiology II–Practical	5	10	4	15	35	4	50
BP208P	Pharmaceutical Organic ChemistryI Practical	5	10	4	15	35	4	50
BP209P	Biochemistry – Practical	5	10	4	15	35	4	50
BP210P	Computer Applications in Pharmacy– Practical	5	5	2	10	15	2	25
BP212CE	Comprehensive online examination	-	-	-	-	50	1	50
Total		**80**	**125**	**20**	**205**	**570**	**31**	**775**

Semester III

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration (Hrs.)	
			Marks	Duration (Hrs.)				
BP301T	Pharmaceutical Organic ChemistryII – Theory	10	15	1	25	75	3	100
BP302T	Physical Pharmaceutics I –Theory	10	15	1	25	75	3	100
BP303T	Pharmaceutical Microbiology –Theory	10	15	1	25	75	3	100
BP304T	Pharmaceutical Engineering –Theory	10	15	1	25	75	3	100
BP305P	Pharmaceutical Organic ChemistryII Practical	5	10	4	15	35	4	50
BP306P	Physical Pharmaceutics I –Practical	5	10	4	15	35	4	50
BP307P	Pharmaceutical Microbiology –Practical	5	10	4	15	35	4	50
BP308P	Pharmaceutical Engineering –Practical	5	10	4	15	35	4	50
BP309 UHV	Universal HumanValues#	20	30	2	50	-	-	50
BP310 CE	Comprehensive online examination (AECC)	-	-	-	-	50	1	50
Total		**80**	**130**	**22**	**210**	**490**	**29**	**700**

Audit Course

Semester IV

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration (Hrs.)	
			Marks	Duration (Hrs.)				
BP401T	Pharmaceutical Organic Chemistry III– Theory	10	15	1	25	75	3	100
BP402T	Medicinal Chemistry I – Theory	10	15	1	25	75	3	100
BP403T	Physical Pharmaceutics II –Theory	10	15	1	25	75	3	100
BP404T	Pharmacology I – Theory	10	15	1	25	75	3	100
BP405T	Pharmacognosy I – Theory	10	15	1	25	75	3	100
BP406P	Medicinal Chemistry I – Practical	5	10	4	15	35	4	50
BP407P	Physical Pharmaceutics II –Practical	5	10	4	15	35	4	50
BP408P	Pharmacology I – Practical	5	10	4	15	35	4	50
BP409P	Pharmacognosy I – Practical	5	10	4	15	35	4	50
BP411CE	Comprehensive online examination	-	-	-	-	50	1	50
Total		**70**	**115**	**21**	**185**	**565**	**32**	**750**

Semester V

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration (Hrs.)	
			Marks	Duration (Hrs.)				
BP501T	Medicinal Chemistry II – Theory	10	15	1	25	75	3	100
BP502T	Pharmacology II – Theory	10	15	1	25	75	3	100
BP503T	Pharmacognosy II – Theory	10	15	1	25	75	3	100
BP504T	Industrial Pharmacy I–Theory	10	15	1	25	75	3	100
BP505T	Pharmaceutical Jurisprudence – Theory	10	15	1	25	75	3	100
BP506P	Pharmacology II – Practical	5	10	4	15	35	4	50
BP507P	Pharmacognosy II – Practical	5	10	4	15	35	4	50
BP508P	Industrial Pharmacy I– Practical	5	10	4	15	35	4	50
BP509ET	Pharma Marketing Management	10	15	1	25	75	3	100
BP510ET	Health Care Dietary Supplements							
BP511ET	Entrepreneurship Development							
BP512CE	Comprehensive online examination (AECC)	-	-	-	-	50	1	50
Total		**75**	**120**	**18**	**195**	**605**	**31**	**800**

Semester VI

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration (Hrs.)	
			Marks	Duration (Hrs.)				
BP601T	Medicinal Chemistry III– Theory	10	15	1	25	75	3	100
BP602T	Pharmacology III– Theory	10	15	1	25	75	3	100
BP603T	Herbal Drug Technology– Theory	10	15	1	25	75	3	100
BP604T	Biopharmaceutics and Pharmacokintetics– Theory	10	15	1	25	75	3	100
BP605T	Pharmaceutical Biotechnology– Theory	10	15	1	25	75	3	100
BP606P	Medicinal Chemistry III– Practical	5	10	4	15	35	4	50
BP607P	Pharmacology III– Practical	5	10	4	15	35	4	50
BP608P	Herbal Drug Technology– Practical	5	10	4	15	35	4	50
BP609AC1	Integrated Personality Development	-	-	-	50	1	50	50
BP610AC2	English Research Paper Writing							
BP611AC3	Industrial Waste Management							
BP612AC4	Drug abuse : Problem, Prevention and Management							
BP613CE	Comprehensive Online Examination	-	-	-	-	50	1	50
Total		**70**	**110**	**14**	**230**	**575**	**77**	**800**

Audit Course

Semester VII

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration (Hrs.)	
			Marks	Duration (Hrs.)				
BP701T	Instrumental Methods of Analysis– Theory	10	15	1	25	75	3	100
BP702T	Industrial Pharmacy II– Theory	10	15	1	25	75	3	100
BP703T	Pharmacy Practice– Theory	10	15	1	25	75	3	100
BP704T	Novel Drug Delivery System– Theory	10	15	1	25	75	3	100
BP705T	Quality Assurance– Theory	10	15	1	25	75	3	100
BP706P	Instrumental Methods of Analysis– Practical	5	10	4	15	35	4	50
BP707PP	Practice School*	25	-	-	25	125	5	150
BP708AC1	Constitution of India#	-	-	-	50	1	50	50
BP709AC2	Yoga and Stress Management#							
BP710CE	Comprehensive Online Examination	-	-	-	-	50	1	50
Total		**80**	**85**	**9**	**215**	**586**	**75**	**800**

Audit Course

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

Semester VIII

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration (Hrs.)	
			Marks	Duration (Hrs.)				
BP801T	Biostatistics and Research Methodology– Theory	10	15	1	25	75	3	100
BP802T	Social and Preventive Pharmacy–Theory	10	15	1	25	75	3	100
BP803PW	Project Work	-	-	-	-	150	4	150
BP804ET	Pharmaceutical Regulatory science	10+10=20	15+15=30	1+1=2	25+25=50	75+75=150	3+3=6	100+100 = 200
BP805ET	Advanced Medicinal Chemistry (CADD)							
BP806ET	Cell and Molecular Biology							
BP807ET	Cosmetic Science							
BP808ET	Advanced Instrumentation Techniques							
BP809ET	Experimental Pharmacology							
BP810CE	Comprehensive Online Examination	-	-	-	-	50	1	50
Total		**40**	**60**	**4**	**100**	**500**	**17**	**600**

Internal assessment: Continuous mode

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

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

Theory		
Criteria	**Maximum Marks**	
Assignment	5	2.5
Student – Teacher interaction i. Seminar ii. Group Discussion	 3 2	 1.5 1
Total	**10**	**5**
Practical		
Regular viva voce	**5**	

11.2.1. 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 markssecured by the student in both the mid examinations with 80% weightage to the better mid examination and 20% to the other. **The final sessional examinations shall be computed for internal assessment as per the requirements given in tables – X.**

Sessional exam shall be conducted for 30 marks for theory and shall be computed for 15 marks. **However, for the courses such as, Communication skills theory, Remedial biology theory shall be conducted for 30 marks and shall be computed for 10 marks.** Similarly, Sessional exam for practical shall be conducted for 40 marks and shall be computed for 10 marks. **However, for the courses such as, Communication skills practical, Remedial biology practical, Computer applications in pharmacy practical shall be conducted for 20 marks and shall be computed for 5 marks.**

Theory (Internal)

Question paper pattern for theory sessional examinations

I.	Objective type of question	: 10 x 1=10
II.	Long answer (Answer 2 out of 3)	: 2×10=20
	Total	**: 30 Marks**

Question paper pattern for theory sessional examinations/ Non University

(Communication skills practical,Remedial biology practical, Computer applications in pharmacy practical).

I.	Long answer (Answer 2 out of 3)	: 2×15=30
	Total	**: 30 Marks**

Practical (Internal)

Question paper pattern for practical sessional examinations

I.	Synopsis	10
II.	Experiment	25
III.	Viva	05
	Total	**: 40 Marks**

Question paper pattern for practical sessional examinations/ Non University

(Communication skills practical,Remedial biology practical, Computer applications in pharmacy practical).

I.	Synopsis	05
II.	Experiment	10
III.	Viva	05
	Total	**: 20 Marks**

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

Question paper pattern for end semester theory examinations

Theory External

For 75 marks paper

Section A

I. Objective Type Questions (11 x 1)	=	11 x 1 = 11
II. Long Answers (Answer 2 out of 3)	=	2 x 16 = 32

Section B

I. Long Answers (Answer 2 out of 3)	=	2 x 16 = 32
	Total =	75 marks

For 35 marks paper

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

Practical External

Question paper pattern for end semester practical examinations

For 35 Marks paper

I. Synopsis	=	5
II. Experiments	=	25
III. Viva voce	=	5
	Total	= 35 marks

Question paper pattern for end semester practical examinations
For 15 marks paper

I. Synopsis	=	3
II. Experiments	=	10
III. Viva voce	=	2
	Total	=15 marks

Question paper pattern for Sessional Examination

Seat No._____ **Enrolment No._____**

Shree Dhanvantary Pharmacy College Kim
(An Autonomous College U/s UGC Act 1956)

B.Pharm Sessional Theory Examination Summer/ Winter 20_

Semester: **Date:**

Subject Code: **Time:**

Subject name: **Total Marks: 30**

Instruction:

1. Q.1 is Compulsory to attempt.
2. Attempt any **TWO** questions from Q.2 to Q.4

Q.1	Objective type questions (1 mark each)	Marks	BL	CO	PO
a.		[1]			
b.		[1]			
c.		[1]			
d.		[1]			
e.		[1]			
f.		[1]			
g.		[1]			
h.		[1]			
i.		[1]			
j.		[1]			
Q.2	**Answer the following Questions**				
a.		[4]			
b.		[3]			
c.		[3]			
Q.3	**Answer the following Questions**				
a.		[4]			
b.		[3]			
c.		[3]			
Q.4	**Answer the following Questions**				
a.		[4]			
b.		[3]			
c.		[3]			

BL - Bloom's Taxonomy Levels (1-Remembering, 2-Understanding, 3 –Applying,4 –Analyzing, 5 – Evaluating, 6 -Creating) CO - Course Outcomes, PO - Program Outcomes

Question paper pattern for End Exam (non-University)

Seat No._____ **Enrolment No._____**

Shree Dhanvantary Pharmacy College Kim
(An Autonomous College U/s UGC Act 1956)

B. Pharm Sessional Theory Examination Summer/ Winter 20_

Semester: **Date:**

Subject Code: **Time:**

Subject name: **Total Marks: 30**

Instruction:

1. Attempt any **TWO** questions.

Q.1	Answer the following Questions	Marks	BL	CO	PO
a.		[6]			
b.		[5]			
c.		[4]			
Q.2	Answer the following Questions				
a.		[6]			
b.		[5]			
c.		[4]			
Q.3	Answer the following Questions				
a.		[6]			
b.		[5]			
c.		[4]			

BL - Bloom's Taxonomy Levels (1-Remembering, 2-Understanding, 3 –Applying,4 –Analyzing, 5 – Evaluating, 6 -Creating) CO - Course Outcomes, PO - Program Outcomes

Question paper pattern for End Examination

Seat No._____ Enrolment No._____

Shree Dhanvantary Pharmacy College Kim
(An Autonomous College U/s UGC Act 1956)

B.Pharm End Semester Theory Examination Summer/ Winter 20_

Semester: **Date:**
Subject Code: **Time:**
Subject name: **Total Marks: 75**

Instruction:
1. Q.1 is Compulsory to attempt.
2. Attempt any **TWO** questions from Q.2 to Q.4
3. Attempt any **TWO** questions from Q.5 to Q.7

Section A					
Q.1	**Objective type Questions (1 mark each) (1 x 11=11 marks)**	**Marks**	**BL**	**CO**	**PO**
a.		[1]			
b.		[1]			
c.		[1]			
.		.			
.		.			
k.		[1]			
Q.2	**Answer the following Questions**				
a.		[6]			
b.		[5]			
c.		[5]			
Q.3	**Answer the following Questions**				
a.		[6]			
b.		[5]			
c.		[5]			
Q.4	**Answer the following Questions**				
a.		[6]			
b.		[5]			
c.		[5]			
Section B					
Q.5	**Answer the following Questions**				
a.		[6]			
b.		[5]			
c.		[5]			
Q.6	**Answer the following Questions**				

a.		[6]			
b.		[5]			
c.		[5]			
Q.7	**Answer the following Questions**				
a.		[6]			
b.		[5]			
c.		[5]			

BL - Bloom's Taxonomy Levels (1-Remembering, 2-Understanding, 3 –Applying,4 –Analyzing, 5 – Evaluating, 6 -Creating) CO - Course Outcomes, PO - Program Outcomes

Question paper pattern for End Examination (non University)

Seat No._____ **Enrolment No._____**

Shree Dhanvantary Pharmacy College Kim
(An Autonomous College U/s UGC Act 1956)

B.Pharm End Semester Theory Examination Summer/ Winter 20_

Semester: **Date:**
Subject Code: **Time:**
Subject name: **Total Marks: 35**

Instruction:

1. Figures to right indicate maximum marks
2. Make suitable assumptions whenever necessary

Q.1	Long Answers (Any 1 out of 2) (10 mark each)	Marks	BL	CO	PO
a.		[10]			
b.		[10]			
Q.2	Short Answers (any 5 out of 7) (5 marks each)				
a.		[05]			
b.		[05]			
c.		[05]			
d.		[05]			
e.		[05]			
f.		[05]			
g.		[05]			

BL - Bloom's Taxonomy Levels (1-Remembering, 2-Understanding, 3 –Applying,4 –Analyzing, 5 – Evaluating, 6 -Creating) CO - Course Outcomes, PO - Program Outcomes

12. Promotion and award of grades

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

13. Carry forward of marks

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

14. Improvement of internal assessment

a. 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
b. 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.
c. The candidate has to re-register for the chosen subjects and fulfill the academic requirements.
d. 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
e. 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. Advanced supplementary examination

Advanced supplementary examination shall be conducted immediately after the declaration of results. The exact dates of examinations shall be notified from time to time.

16. Academic Progression:

No student shall be admitted to any examination unless he/she fulfills the norms given in **sec. 6**.

Academic progression rules are applicable as follows:

- A student shall be eligible to carry forward maximum of 4 courses of I, II (n-2) and all the courses of III (n-1) 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 maximum of 4 courses of III, IV (n-2) and all the courses V (n-1) 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 maximum of 4 courses of V, VI (n-2) and all the courses VII (n-1) semesters till the VIII semester examinations. However, he/she shall not be eligible to get the course completioncertificate until all the courses of I, II, III, IV, V and VI semesters are successfully completed.

- Non university courses and noncredit courses are exempted from the rules above.

- 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 **section 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 **section 26**.

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

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

17. Grading of performances

Letter grades and grade points allocations:

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

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

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

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

18. The Semester grade point average (SGPA)

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

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

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

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

19. Cumulative Grade Point Average (CGPA)

The CGPA is calculated with the SGPA of all the VIII semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all VIII semesters and their courses. The CGPA shall reflect the failed 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:

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

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

20. Declaration of class

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

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

21. Project work

All the students shall undertake a project under the supervision of a teacher and submit a report. The area of the project shall directly relate any one of the elective 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 evaluatedas per the criteria given below.

Evaluation of Dissertation Book:

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

Evaluation of Presentation:

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

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

22. Industrial training (Desirable)

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

23. Practice School

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

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

24. Award of Ranks

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

25. 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 withheldand he will not be allowed / promoted into the next higher semester. The issue of awarding a degreeis liable to be withheld in such cases.

26. Award of degree:

Candidates who fulfill 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 registration.

Detailed Syllabus Semester Wise

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Bachelor of Pharmacy
Sub Code: BP101T
SEMESTER**:** I
Subject Name: Human Anatomy & Physiology- I

Scope: This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: Identification of various cells, tissues and organs of different systems of human body
CO 2: Gross morphology, structure and functions of various organs of the human body like skeleton, joints and Integumentary system.
CO 3: Various homeostatic mechanisms and their imbalances, along with anatomy and physiology of heart related to it.
CO4**:** Various experiments related to special senses and nervous system.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	**Introduction to human body:** 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, Forms of intracellular signaling: a) Contact-dependent b) Paracrine c) Synaptic d) Endocrine **Tissue level of organization:** Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues.	10
2	**Integumentary system**: 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 Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction. **Joints** Structural and functional classification, types of joints movements and its articulation.	10

3	**Body fluids and blood:** Body fluids, composition and functions of blood, hemopoeisis, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood, Reticulo endothelial system **Lymphatic system:** Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system	10
4	**Peripheral nervous system:** Classification of peripheral nervous system: Structure and functions of sympathetic and parasympathetic nervous System, Origin and functions of spinal and cranial nerves **Special senses:** Structure and functions of eye, ear, nose and tongue and their disorders.	8
5	**Cardiovascular system:** Heart – anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, elements of conduction system of heart and heart beat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.	7
	Total	45

Recommended Texts/Reference books/web resources:

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill
3. Livingstone, New York
4. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co,Riverview, MI USA
5. Text book of Medical Physiology- Arthur C,Guyton andJohn.E. Hall. Miamisburg, OH, U.S.A.
6. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
7. of Human Histology by Inderbir Singh, Jaypee brother's medical publishers, New Delhi

Reference Books (Latest Editions)

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

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Bachelor of Pharmacy

Sub Code: BP102T

SEMESTER**:** I

Subject Name: Pharmaceutical Analysis I

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

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.

CO 4: Understand the quantitative standardization and assay methods.

Teaching Scheme and Examination Scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Contents	Hours
1.	**(a)Pharmaceutical analysis**- Definition and scope i)Different techniques of analysis ii) Methods of expressing concentration iii) Primary and secondary standards. iv) 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)Determination of moisture content:** Physical and chemical methods of determination of moisture content (Karl- Fischer method, LOD)	10
2.	**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 bases .neutralization curves **Non aqueous titration**:S olvents, acidimetry and alkalimetry titration Estimation of Sodium benzoate and Ephedrine HCl	10

3.	**Precipitation titrations**: Mohr's method, Volhard's, Modified Volhard's, Fajan's method, estimation of sodium chloride. **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 diazotization titration.	10
4.	**Redox titrations:** (a) Concepts of oxidation and reduction (b) Types of redox titrations(Principles and applications) Cerimetry,Iodimetry,Iodometry,Bromatometry,Dichrometry,Titration with Potassium iodate	8
5.	**Electrochemical methods of analysis** **Conductometry**- Introduction,Conductivitycell,Conductometrictitrations, 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	7
	Total	45

Recommended Text books /References/web sources

1. Vogel A. I. Textbook of Quantitative Chemical Analysis, Fifth ed. New York Longman, Scientific and Technical, 1989. ISBN 0582446937
2. Indian pharmacopeia. (2014). Government of India, Ministry of health and family welfare.
3. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London.
4. A.I.Vogel, Text Book of Quantitative Inorganic Analysis.
5. P.Gundu Rao, Inorganic Pharmaceutical Chemistry.
6. Bentley and Driver's Text book of Pharmaceutical Chemistry.
7. JohnH. Kennedy, Analytical chemistry principles.

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Bachelor of Pharmacy
Sub Code: BP103T
SEMESTER**:** I
Subject Name: Pharmaceutics I

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

Course Outcomes: Upon successful completion of this course, students should be able to:
CO1: Know the history of profession of pharmacy.
CO2: Understand the professional way of handling the prescription. Preparation of some conventional dosage forms.
CO3: Preparation of various conventional dosage forms.
CO4**:** Understand the pharmaceutical calculation.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Sr No	Course Contents	Hrs.
1	**Historical background and development of profession of pharmacy**: History of profession of Pharmacy in India in relation to pharmacy education, industry and organization, Pharmacy as a career, Pharmacopoeias: Introduction to IP, BP, USP and Extra Pharmacopoeia **Prescription:** Definition, Parts of prescription, handling of Prescription and Errors in prescription **Posology:** Definition, Factors affecting posology. Pediatric dose calculations based on age, body weight and body surface area	10
2	**Pharmaceutical calculations**: Weights and measures – Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point and molecular weight. **Dosage forms:** Introduction to dosage forms, classification and definitions **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, Mixtures	10

3	**Monophasic liquids:** Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments and Lotions. **Biphasic liquids:** **Suspensions:** Definition, advantages and disadvantages, classifications, Preparation of suspensions; Flocculated and Deflocculated suspension & stability problems and methods to overcome. **Emulsions:** Definition, classification, emulsifying agent, test for the identification of type of Emulsion, Methods of preparation & stability problems and methods to overcome.	8
4	**Suppositories**: Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories **Pharmaceutical incompatibilities**: Definition, classification, physical, chemical and therapeutic incompatibilities with examples	8
5	**Semisolid dosage forms:** Definitions, classification, mechanisms and factors influencing dermal penetration of drugs. Preparation of ointments, pastes, creams and gels. Excipients used in semi solid dosage forms. Evaluation of semi solid dosages forms	7
	Total	45

Recommended Texts/Reference books/web resources:

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.Isaac Ghebre Sellassie: Pharmaceutical Pelletization Technology, Marcel Dekker, INC, NewYork.
10. Dilip M. Parikh: Handbook of Pharmaceutical Granulation Technology, Marcel Dekker, INC,New York.
11. Francoise Nieloud and Gilberte Marti-Mestres: Pharmaceutical Emulsions and Suspensions,Marcel Dekker, INC, New York.

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Bachelor of Pharmacy
Sub Code: BP104T
SEMESTER**:** I
Subject Name: Pharmaceutical Inorganic Chemistry

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

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO1: Understand the introduction of inorganic chemistry, understand the sources of impurities and limit tests
CO2: Understand concept of acids, base and Buffers, intra cellular and extra cellular electrolytes and it role and gastrointestinal agents.
CO3: Understand the medicinal and pharmaceutical importance of inorganic compounds in treatment of various disease
CO4**:** Understand the concept of Radiopharmaceuticals and types of antidote in treatment of poisoning.

Teaching Scheme and Examination Scheme

Teaching Scheme				**Evaluation Scheme**			
Theory	**Tutorial**	**Practical**	**Total**	**Theory**		**Practical**	
				External	**Internal**	**External**	**Internal**
3	**1**	**-**	**4**	**75**	**25**	**-**	**-**

Unit	**Course Content**	**Hours**
1	**Impurities in pharmaceutical substances** • History of Pharmacopoeia • Sources and types of impurities • Principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals • Modified limit test Chloride and Sulphate	10
2	**Acids, Bases and Buffers** • Buffer equations and buffer capacity in general • buffers in pharmaceutical systems, preparation, stability • Buffered isotonic solutions • Measurements of tonicity • Calculations and methods of adjusting isotonicity	04
3	**Major extra and intracellular electrolytes** • Functions of major physiological ions • Physiological acid base balance. • Electrolytes used in the replacement therapy	04

	• Oral Rehydration Salt (ORS) **General methods of preparation, assay, properties and medicinal uses of following inorganic compounds** • Sodium chloride • Potassium chloride • Calcium gluconate	
4	**Dental products** • Dentifrices, • Role of fluoride in the treatment of dental caries • Desensitizing agents • Composition and use of Zinc eugenol cement **General methods of preparation, assay, properties and medicinal uses of following inorganic compounds** • Calcium carbonate, Sodium fluoride	02
5	**Gastrointestinal agents** • **Acidifiers:** Dil. HCl • **Antacid** • Ideal properties of antacids, • combinations of antacids, Aluminum hydroxide gel Magnesium hydroxide mixture • **Cathartics** • Types of cathartics, mechanism of action and uses • Magnesium sulphate, Sodium orthophosphate, Kaolin and Bentonite • **Antimicrobials**: • Mechanism, classification • Iodine and its preparations **General methods of preparation, assay, properties and medicinal uses of following inorganic compounds** • Ammonium chloride • Sodium Bicarbonate • Aluminum hydroxide • Potassium Permanganate • Hydrogen peroxide • Chlorinated lime • Boric Acid	10
6	**Miscellaneous compounds** • **Expectorants** • Classification and Mechanism of Action • Potassium iodide • **Emetics** • Types of Emetics and Mechanism • **Haematinics** • Sources and Role • Ferrous gluconate • **Poison and Antidote** • Classification, Mechanism of action • Cyanide Poisoning	08

	• Activated charcoal
	• **Astringents**:
	  • Defination & Mechanism of action
	  • Zinc Sulphate, Potash Alum
	General methods of preparation, assay, properties and medicinal uses of following inorganic compounds
	  • Ammonium chloride.
	  • Copper sulphate,
	  • Sodium potassium tartarate
	  • Sodium thiosulphate
	  • Sodium nitrite
	  • Ferrous sulphate	

7	**Radiopharmaceuticals**:
	  • Properties of α, β, γ radiations,
	  • Half-life of radio isotopes, Radio activity,
	  • Measurement of radioactivity
	  • Principle and Working of G.M.Counter
	  • Study of radioisotopes - Sodium iodide I131
	  • Storage and precautions for handling radioisotopes
	  • Pharmaceutical application of radioactive substances
		7

	Total	45

Recommended Texts/Reference books/web resources:

1. 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.
6. Indian Pharmacopoeia

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Bachelor of Pharmacy
Sub Code: BP105T
SEMESTER**:** I
Subject Name: Communication Skill

Scope: This course will prepare the young pharmacy student to interact effectively with doctors, nurses, dentists, physiotherapists and other health workers. At the end of this course the student willget the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business.

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO1: Understand the behavioral needs for a Pharmacist to function effectively in the areas of Pharmaceutical operation
CO2: Understand the of effective communication (verbal and Non Verbal)
CO3: Effectively manage team as a Team player
CO4: Development of interview skill, leadership Quality and Essentials

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
2	-	-	2	35	15	-	-

Unit	Contents	Hours
1	**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	7
2	**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	7

	Style, Systematic Communication Style, Considerate Communication Style	
3	**Basic Listening Skills:** Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, 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 Lines, Put the Main Point First, Know Your Audience, Organization of the Message	7
4	**Interview Skills:** Purpose of an interview, Do's and Dont's of an interview **Giving Presentations:** Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery	5
5	**Group Discussion:** Introduction, Communication skills in group discussion, Do's and Dont's of group discussion	4
	Total	30

Recommended Texts/Reference books/web resources:

1. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011
2. Communication skills, Sanjay Kumar, Pushpalata, 1stEdition, Oxford Press, 2011
3. Organizational Behaviour, Stephen .P. Robbins, 1stEdition, Pearson, 2013
4. Brilliant- Communication skills, Gill Hasson, 1stEdition, Pearson Life, 2011
5. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5thEdition, Pearson, 2013
6. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010
7. Communication skills for professionals, Konar nira, 2ndEdition, New arrivals – PHI, 2011
8. Personality development and soft skills, Barun K Mitra, 1stEdition, Oxford Press, 2011
9. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning india pvt.ltd, 2011
10. Soft skills and professional communication, Francis Peters SJ, 1stEdition, Mc Graw Hill Education, 2011
11. Effective communication, John Adair, 4thEdition, Pan Mac Millan,2009 12. Bringing out the best in people, Aubrey Daniels, 2ndEdition, Mc Graw Hill, 1

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Bachelor of Pharmacy
Sub Code: BP106T
SEMESTER**:** I
Subject Name: Remedial Biology

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

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: Know the classification and silent feature of five kingdoms of life and understand the basic components and modifications in plants.
CO 2: To know the information regarding cells and different types of tissues.
CO 3: Know and understand the basic components of anatomy and physiology of various system (Cardiovascular system, Nervous system, Respiratory system, Endocrine system etc.) with special reference to human.
CO4: To know about different plant and mineral nutrition, plant respiration and photosynthesis.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
2	-	-	2	35	15	-	-

Unit	Course Content	Hours
1	**Living world:** Definition and characters of living organisms Diversity in the living world Binomial nomenclature Five kingdoms of life and basis of classification. Salient features of Monera, Potista, Fungi, Animalia and Plantae, Virus, Morphology of Flowering plants Morphology of different parts of flowering plants – Root, stem, inflorescence, flower, leaf, fruit, seed. General Anatomy of Root, stem, leaf of monocotyledons & Dicotylidones	7
2	**Body fluids and circulation** Composition of blood, blood groups, coagulation of blood Composition and functions of lymph Human circulatory system Structure of human heart and blood vessels Cardiac cycle, cardiac output and ECG **Digestion and Absorption** Human alimentary canal and digestive glands Role of digestive enzymes Digestion, absorption and assimilation of digested food	7

	Breathing and respiration Human respiratory system Mechanism of breathing and its regulation Exchange of gases, transport of gases and regulation of respiration Respiratory volumes	
3	**Excretory products and their elimination** 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	7
4	**Plants and mineral nutrition:** Essential mineral, macro and micronutrients Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation **Photosynthesis** Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis.	5
5	**Plant respiration:** Respiration, glycolysis, fermentation (anaerobic). **Plant growth and development** Phases and rate of plant growth, Condition of growth,Introduction to plant growth regulators **Cell - The unit of life** Structure and functions of cell and cell organelles.Cell division **Tissues** Definition, types of tissues, location and functions.	4
	Total	30

Recommended Texts/Reference books/web resources:

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

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Bachelor of Pharmacy
Sub Code: BP107TT
SEMESTER**:** I
Subject Name: REMEDIAL MATHEMATICS

Scope: This is an introductory course in mathematics. This subject deals with the introduction to Partial fraction, Logarithm, matrices and Determinant, Analytical geometry, Calculus, differential equation and Laplace transform.

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1. Know the theory and their application in Pharmacy.
CO 2Solve the different types of problems by applying theory
CO 3Appreciate the important application of mathematics in Pharmacy
CO4**:** Introduction matrices, Types of matrices, Operation on matrices

Teaching Scheme and Examination Scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
2	-	-	2	35	15	-	-

Unit	Course Content	Hours
1	**Partial fraction** : Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction , Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics **Logarithms Introduction,** Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems Function: Real Valued **function**, Classification of real valued functions, Limits and **continuity** : Introduction , Limit of a function, Definition of limit of a function	6
2	**Matrices and Determinant**: Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants , Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix , Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method, Cramer's rule, Characteristic equation and roots of a square matrix, Cayley– Hamilton theorem ,Application of Matrices in solving Pharmacokinetic equations	6

3	**Calculus:** Differentiation : Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function , Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula), Derivative of the quotient of two functions (Quotient formula) – Without Proof, Derivative of xn w .r. tx, where n is any rational number, Derivative of ex,, Derivative of loge x , Derivative of Derivative of trigonometric functions from first principles (without Proof), Successive Differentiation, Conditions for a function to be a maximum or a minimum at a point. Application	6
4	**Analytical Geometry:** Introduction: Signs of the Coordinates, Distance formula, **Straight Line**: Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines, Slope of a line joining two points, Slope – intercept form of a straight line **Integration**: Introduction, Definition, Standard formulae, Rules of integration, Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application	6
5	**Differential Equations** : Some basic definitions, Order and degree, Equations in separable form , Homogeneous equations, Linear Differential equations, Exact equations, Application in solving Pharmacokinetic equations Laplace Transform : Introduction, Definition, Properties of Laplace transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives, Application to solve Linear differential equations, Application in solving Chemical kinetics and Pharmacokinetics equations	6
	Total	30

Recommended Texts/Reference books/web resources:

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

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Bachelor of Pharmacy
Sub Code: BP108P (Practical)
SEMESTER**:** I
Subject Name: Human Anatomy & Physiology- I

Scope: Practical physiology is complimentary to the theoretical discussions in physiology. Practical's allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject.

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: Study of microscope & understand the microscopic study of the different tissues.
CO 2: Identify various types of tissues and bones of the human body through the charts and models.
CO 3: Introduction to hemocytometry and estimation of various blood parameters.
CO4**:** Record various physiological parameters, and perform hematological tests.

Teaching Scheme and Examination Scheme:

Teaching Scheme				**Evaluation Scheme**			
Theory	**Tutorial**	**Practical**	**Total**	**Theory**		**Practical**	
				External	**Internal**	**External**	**Internal**
-	**-**	**4**	**2**	**-**	**-**	**35**	**15**

S.No	**Details of experiment**
1.	Study of compound microscope.
2.	Microscopic study of epithelial, connective tissue, muscular and nervous tissue
3.	To study the integumentary and special senses using specimen, models, etc.,
4.	Identification of axial bones and appendicular bones
5.	Introduction to hemocytometry.
6.	Enumeration of white blood cell (WBC) count
7.	Enumeration of total red blood corpuscles (RBC) count
8.	Determination of platelet count.
9.	Determination of reticulocytes count.
10.	Determination of bleeding time and clotting time
11.	Estimation of hemoglobin content
12.	Determination of blood group.
13.	Determination of erythrocyte sedimentation rate (ESR).
14.	Determination of heart rate and pulse rate.
15.	Recording of blood pressure.

Recommended Texts/Reference books/web resources:

1. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.
2. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi
3. Kale S R,Kale R R. practical human anatomy and physiology.19 th ed. Pune. Nirali prakashan; 2009.

4. Goyal R K, Natvar M P, Shah S A. Practical anatomy, Physiology and biochemistry,1st ed. Publisher: B S Shah Publisher: Ahmadabad; 1988
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 th ed. Harcot Publishers: Singapore; 2000.

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Bachelor of Pharmacy
Sub Code: BP109P (Practical)
SEMESTER**:** I
Subject Name: Pharmaceutical Analysis I

Scope: It deals with the application of fundamentals of analytical chemistry and principles of analysis of drugs.

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO1: Illustrate the limits of chloride, sulphate& heavy metals content in various pharmaceuticals.
CO2: Understand the quantitative standardization and assay methods by volumetric analysis.
CO3: Adapt various electrochemical techniques to quantify the acids & bases.
CO4**:** Understand the quantitative standardization and assay methods

Teaching Scheme and Examination Scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
-	-	4	2	-	-	35	15

Sr. No:	Details of experiment
I.	**Preparation and standardization of:**
1.	Sodium hydroxide
2.	Sulphuric acid
3.	Sodium thio sulfate
4.	Potassium permanganate
5.	Ceric ammonium sulphate
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.	**Determination of Normality by electro-analytical methods**
13.	Conductometric titration of strong acid against strong base
14.	Conductometric titration of strong acid and weak acid against strong base
15.	Potentiometric titration of strong acid against strong base
IV.	**Determination of pKa using pH meter**
V.	**Determination of Loss on drying (LOD) of Paracetamol as per IP-2010**

Recommended Text books /References/web sources

1. Vogel A. I. Textbook of Quantitative Chemical Analysis, Fifth ed. New York Longman, Scientific and Technical, 1989.ISBN0582446937
2. Indian pharmacopeia. (2014). Government of India, Ministry of health and family welfare
3. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of Universityof London
4. A.I.Vogel,Text Book of Quantitative Inorganic Analysis
5. P.Gundu Rao,Inorganic Pharmaceutical Chemistry
6. Bentley and Driver's Textbook of Pharmaceutical Chemistry
7. John H.Kennedy, Analytical chemistry principles

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Bachelor of Pharmacy
Sub Code: BP110P (Practical)
SEMESTER**:** I
Subject Name: Pharmaceutics I

Scope: Its deals with the application of fundamentals of preparation and dispensing of different pharmaceutical formulations.

Course Outcomes: Upon successful completion of this course, students should be able to:
CO1: Learn the preparation and dispensing of syrups, elixirs and linctuses.
CO2: Understand and learn the theories, procedures and dispensing of the preparations of solutions, suspensions and emulsions.
CO3: Illustrate the procedures for preparation and dispensing of powder, granule and suppositories.
CO4**:** Understand the procedures and dispensing of semisolids, gargles and mouthwashes.

Teaching Scheme and Examination Scheme

Teaching Scheme				**Evaluation Scheme**			
Theory	**Tutorial**	**Practical**	**Total**	**Theory**		**Practical**	
				External	**Internal**	**External**	**Internal**
-	**-**	**4**	**2**	**-**	**-**	**35**	**15**

S.No	**Details of experiment**
1	**Syrups:** a) Syrup IP'66 b) Compound syrup of Ferrous Phosphate BPC'68
2	**Elixirs:** a) Piperazine citrate elixir b) Paracetamol pediatric elixir
3	**Linctus** a) Terpin Hydrate Linctus IP'66 b) Iodine Throat Paint (Mandles Paint)
4	**Solutions:** a) Strong solution of ammonium acetate b) Cresol with soap solution c) Lugol's solution
5	**Suspensions:** a) Calamine lotion b) Magnesium Hydroxide mixture c) Aluminimum Hydroxide gel
6	**Emulsions:** a) Turpentine Liniment b) Liquid paraffin emulsion
7	**Powders and Granules** a) ORS powder (WHO) b) Effervescent granules c) Dusting powder d) Divided powders
8	**Suppositories** a) Glycero gelatin suppository b) Coca butter suppository c) Zinc Oxide suppository
9	**Semisolids** a) Sulphur ointment b) Non staining-iodine ointment with methyl salicylate c) Carbopal gel
10	**Gargles and Mouthwashes** Iodine gargle b) Chlorhexidine mouthwash

Recommended Texts/Reference books/web resources:

1. Indian pharmacopoeia.
2. British pharmacopoeia.
3. Sanmathi B. S., Kalpesh K Mehta, Anshu Gupta, Dispensing Pharmacy-a practical manual, PharmaMed Press, Hyderbad.

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Bachelor of Pharmacy
Sub Code: BP111P (Practical)
SEMESTER**:** I
Subject Name: Pharmaceutical Inorganic Chemistry

Scope: It deals with the application of fundamentals of inorganic chemistry and principles of limit tests.

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO1: Perform the limit tests, assay methods to know the impurities limit, and percentage purity of the pharmaceuticals.
CO2: Differentiate various cations and anions by chemical tests.
CO3: Identify the purity of the various pharmaceuticals by suitable methods

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
-	-	4	2	-	-	35	15

Sr. No	Details of Experiment
Limit tests for following ions	
1	Limit test for Chlorides and Sulphates
2	Modified limit test for Chlorides and Sulphates
3	Limit test for Iron
4	Limit test for Heavy metals
Identification test for following Inorganic compounds	
5	Ferrous sulphate
6	Magnesium hydroxide
7	Sodium bicarbonate
8	Calcium gluconate
9	Copper sulphate
Test for purity of followings	
10	Swelling power of Bentonite
11	Neutralizing capacity of aluminum hydroxide gel
12	Determination of potassium iodate and iodine in potassium Iodide
Preparation of inorganic pharmaceuticals	
13	Boric acid
14	Potash alum
15	Ferrous sulphate
Demonstration of Following:	
16	Limit test for Lead
17	Limit test for Arsenic

Recommended Texts/Reference books/web resources:

1. 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

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Bachelor of Pharmacy
Sub Code: BP112P (Practical)
SEMESTER**:** I
Subject Name: Communication Skill

Scope: This Advanced Communication Skills course is suitable for anyone who is responsible for building and managing influential relationships, particularly where polished communication and interpersonal skills really count. Ideally delegates will approach the course with some theoretical or practical understanding of interpersonal communication.

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO1: Apply the skills necessary for communication excellence
CO2: Develop your communication style to increase rapport with others
CO3: Apply the art and science of influence: body language and listening
CO4: Identify different thinking styles to be more persuasive

Teaching Scheme and Examination Scheme

Teaching Scheme				**Evaluation Scheme**			
Theory	**Tutorial**	**Practical**	**Total**	**Theory**		**Practical**	
				External	**Internal**	**External**	**Internal**
-	**-**	**2**	**1**	**-**	**-**	**35**	**15**

The following learning modules are to be **conducted using Any Software** **English** language labsoftware	
Basic communication covering the following topics	
1	Meeting People
2	Asking Questions
3	Making Friends
4	What did you do?
5	Do's and Dont's
Pronunciations covering the following topics	
1	Pronunciation (Consonant Sounds)
2	Pronunciation and Nouns
3	Pronunciation (Vowel Sounds)
Advanced Learning	
1	Listening Comprehension / Direct and Indirect Speech
2	Figures of Speech
3	Effective Communication
4	Writing Skills
5	Effective Writing
6	Interview Handling Skills
7	E-Mail etiquette
8	Presentation Skills

Recommended Texts/Reference books/web resources:

1. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011
2. Communication skills, Sanjay Kumar, Pushpalata, 1stEdition, Oxford Press, 2011
3. Organizational Behaviour, Stephen .P. Robbins, 1stEdition, Pearson, 2013
4. Brilliant- Communication skills, Gill Hasson, 1stEdition, Pearson Life, 2011
5. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5thEdition, Pearson, 2013
6. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010
7. Communication skills for professionals, Konar nira, 2ndEdition, New arrivals – PHI, 2011
8. Personality development and soft skills, Barun K Mitra, 1stEdition, Oxford Press, 2011
9. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning india pvt.ltd, 2011
10. Soft skills and professional communication, Francis Peters SJ, 1stEdition, Mc Graw Hill Education, 2011
11. Effective communication, John Adair, 4thEdition, Pan Mac Millan,2009 12. Bringing out the best in people, Aubrey Daniels, 2ndEdition, Mc Graw Hill, 199.

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Bachelor of Pharmacy
Sub Code: BP113P (Practical)
SEMESTER**:** I
Subject Name: Remedial Biology

Scope: The Biology laboratory course is aimed to train the students Care and uses of microscope, Gross identification of permanent slides of structure and life cycle of plants/animals, this course also deals with wet laboratory-based experiments on identification of plants, this course also provides the laboratory skills Study of various morphological characters of plant parts. Preparation, Microscopic Examination of Stem, Root and Leaf of Mono and Dicot leaves. Structure of human parasites and insects mentioned in the theory with the help of specimen. Anatomical features of different organs of frog and rabbit using charts.

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: Describe the plant cell, animal cell, and their features
CO 2: Demonstrate the skills on identification, histology of plants
CO3: State morphological identification of plants.
CO 4**:** List the parasites, insects and their disease

Teaching Scheme and Examination Scheme

Teaching Scheme				**Evaluation Scheme**			
Theory	**Tutorial**	**Practical**	**Total**	**Theory**		**Practical**	
				External	**Internal**	**External**	**Internal**
-	**-**	**2**	**1**	**-**	**-**	**35**	**15**

S.No	**Details of experiment**
1.	Introduction to experiments in biology a) Study of Microscope b) Section cutting techniques c) Mounting and staining d) Permanent slide preparation
2.	Study of cell and its inclusions
3.	Study of Stem, Root, Leaf, seed, fruit, flower and their modifications
4.	Detailed study of frog by using computer models
5.	Microscopic study and identification of tissues pertinent to Stem, Root Leaf, seed, fruit and flower.
6.	Identification of bones.
7.	Determination of blood group.
8.	Determination of blood pressure.
9.	Determination of tidal volume.

Reference Books

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

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Bachelor of Pharmacy
Sub Code: BP201T
SEMESTER**:** II
Subject Name: Human Anatomy & Physiology- II

Scope: This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: To know the knowledge of anatomy as well as physiology of nervous system.
CO 2: To understand the anatomy and physiology of Digestive system.
CO 3: To understand the anatomy and physiology of respiratory and urinary system.
CO 4: To understand the concept of various hormones and know the anatomy and physiology of reproductive system.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	**Nervous system:** Organization of nervous system, neuron, classification and properties of nerve fibre, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. Structure and functions of brain (cerebrum, brain stem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity) Physiology of pain, Headache.	10
2	**Digestive system** Anatomy of GI Tract with special reference to anatomy and functions ofstomach, (Acid production in the stomach, regulation of acid productionthrough parasympathetic nervous system, pepsin role in protein digestion) small intestine and large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT **Energetics:**	6

	Formation and role of ATP, Creatinine Phosphate and BMR.	
3	**Respiratory system** Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration Lung Volumes and capacities transport of respiratory gases, artificialrespiration, and resuscitation methods **Urinary system** Anatomy of urinary tract with special reference to anatomy of kidney andnephrons, functions of kidney and urinary tract, physiology of urine formation, micturition reflex and role of kidneys in acid base balance, role of RAS in kidney and disorders of kidney	10
4	**Endocrine system** Classification of hormones, mechanism of hormone action, structure andfunctions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland, thymus and their disorders.	10
5	**Reproductive system** Anatomy of male and female reproductive system, Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition. **Introduction to genetics** Chromosomes, genes and DNA, protein synthesis, genetic pattern ofinheritance	9
	Total	45

Recommended Texts/Reference books/web resources:

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview,MI USA
4. Text book of Medical Physiology- Arthur C,Guyton andJohn.E. Hall. Miamisburg, OH, U.S.A
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A
6. Textbook of Human Histology by Inderbir Singh, Jaypee brothers medical publishers, New Delhi
7. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
8. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A
9. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje ,Academic Publishers Kolkata

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Bachelor of Pharmacy
Sub Code: BP202T
SEMESTER**:** II
Subject Name: Pharmaceutical Organic Chemistry I

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

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: write the structure, name and the type of isomerism of the organic compound
CO 2: write the reaction, name the reaction and orientation of reactions
CO 3: account for reactivity/stability of compounds
CO 4: identify/confirm the identification of organic compound

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	Classification, nomenclature and isomerism: • Classification of Organic Compounds. • Common and IUPAC systems of nomenclature of organic compounds (up to 10 Carbons open chain and carbocyclic compounds). • Structural isomerism in organic compounds.	7
2	Alkanes*, Alkenes*and Conjugated dienes*: • SP^3 hybridization in alkanes, Halogenation of alkanes, uses of paraffins. • Stabilities of alkenes, SP^2 hybridization in alkenes. • E_1 and E_2 reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeffs orientation and evidences. E_1 verses E_2 reactions, Factors affecting E_1 and E_2 reactions. • **Chemical Reactions:** Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation. • Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement.	10

3	**a)** Alkyl halides*: • SN_1 and SN_2 reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations, SN_1 versus SN_2 reactions, Factors affecting SN_1 and SN_2 reactions. • Structure and uses of ethylchloride, Chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform. **b) Alcohols*:** • Qualitative tests, Structure and uses of Ethyl alcohol, Methyl alcohol, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol.	10
4	Carbonyl compounds* (Aldehydes and ketones): • Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation. • Qualitative tests, Structure and uses of Formaldehyde, **Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanilin, Cinnamaldehyde.**	10
5	**a)** Carboxylic acids*: • Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids, amide and ester. • Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid, Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetylsalicylic acid. **b)** Aliphatic amines*: • Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine.	8

Note: 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.

Recommended Texts/Reference books/web resources:

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

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Bachelor of Pharmacy
Sub Code: BP203T
SEMESTER**:** II
Subject Name: Biochemistry

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

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: Understand the nutrient Molecules and metabolism of carbohydrates molecules in physiological and pathological condition and bioenergetics.
CO 2: Understand the metabolism of Lipids and Amino acid in physiological and pathological condition.
CO 3: Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and Proteins.
CO4**:** Understand the catalytic role of enzyme, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic application of enzymes

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	**Biomolecules:** • Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins. **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	8
2	**Carbohydrate metabolism:** • 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	10

	• 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	
3	**Lipid metabolism:** • β-Oxidation of saturated fatty acid (Palmitic acid) • Formation and utilization of ketone bodies; ketoacidosis • De novo synthesis of fatty acids (Palmitic acid) • Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D • Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity.	10
4	**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) Transcription or RNA synthesis • Genetic code, Translation or Protein synthesis and inhibitors	10
5	**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 Coenzymes –Structure and biochemical functions	7
	Total	45

Recommended Texts/Reference books/web resources:

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

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Bachelor of Pharmacy
Sub Code: BP 204T
SEMESTER**:** II
Subject Name: Pathophysiology

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

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: Identify and Explain the etiology of human diseases.
CO 2: Identify & Explain the Pathogenesis of human diseases.
CO 3: Have the ability to identify signs & symptoms of selected diseases.
CO4: Able to know diagnostic method of selected human diseases.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	**Basic principles of Cell injury and Adaptation:** Causes of cellular injury, Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage),Morphology ofcell injury – Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia),Cell swelling, Intra cellular accumulation, Calcification, Enzyme leakage and Cell Death Acidosis &Alkalosis,Electrolyte **Mechanism involved in the process of inflammation and repair:** Introduction, Clinical signs of inflammation, Different types of Inflammation,Mechanism of Inflammation – Alteration in vascular permeability and bloodflow, migration of WBC's,Mediators of inflammation, Basic principles of wound healing in the skin, Pathophysiology of Atherosclerosis	10
2	**Cardiovascular System:** Hypertension, congestive heart failure, ischemic heart disease (angina,myocardial infarction, atherosclerosis and arteriosclerosis) **Respiratory system:**Asthma, Chronic obstructive airways diseases. **Renal system:**Acute and chronic renal failure	10
3	**Haematological Diseases:** Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cellanemia, thalasemia, hereditary acquired anemia, hemophilia	10

	Endocrine system: Diabetes, thyroid diseases, disorders of sex hormones **Nervous system:** Epilepsy, Parkinson's disease, stroke, psychiatric disorders:depression, schizophrenia and Alzheimer's disease.	
4.	**Gastrointestinal system:** Peptic Ulcer , Inflammatory bowel diseases,jaundice, hepatitis (A,B,C,D,E,F) alcoholic liver disease **Disease of bones and joints:** Rheumatoid arthritis, osteoporosis and gout **Principles of cancer:** classification, etiology and pathogenesis of cancer	8
5.	**Infectious diseases:** Meningitis, Typhoid, Leprosy, Tuberculosis Urinary tractinfections **Sexually transmitted diseases:** AIDS, Syphilis, Gonorrhea	7
	Total	45

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; 9. Pharmacotherapy: A Pathophysiological Approach; 9th edition; London; McGraw- Hill Medical; 2014.
9. V. Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6th edition; Philadelphia; WB Saunders Company; 1997.
10. Roger Walker, Clive Edwards; Clinical Pharmacy and Therapeutics; 3rd edition; London; Churchill Livingstone publication; 2003.

Recommended Journals:

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

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Bachelor of Pharmacy
Sub Code: BP205T
SEMESTER**:** II
Subject Name: Computer Application in Pharmacy

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

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: To understand Number System, concept of Information Systems and Software.
CO 2: To understand Web Technologies.
CO 3: To know the various application of computer in Pharmacy.
CO4**:** To know various types of Databases and its application that applies in Pharmacy.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	-	-	3	35	15	-	-

Unit	Topics	Hours
1.	**Number system**: Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One's complement ,Two's complement method, binary multiplication, binary division **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	6
2.	**Web technologies**: Introduction to HTML, XML,CSS and Programming languages, introduction to web servers and Server Products. Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database	6
3.	**Application of computers in Pharmacy** – Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems,	5

	barcode medicine identification and automated dispensingof drugs, mobile technology and adherence monitoring Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System	
4.	**Bioinformatics:** Introduction, Objective of Bioinformatics,Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery	5
5.	**Computers as data analysis in Preclinical development**: Chromatographic dada analysis(CDS),Laboratory Information management System(LIMS) and Text Information Management System(TIMS)	5
6	**Introduction of Artificial intelligence:** Introduction to AI, foundation of AI and history of AI intelligence,Role of Artificial Intelligence in the Pharmaceutical Industry	3
	Total	30

Recommended Texts/Reference books/web resources

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 – 11000

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Bachelor of Pharmacy
Sub Code: BP206TT
SEMESTER: II
Subject Name: Environmental Sciences

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

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1. Create the awareness about environmental problems among learners.
CO 2. Impart basic knowledge about the environment and its allied problems.
CO 3. Develop an attitude of concern for the environment.
CO 4. Motivate learner to participate in environment protection and environment improvement.

Teaching Scheme and Examination Scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
2	-	-	2	35	15	-	-

Unit	Course Content	Hours
1	The Multidisciplinary nature of environmental studies Natural Resources Renewable and non-renewable resources: Natural resources and associated problems Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources	10
2	Ecosystems: Concept of an ecosystem. Structure and function of an ecosystem. Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	10
3	Environmental Pollution: Air pollution; Water pollution; Soil pollution	10
	Total	30

Recommended Books (Latest Editions)

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

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Bachelor of Pharmacy
Sub Code: BP207P (Practical)
SEMESTER**:** II
Subject Name: Human Anatomy & Physiology- II

Scope: Practical physiology is complimentary to the theoretical discussions in physiology. Practical's allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject.

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

CO 1: Study of various systems using models and charts.

CO 2: Explain different family planning methods and demonstration of feedback mechanism.

CO 3: Demonstration of instrument used to evaluate different physiological parameters of the body.

CO4**:** Examine different tastes and roles of BMI & PFI in humans.

Teaching Scheme and Examination Scheme:

Teaching Scheme				**Evaluation Scheme**			
Theory	**Tutorial**	**Practical**	**Total**	**Theory**		**Practical**	
				External	**Internal**	**External**	**Internal**
-	**-**	**4**	**2**	**-**	**-**	**35**	**15**

S.No	**Details of experiment**
1.	To study the nervous system using specimen, models, etc.,
2.	To study the endocrine system using specimen, models, etc
3.	To examine nervous system including cranial nerve, sensory system, motor system and reflexes.
4.	To examine the different types of taste.
5.	Recording of body temperature.
6.	To demonstrate positive and negative feedback mechanism
7.	Determination of tidal volume and vital capacity
8.	Study of digestive, respiratory, cardiovascular systems with the help of models, charts and specimens.
9.	Study of urinary and reproductive systems with the help of models, charts and specimens.
10.	Recording of Basal Mass Index (BMI).
11.	Recording of Physical Fitness Index (PFI).
12.	Study of family planning devices and pregnancy diagnosis test
13.	Demonstration of total blood count by cell analyser.
14.	Permanent slides of vital organs and gonads.
15.	Determination the presence of Bile Salts in Urine.

Recommended Texts/Reference books/web resources:

1. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.
2. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi
3. Kale S R,Kale R R. practical human anatomy and physiology.19 th ed. Pune. Nirali prakashan; 2009.
4. Goyal R K, Natvar M P, Shah S A. Practical anatomy, Physiology and biochemistry,1st ed. Publisher: B S Shah Publisher: Ahmadabad; 1988
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 th ed. Harcot Publishers: Singapore; 2000.

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Bachelor of Pharmacy
Sub Code: BP208P
SEMESTER**:** II
Subject Name: Pharmaceutical Organic Chemistry I

Scope: 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 the 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 Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: Demonstrate the skills on determination of various physical properties of organic molecules.
CO 2: Differentiate various classes of organic compounds by experimental techniques.
CO 3: Perform chemical reaction and purification of organic compounds of pharmaceutical interest.
CO 4: Analyze the identification of the organic compounds with different functional groups.

Teaching Scheme and Examination Scheme

Teaching Scheme				**Evaluation Scheme**			
Theory	**Tutorial**	**Practical**	**Total**	**Theory**		**Practical**	
				External	**Internal**		**Internal**
-	**-**	**4**	**2**	**-**	**-**	**35**	**15**

S.No	**Details of experiment**
1	Safety measures in an organic laboratory.
2	**Introduction to laboratory techniques:** Calibration of thermometer, melting point, boiling point, distillation, and crystallization.
3	**Systematic qualitative analysis of unknown organic compounds (min 05)** a) Preliminary test: color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc. a) Detection of elements like nitrogen, sulphur and halogen by Lassaigne's test. b) Solubility test c) Functional group test like phenols, amides, carbohydrates, amines, carboxylic acids, aldehydes and ketones, alcohols, esters, aromatic and halogenated hydrocarbons, nitro compounds and anilides. d) Melting point/Boiling point of organic compounds. e) Identification of the unknown compound from the literature using melting point/ boiling point.

4	Preparation of suitable solid derivatives from organic compounds.
5	Building of molecular models of structures containing various functional groups

Recommended Texts/Reference books/web resources:

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.

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Bachelor of Pharmacy
Sub Code: BP209P (Practical)
SEMESTER**:** II
Subject Name: Biochemistry

Scope: It deals with the application of fundamentals of analytical chemistry and principles of analysis of drugs.

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: Understand the Qualitative analysis of carbohydrates and Protein.
CO 2: Understand the Quantitative analysis of reducing sugars and how to prepare buffer solution.
CO 3: Understand the determination technique of blood creatinine, blood sugar and serum total cholesterol
CO4**:** Understand the catalytic role of Salivary enzyme based on hydrolysis of starch.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
-	-	4	2	-	-	35	15

Unit	Course Content
1	• Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch) • Identification tests for Proteins (albumin and Casein)
2	• Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method) • Qualitative analysis of urine for abnormal constituents • Preparation of buffer solution and measurement of pH
3	• Determination of blood creatinine • Determination of blood sugar • Determination of serum total cholesterol
4	• Study of enzymatic hydrolysis of starch • Determination of Salivary amylase activity • Study the effect of Temperature on Salivary amylase activity • Study the effect of substrate concentration on salivary amylase activity

Recommended Texts/Reference books/web resources:

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.

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Bachelor of Pharmacy
Sub Code: BP210P (Practical)
SEMESTER**:** II
Subject Name: Computer Application in Pharmacy

Scope: It deals with the application of practical knowledge of computer in field of Pharmacy

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: Perform different Web Technologies.
CO 2: Perform the operating system of computer and its applications in pharmacy.
CO3**:** Analyze the statistical quality control of X-bar chart, R chart, c chart, p chart.
CO4: Lean to use AI software and application of it in Pharmacy

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
-	-	2	1	-	-	35	15

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

Recommended Texts/Reference books/web resources:

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
3. Wiley-Interscience, A John Willey and Sons, INC., Publication, USA
4. Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA)
5. 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 - 11000

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Bachelor of Pharmacy
Sub Code: BP301T
SEMESTER**:** III
Subject Name: Pharmaceutical Organic Chemistry-II

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

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: Understand the reactivity, method of preparation, orientation of reaction, name reaction, structure & use of Benzene & Its derivatives.
CO 2: Understand the reactivity, method of preparation, name reaction, structure & use of Phenols, Aromatic amines and Aromatic acids.
CO 3: Understand the reactions & stability of fats & oils.
CO 4: Understand the reactivity, method of preparation, name reaction, synthesis, structure & use of Polynuclear hydrocarbons and stability, isomerism & preparation of Cycloalkanes.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1.	**Benzene and its derivatives:** • Analytical, synthetic and other evidences in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's rule • Reactions of benzene - nitration, sulphonation, halogenation-reactivity, Friedelcrafts alkylation- reactivity, limitations, Friedelcrafts acylation. • Substituents, effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction. • Structure and uses of DDT, Saccharin, BHC and Chloramine	10

2.	**Phenols*:** • Acidity of phenols, effect of substituents on acidity, qualitative tests, Structureand uses of phenol, cresols, resorcinol, naphthols. **Aromatic Amines*:** • Basicity of amines, effect of substituents on basicity, and synthetic uses of aryldiazonium salts. **Aromatic Acids*:** • Acidity, effect of substituents on acidity and important reactions of benzoicacid.	10
3.	**Fats and Oils:** • Fatty acids – reactions. • Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Dryingoils. • Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination.	10
4.	**Polynuclear hydrocarbons:** • Synthesis, reactions • Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives	8
5.	**Cyclo alkanes*:** • Stabilities – Baeyer's strain theory, limitation of Baeyer's strain theory, Coulson and Moffitt's modification, Sachse Mohr's theory (Theory of strainless rings), reactions of cyclopropane and cyclobutane only	7
	Total	45

Note: 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

Recommended Texts/Reference books/web resources:

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

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Bachelor of Pharmacy
Sub Code: BP302T
SEMESTER**:** III
Subject Name: Physical Pharmacy-I

Scope: 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 studentto get a better insight into various areas of formulation research and development, and stability studiesof pharmaceutical dosage forms.

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO1: Study of various parameters related to solubility of drug and factors affecting solubility of solid in liquid and gases in liquid.
CO2: Study of state of matter and physical properties of drug molecules.
CO3: Understand concepts of surface and interfacial tension.
CO4: Study the theoretical concepts of Complexation and Protein binding.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	**Solubility of drugs** Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions. Partially miscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications	10
2	**States of Matter and Properties of matter** State of matter, changes in the state of matter, latent heats, vapour pressure, sublimation critical point, eutectic mixtures, gases, 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.	10

3	**Surface and interfacial phenomenon** Liquid interface, surface & interfacial tensions, surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB Scale, solubilisation, detergency, adsorption at solid interface.	10
4	**Complexation and protein binding** Introduction, Classification of Complexation, Applications, methods of analysis, protein binding.	07
5	**pH, buffers and Isotonic solutions** Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in biological systems, buffered isotonic solutions.	08
	Total	45

Recommended Texts/Reference books/web resources:

1. Physical Pharmaceutics by C.V.S. Subramanyam
2. Physical Pharmacy by Alfred Martin
3. Experimental Pharmaceutics by Eugene, Parott.
4. Tutorial Pharmacy by Cooper and Gunn.
5. Stocklosam J. Pharmaceutical Calculations, Lea &Febiger, Philadelphia.
6. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, MarcelDekkar Inc.
7. Liberman H.A, Lachman C, Pharmaceutical Dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
8. Physical Pharmaceutics by Ramasamy C and ManavalanR.
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

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Bachelor of Pharmacy
Sub Code: BP303T
SEMESTER**:** III
Subject Name: Pharmaceutical Microbiology

Scope: Study of all categories of microorganisms especially for the production of alcohol antibiotics,vaccines, vitamins enzymes etc...

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

CO1: Understand the introduction to Microbiology, Microscopy and detailed description about bacteria, virus and fungi.
CO2: Understand the concept involved in various staining techniques, sterilization and disinfectants.
CO3: Knowledge of aseptic area, various sterility, standardization and microbial assay methods.
CO4**:** Understand the concept of microbial spoilage, contaminants and method for preservation.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Contents	Hours
1	**Basics of Microbiology:** Introduction, history of microbiology, its branches, scope and its importance. Introduction to Prokaryotes and Eukaryotes: Study of ultra-structure and morphological classification of bacteria, nutritional requirements, raw materialsused for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total & viable count). **Types of Microscopy:** Study ofdifferent types of phase contrast microscopy, dark field microscopy and electron microscopy	10
2	**Identification of bacteria:** Identification of bacteria using staining techniques (simple, Gram's &Acid faststaining) and biochemical tests (IMViC). **Sterilization:** Study of principle, procedure, merits, demerits and applications of physical, chemical gaseous, radiation and mechanical method of sterilization. Evaluation of the efficiency of sterilization methods. Equipments employed in large scale sterilization. Sterility indicators	10

3	**Fungi and Viruses:** Study of morphology, classification, reproduction/replication and cultivation ofFungi and Viruses. **Disinfection:** Classification and mode of action of disinfectants Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic andbactericidal actions. **Sterility Testing:** Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.	10
4	**Aseptic Practice:** Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification. **Microbiological Assay:** Principles and methods of different microbiological assay. Methods forstandardization of antibiotics, vitamins and amino acids. Assessment of a new antibiotic.	8
5	**Contamination and Prevention:** Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage. Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations. **Cell Culture:** Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures. Application of cell cultures in pharmaceutical industry and research.	7
	Total	45

Recommended Texts/Reference books/web resources:

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

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Bachelor of Pharmacy
Sub Code: BP304T
SEMESTER**:** III
Subject Name: Pharmaceutical Engineering

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

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO1: Understand the theoretical concepts and principles of mechanism of size reduction and size separation.
CO2: Understand the basic concepts of evaporation and study the during rule and Raoult's law. Study the various laws related to distillation and theoretical concept of various distillation process.
CO3: Study of various dryers and the rate of drying curve and various parameters related it and factor affecting mixing.
CO4: Understand the theoretical concept and principle used in filtration and centrifugation, different types of filters and centrifuges. To understand material handling technique.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	**Size Reduction:** Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill, Roller Mill, Cutter 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, Alpine Airjet Sieve, Bag filter & elutriation tank	10
2	**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	10

	simple distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation	
3	**Drying:** Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demeritsof 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	10
4	**Filtration:** Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working,Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drumfilter, Meta filter & Cartridge filter, membrane filters and Seidtz filter **Centrifugation:** Objectives, principle & applications of Centrifugation,principles, construction, working, uses, merits and demerits of Perforatedbasket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge.	10
5	**Materials of pharmaceutical plant construction, Corrosion and its prevention:** Factors affecting during materials selected for Pharmaceutical plant construction, Theories of corrosion, types of corrosion and there prevention. Ferrous and nonferrous metals, inorganic and organic non metals, basic of material handling systems.	5
	Total	45

Recommended Texts/ Reference books/ web resources:

1. Introduction to chemical engineering – Walter L Badger & Julius Banchero, Latest edition.
2. Solid phase extraction, Principles, techniques and applications by Nigel J.K. Simpson-Latestedition.
3. Unit operation of chemical engineering – Mcabe Smith, Latest edition.
4. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latestedition.
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

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Bachelor of Pharmacy (Practical)
Sub Code: BP305P
SEMESTER**:** III
Subject Name: Pharmaceutical Organic Chemistry II

Scope: It deals with synthesis of drugs/intermediates and Assay of drugs.

Course 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.
CO 4**:** Understand the Lab Scale reaction processes

Teaching Scheme and Examination Scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
-	-	4	2	-	-	35	15

S.No	Details of experiment
1	**Experiments involving laboratory techniques** a. Recrystallization b. Steam distillation
2	**Determination of following oil values (including standardization of reagents)** a. Acid value b. Saponification value c. Iodine value
3	**Preparation of compounds** a. Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol /Aniline by acylation reaction. b. 2,4,6-Tribromo aniline/Para bromo acetanilide from Aniline/ c. Acetanilide by halogenation (Bromination) reaction. d. 5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction e. Benzoic acid from Benzyl chloride by oxidation reaction. f. Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction. g. 1-Phenyl azo-2-napthol from Aniline by diazotization and coupling reactions. h. Benzil from Benzoin by oxidation reaction.

	i. Dibenzal acetone from Benzaldehyde by Claison Schmidt reaction j. Cinnammic acid from Benzaldehyde by Perkin reaction k. P-Iodo benzoic acid from P-amino benzoic acid

Recommended Texts/Reference books/web resources:

1. 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 Delhi: 2004

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Bachelor of Pharmacy
Sub Code: BP306P(Practical)
SEMESTER**:** III
Subject Name: Physical Pharmacy-I

Scope: 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: Upon successful completion of this course, the student should be able to:
CO1: Demonstrate the skills on determination of various physical properties of drugmolecules.
CO 2: Operate equipments like pH meter, Refractometer etc.,
CO 3: Calculate the buffer capacities of pharmaceutical buffers by experimental techniques.
CO 4: Determination of surface and interfacial tension of given liquids by different method.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
-	-	4	2	-	-	35	15

S. No	Details of experiment
1	To determine solubility of drug at room temperature
2	To determine CMC of given surfactant using Stalagmometer based on surface tension measurement
3	To determine surface tension and parachor value of benzene, toluene and CH_2 using Ostwald Stalagmometer
4	Determination of surface tension of given liquids by drop weight method
5	To determine distribution co-efficient of iodine between CCl_4 and H_2O
6	To determine distribution co-efficient of benzene between benzoic acid and water
7	To determine interfacial tension between two liquids using Ostwald Stalagmometer
8	To determine upperconsolute temperature of phenol water system
9	To analyze copper glycerin complex by pH titration method calculation of n & p[A] at pH 3.30 and 8
10	To evaluate complex action behaviour of caffeine and PABA
11	To determine pKa of weak acid by buffer capacity and dissociation of acid
12	To determine HLB value of given surfactant

Recommended Texts/Reference books/web resources:

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

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Bachelor of Pharmacy
Sub Code: BP307P (Practical)
SEMESTER**:** III
Subject Name: Pharmaceutical Microbiology

Scope: Its deals with fundamental procedures for identification of microorganisms, sterilization procedures and microbiological assays of antibiotics.

Course Outcomes: Upon successful completion of this course, students should be able to:
CO1: Understand the processing of different equipments required in experimental microbiology and different sterilization procedures.
CO2: Learn and practice sub culturing of microorganisms and different staining techniques for identification of microorganism.
CO3: Illustrate isolation of microorganism and microbiological assay of antibiotics.
CO4**:** Learn sterility testing of pharmaceuticals and biochemical tests.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
-	-	4	4	-	-	35	15

S.No	Details of experiment
1	Introduction and study of different equipment and processing, e.g., B.O.D. incubator, laminar flow,aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.
2	Sterilization of glassware, preparation and sterilization of media.
3	Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.
4	Staining methods- Simple, Grams staining and acid fast staining (Demonstration with practical).
5	Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques.
6	Microbiological assay of antibiotics by cup plate method and other methods.
7	Motility determination by Hanging drop method.
8	Sterility testing of pharmaceuticals.
9	Bacteriological analysis of water
10	Biochemical test.

Recommended Texts/Reference books/web resources:

1. Rakesh Patel & kiran Patel, Experimental Microbiology, Aditya Publication, Ahmedabad, Gujarat.

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Bachelor of Pharmacy
Sub Code: BP308P(Practical)
SEMESTER**:** III
Subject Name: Pharmaceutical Engineering

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

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: Demonstrate the techniques of filtration, distillation and size reduction.
CO 2: Perform and illustrate different mixing and Evaporation techniques.
CO3: Measure humidity at different environments using dry bulb and wet bulb thermometers.
CO4: To study the effect of temperature on percentage yield of crystal on given sample of $CuSO_4$

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
-	-	4	2	-	-	35	15

S. No	Details of experiment
1	To demonstrate steam distillation
2	To study the effect of temperature on rate of evaporation
3	To study the effect of surface area on rate of evaporation
4	To study the effect of surface area on rate of filtration
5	To study the effect of thickness of filter paper on rate of filtration
6	To study the effect of viscosity of slurry on rate of filtration
7	To study the effect of surface area on the rate of drying
8	To study the effect of type of solid material on rate of drying
9	To demonstrate fluidized bed dryer
10	To study the effect of temperature on percentage yield of crystal on given sample of $CuSO_4$
11	To demonstrate freeze dryer
12	Determination of humidity of air- i) from wet and dry bulb temperatures-use of Dew point method
13	To calculate the uniformity Index for given sample by using Double Cone Blender

Recommended Texts/Reference books/web resources:

1. Paradkar A. Introduction to Pharmaceutical Engineering. Eleventh Edition, Nirali Prakashan, Pune. 2007.
2. Badger WL, Banchero JT. Introduction to Chemical Engineering. International Edition, McGraw Hill Book Company. 1955.
3. Subrahmanyam CVS, Thimma Setty J, Sarasija Suresh, Kusum Devi V. Pharmaceutical Engineering Unit Operations-II. Second Edition, Vallabh Prakashan, Delhi. 2011.
4. Tekade AR, Pande VV, Shastri KV. Pharmaceutical Engineering. First Edition, TechMax Publications, Pune. 2015.
5. Sambamurthy K. Pharmaceutical Engineering. First Edition, New Age International Publishers, New Delhi. 1998

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Bachelor of Pharmacy
Sub Code: BP309UHV
Semester**:** III
Subject Name: Human Values & Professional Ethics (Audit Course)

Scope: This course is universally adaptable, involving a systematic and rational study of the human being vis-a-vis the rest of existence. It is free from any dogma or value prescriptions. It is a process of self-investigation and self-exploration, not giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated to verify it in their right based on their Natural Acceptance and Experiential Validation. This process of self-exploration takes the form of a dialogue between the teacher and the students, to begin with, and within the student himself/herself finally. This self-exploration also enables them to evaluate their pre-conditionings and present beliefs.

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: Help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
CO2: Facilitate the development of a Holistic perspective among students towards life, profession, and happiness, based on a correct understanding of Human reality and the rest of existence. Such a holistic perspective forms the basis of Value-based living in a natural way
CO 3: Highlight plausible implications of such a Holistic understanding in terms of ethical human
CO4: conduct, trustful and mutually satisfying human behavior, and mutually enriching interaction with Nature.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
2	-	-	-	-	-	-	-

Unit	Course Content	Hours
1	**Introduction –Need, Basic Guidelines, and Content** 1. Understanding the need, basic guidelines, content and process for value Education 2. Self-Exploration – What is it? – its content and process: 'Natural Acceptance' and Experiential Validation – as the mechanism for self-explanation 3. Continuous Happiness and Prosperity – A look at basic Human Aspirations	4
2	**Process for Value Education**	4

	1. Right Understanding, Relationship and Physical Facilities – basic requirements for fulfillment of aspirations of every human being with their correct priority 2. Understanding Happiness and prosperity correctly – A critical appraisal of the current scenario 3. Method to fulfill the above human aspirations; understanding and living in harmony at various levels	
3	**Understanding Harmony in the Human Being –** 1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body' 2. Understanding the needs of Self ('I') and 'Body' – Sukh and Suvidha 3. Understanding the Body as an instrument of 'I' (I being the doer, seer, and enjoyer)	4
4	**Harmony in Myself** 1. Understanding the characteristics and activities of 'I' and harmony in 'I' 2. Understanding the harmony of I with the Body: Sanyam and Swasthya: correct appraisal of Physical needs, meaning of Prosperity in detail 3. Programs to ensure Sanyam and Swasthya – practice exercises and Case Studies will be taken up in Practice Sessions	4
5	**Understanding Harmony in the Family and Society – Harmony in Human - Human Relationship** 1. Understanding harmony in the family – the basic unit of human interaction 2. Understanding values in human relationship; the meaning of Nyaya and Program for its fulfillment to ensure Ubhay-tripti	4
6	**Trust (Vishwas) and Respect (Samman) as the foundational values of relationship.** Understanding the meaning of Vishwas;Difference between intention and competence. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astiva as comprehensive Human Goals. Visualizing a universal harmonious order in society - Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha) - from family to world family!	4
7	**Understanding Harmony in nature and Existence - Whole Existence as Co-existence:** Understanding the harmony in Nature. Interconnectedness and mutual fulfillment among the four orders of nature - recyclability and self-regulation in nature. Understanding Existence as Co-	4

	existence (Sah-astiva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence	
8	**Implications of the above Holistic Understanding of Harmony on Professional Ethics:** Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order, b. Ability to identify the scope and characteristics of people-friendly and ecofriendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.	4
	Total	30

Recommended Texts/Reference books/web resources:

1. R R Gaur, R, Sangal, G.P Bagaria, A Foundation Course in Value Education (English), 2009.
2. R R Gaur, R Sangal G P Bagaria, Teacher's Manual (English), 2009
3. Ivan IIIich, Energy& Equity, The Trinity Press, Worcester, and Harper Collins, USA, 1974
4. Schumacher E.F, Small is Beautiful; a study of economics as if people mattered, Blond & Briggs, Britain, 1973.
5. Nagraj A, Jeevan Vidya to Na Prayanam, Hyderabad, 1998.
6. Pradeep Kumar R., Jeevan Vidya to Na Prayanam, Hyderabad, 2013
7. Sussan George, How the other half Dies, Penguin Press, Peprinted 1986, 1991
8. Dhar PL, Gaur RR, Science and Humanism, commonwealth publishers, 1990.
9. A.N. Tripathy, Human values, New Age International Publishers, 2003.
10. Subhas Palekar, how to practice natural Farming, Pracheen (Vaidik) Krishi tantra shodh, Amravati, 2000.
11. Donella H. Meadows, Dennis L. Meadows,Jorgen Randers, William W. B1ehrens III, Limits to Growth – club of Rome's report, universe Books, 1972
12. E.G. Seebauer & Robert, L BERRY, Foundations of Ethics for Scientists & Engineers, Oxford University Press, 2000.
13. Govindrajran M., Natrajan S & Senthi Kumar V.S., Engineering Ethics (including human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
14. Banerjee B P, Foundations of Ethics and Management, Excel books, 2005.
15. B.L. Bajpai, Indian Ethos and Modern Management, New Royal book Co; Lucknow, 2004

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Bachelor of Pharmacy
Sub Code: BP401T
SEMESTER**:** IV
Subject Name: Pharmaceutical Organic Chemistry III

Scope: This subject imparts knowledge on stereo-chemical aspects of organic compounds and organic reactions, important named reactions, chemistry of important hetero cyclic compounds. It also emphasizes on medicinal and other uses of organic compounds.

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

CO 1: Understand the Stereo isomerism, Optical isomerism
CO 2: Understand the Geometric isomerism and Stereo Chemical reactions of Chiral molecules
CO 3: Understand the Chemistry, Nomenclature, Classification of Heterocyclic compound and their synthesis, reaction and medicinal uses of Heterocyclic compound derivatives
CO4: Understand the Reaction of synthesis of oxidation and reduction reaction of Organic Compounds

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	-	75	25	-	-

Unit	Course Content	Hours
1	**Stereo isomerism** • Optical isomerism: Optical activity, enantiomerism, diastereoisomerism, meso compounds • Elements of symmetry, chiral and achiral molecules • Sequence rules • DL system of nomenclature of optical isomers, RS system of nomenclature of optical isomers • Reactions of chiral molecules • Racemic modification and resolution of racemic mixture. Asymmetric synthesis: partial and absolute	10
2	**Geometrical isomerism** • Nomenclature of geometrical isomers (Cis Trans, EZ, Syn -Anti systems) • Methods of determination of configuration of geometrical isomers • Conformational isomerism in Ethane, n-Butane and Cyclohexane • Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity • Stereospecific and stereoselective reactions	10

3	**Heterocyclic compounds:** • Nomenclature and classification • Synthesis, reactions and medicinal uses of following compounds/derivatives: Pyrrole, Furan, and Thiophene • Relative aromaticity and reactivity of Pyrrole, Furan and Thiophene	10
4	**Synthesis, reactions and medicinal uses of following compounds/ derivatives** • Pyrazole, Imidazole, Oxazole and Thiazole. • Pyridine, Quinoline, Isoquinoline, Acridine and Indole • Basicity of pyridine • Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives	8
5	**Reactions of synthetic importance** • Metal hydride reduction (NaBH4 and LiAlH4), • Clemmensen reduction • Birch reduction • Wolff Kishner reduction Oppenauer-oxidation and Dakin reaction. Beckmanns rearrangement and Schmidt rearrangement • Claisen-Schmidt condensation	7
	Total	45

Recommended Texts/Reference books/web resources:

1. Organic chemistry by I.L. Finar, Volume-I & II.
2. A text book of organic chemistry – Arun Bahl, B.S. Bahl
3. Heterocyclic Chemistry by Raj K. Bansal
4. Organic Chemistry by Morrison and Boyd
5. Heterocyclic Chemistry by T.L. Gilchrist
6. Organic Chemistry by Mehta and Mehta

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Bachelor of Pharmacy
Sub Code: BP402T
SEMESTER**:** IV
Subject Name: Medicinal Chemistry I

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

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

CO 1 Understand the chemistry of drugs with respect to their pharmacological activity
CO 2: Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
CO 3: Know the Structural Activity Relationship (SAR) of different class of drugs
CO4**:** Write the chemical synthesis of some drugs

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	**Introduction to Medicinal Chemistry** **History and development of medicinal chemistry** **Physicochemical properties in relation to biological action** **Drug metabolism** • Drug metabolism principles- Phase I • Drug metabolism principles- Phase II. • Factors affecting drug metabolism including stereo chemical aspects	10
2	**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, Terbutaline. Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline. • Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine, Propylhexedrine. • Agents with mixed mechanism: Ephedrine, Metaraminol.	10

	Adrenergic Antagonists: • Alpha adrenergic blockers: Tolazoline*, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide. Beta adrenergic blockers**:** SAR of beta blockers, Propranolol*, Metibranolol, Atenolol, Betazolol, Bisoprolol, Esmolol, Metoprolol, Labetolol, Carvedilol.	
3	**Cholinergic neurotransmitters:** • Biosynthesis and catabolism of acetylcholine. • Cholinergic receptors (Muscarinic & Nicotinic) and their distribution. • Parasympathomimetic agents: SAR of Parasympathomimetic agents • Direct acting agents: Acetylcholine, Carbachol*, Bethanechol, Methacholine,Pilocarpine. • Indirect acting/ Cholinesterase inhibitors (Reversible & Irreversible): Physostigmine, Neostigmine*, Pyridostigmine, Edrophonium chloride, Tacrine hydrochloride, Ambenonium chloride, Isofluorphate, Echothiophateiodide, Parathione, Malathion. • Cholinesterase reactivator: Pralidoxime chloride. • Cholinergic Blocking agents: SAR of cholinolytic agents • Solanaceous alkaloids and analogues: Atropine sulphate, Hyoscyaminesulphate, Scopolamine hydrobromide, Homatropine hydrobromide, Ipratropium bromide*. • Synthetic cholinergic blocking agents: Tropicamide, Cyclopentolate hydrochloride, Clidinium bromide, Dicyclomine hydrochloride*, Glycopyrrolate, Methantheline bromide, Propantheline bromide, Benztropine mesylate, Orphenadrine citrate, Biperidine hydrochloride, Procyclidine hydrochloride*, Tridihexethyl chloride, Isopropamide iodide,Ethopropazine hydrochloride.	10
4	**Drugs acting on Central Nervous System** **Sedatives and Hypnotics:** • Benzodiazepines: SAR of Benzodiazepines, Chlordiazepoxide, Diazepam*,Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem • Barbiturtes: SAR of barbiturates, Barbital*, Phenobarbital, Mephobarbital,Amobarbital, Butabarbital, Pentobarbital, Secobarbital • Miscelleneous: • Amides & imides: Glutethmide. • Alcohol & their carbamate derivatives: Meprobomate, Ethchlorvynol. Aldehyde & their derivatives: Triclofos sodium, Paraldehyde. **Antipsychotics** • Phenothiazeines: SAR of Phenothiazeines - Promazine hydrochloride, Chlorpromazine hydrochloride*, Triflupromazine, Thioridazine hydrochloride, Piperacetazine hydrochloride, Prochlorperazine maleate,Trifluoperazine hydrochloride. • Ring Analogues of Phenothiazeines: Chlorprothixene, Thiothixene,Loxapine succinate, Clozapine. • Fluro buterophenones: Haloperidol, Droperidol, Risperidone.	8

	• Beta amino ketones: Molindone hydrochloride. • Benzamides: Sulpieride. **Anticonvulsants:** SAR of Anticonvulsants, mechanism of anticonvulsant action • Barbiturates: Phenobarbitone, Methabarbital. • Hydantoins:Phenytoin*, Mephenytoin, Ethotoin • Oxazolidine diones: Trimethadione, Paramethadione • Succinimides: Phensuximide, Methsuximide, Ethosuximide* • Urea and monoacylureas: Phenacemide, Carbamazepine* • Benzodiazepines: Clonazepam Miscellaneous: Primidone, Valproic acid , Gabapentin, Felbamate	
5	**Drugs acting on Central Nervous System:** **General anesthetics:** • Inhalation anesthetics: Halothane*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane. • Ultra short acting barbitutrates: Methohexital sodium*, Thiamylal sodium, Thiopental sodium. • Dissociative anesthetics: Ketamine hydrochloride.* **Narcotic and non-narcotic analgesics :** • Morphine and related drugs: SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anilerdine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate*,Methadone hydrochloride*, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartarate. • Narcotic antagonists: Nalorphine hydrochloride, Levallorphan tartarate,Naloxone hydrochloride. **Anti-inflammatory agents:** • Sodium salicylate, Aspirin, Mefenamic acid*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepriac, Diclofenac, Ketorolac, Ibuprofen*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.	7
	Total	45

Note: Study of the development of the classes of drugs, Classification, mechanism of action, uses ofdrugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*)

Recommended Texts/Reference books/web resources:

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

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Bachelor of Pharmacy
Sub Code: BP403T
SEMESTER**:** IV
Subject Name: Physical Pharmaceutics II

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

Course Outcomes: Upon successful completion of this course, students should be able to:
CO1: Understand various rheological properties.
CO2: Study and remember dispersed system and their characteristics.
CO3: Understand various physicochemical properties of drug molecules in the designing the dosage forms.
CO4**:** remember and study the principles of chemical kinetics and use them for stability testing.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	--	4	75	25	-	-

Unit	Course Contents	Hours
1	**Colloidal dispersions:** Classification of dispersed systems & their generalcharacteristics, size & shapes of colloidal particles, classification of colloids & comparative account of their general properties. Optical, kinetic & electrical properties. Effect of electrolytes, coacervation, peptization& protective action.	10
2	**Rheology:** Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling Sphere, rotational viscometers **Deformation of solids:** Plastic and elastic deformation, Heckel equation, Stress,Strain, Elastic Modulus	09
3	**Coarse dispersion:** **Suspension:** Interfacial properties of suspended particles, settling in suspensions, formulation of flocculated and deflocculated suspensions. **Emulsions**: theories of emulsification, micro emulsion and multiple emulsions; Stability of emulsions, preservation of emulsions, rheological properties of emulsions and emulsion formulation by HLB method.	08
4	**Micromeretics:** Particle size and distribution, mean particle size, number and weight distribution, particle number, methods for determining particle size by different methods, counting and separation method, particle shape, specific	09

	surface, methods for determining surface area, permeability, adsorption. Derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.	
5	**Drug stability:** Reaction kinetics: zero, pseudo-zero, first & second order, unitsof 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. Photolyticdegradation and its prevention.	09
	Total	45

Recommended Texts/Reference books/web resources:

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, MarcelDekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3.Marcel Dekkar Inc.
7. Physical Pharmaceutics by Ramasamy C, and Manavalan R.

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Bachelor of Pharmacy
Sub Code: BP404T
SEMESTER**:** IV
Subject Name: Pharmacology-I

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

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO1: Understand general principles of pharmacology, Pharmacokinetic and pharmacodynamics parameters, effect of different enzymes in drug metabolism, detailed description of various terms used in pharmacology. Explain the mechanism of working of receptors and their principles.
CO2: Understand about Drug discovery phases DI, ADRs, PV, and Clinical phases. Functions of ANS, transmission processes, mechanism of drug action at organ system.
CO3: Observe the effect of drugs on animals by simulated experiments, Understand neurohumoral transmission in CNS and the action of different agents on CNS.
CO4: Recognized correlation of pharmacology with other biomedical sciences and drug action in different CNS disorders.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	**General Pharmacology** **a.** Introduction to Pharmacology- 1. Definition, historical landmarks, and Scope of Pharmacology 2. Nature and source of drugs, and routes of drug administration. 3. Essential drugs concept, Agonists, Antagonists (competitive and noncompetitive) 4. Definition: Spare receptors, Addiction, Tachyphylaxis, Idiosyncrasy, Allergy. **b.** Pharmacokinetics- 1. Membrane transport, 2. Absorption, Distribution, Metabolism, and Excretion of drugs. 3. Enzyme induction, enzyme inhibition, kinetics of elimination.	8

2	**General Pharmacology** a. Pharmacodynamics- 1. Principles and mechanisms of drug action. 2. Receptor theories and classification of receptors and Regulation of receptors. 3. Drug receptors interactions signal transduction mechanisms. 4. i. G-protein–coupled receptors, ii. Ion channel receptor, iii. Transmembrane enzyme linked receptors, iv. transmembrane JAK-STAT binding receptor. 5. Receptors that regulate transcription factors, Dose Response Relationship, 6. Therapeutic Index, Combined effects of drugs and factors modifying drug action. b. Adverse drug reactions. c. Drug interactions (pharmacokinetic and pharmacodynamic) d. Drug discovery and clinical evaluation of new drugs -Drug discovery phase, Preclinical evaluation phase, Clinical trial phase & phases of clinical trials, Pharmacovigilance.	12
3	**Pharmacology of drugs acting on peripheral nervous system** a. Organization and function of ANS. b. Neurohumoral transmission, Co-transmission and classification of neurotransmitters. c. Parasympathomimetics, Parasympatholytics, Sympathomimetics, sympatholytics. d. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral). e. Local anesthetic agents. f. Drugs used in myasthenia gravis and glaucoma	10
4	**Pharmacology of drugs acting on central nervous system** a. Neurohumoral transmission in the C.N.S.special emphasis on importance of various neurotransmitters like GABA, Glutamate, Glycine, serotonin, and dopamine. **b.** General anesthetics and pre-anesthetics**.** c. Sedatives, hypnotics, and centrally acting muscle relaxants. d. Anti-epileptics e. Alcohols and disulfiram	8
5	**Pharmacology of drugs acting on central nervous system** a. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxietyagents, anti-manics and hallucinogens. b. Drugs used in Parkinson's disease and Alzheimer's disease. c. CNS stimulants and nootropics. d. Opioid analgesics and antagonists e. Drug addiction, drug abuse, tolerance and dependence.	7
	Total	45

Recommended Texts/Reference books/web resources

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,
3. Tata Mc Graw-Hill 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 PharmacologyPhysical Pharmaceutics by Ramasamy C, and Manavalan R
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

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Bachelor of Pharmacy
Sub Code: BP405T
SEMESTER**:** IV
Subject Name: PHARMACOGNOSY AND PHYTOCHEMISTRY I

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

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

CO1: To understand the techniques in the cultivation and production of crude drugs

CO2: To describe the crude drugs, their uses and chemical nature

CO3: To explain the evaluation techniques for the herbal drugs

CO4: To analyze the microscopic and morphological evaluation of crude drugs

Teaching Scheme and Examination Scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1.	**Introduction to Pharmacognosy:** • Definition, history, scope and development of Pharmacognosy • **Sources of Drugs** – Plants, Animals, Marine & Tissue culture.Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins). **Classification of drugs:** • Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sera 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 withcamera lucida.	10

2.	**Cultivation, Collection, Processing and Storage of Drugs of Natural Origin:** • Cultivation and Collection of drugs of natural origin • Factors influencing cultivation of medicinal plants. • Plant hormones and their applications. • Polyploidy, mutation and hybridization with reference to medicinal plants • Conservation of Medicinal Plants	10
3.	**Plant Tissue Culture:** • Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance. • Applications of plant tissue culture in pharmacognosy. • Edible vaccines	7
4.	**Pharmacognosy in various systems of medicine:** Role of Pharmacognosy in allopathy and traditional systems of medicine namely: • Ayurveda • Unani • Siddha • Homeopathy • Chinese systems of medicine. **Introduction to secondary metabolites:** Definition, classification, properties and test for identification of : • Alkaloids • Glycosides • Flavonoids • Tannins • Volatile oil and Resins	10
5.	Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs: **Plant Products:** • Fibers - Cotton, Jute, Hemp • Hallucinogens, Teratogens, Natural allergens **Primary metabolites:** General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic used and commercialutility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites: • **Carbohydrates:** Acacia, Agar, Tragacanth, Honey, Starch, Sodium alginate,Pectin, Guar gum • **Proteins and Enzymes:** Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin). • **Lipids(Waxes, fats, fixed oils)** : Castor oil, Chaulmoogra oil, Wool Fat, BeesWax **Marine Drugs:** Novel medicinal agents from marine sources	8
	Total	45

Recommended Texts/Reference books/web resources:

1. 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. T.E. Wallis, Textbook of Pharmacognosy, 5th edition, CBS Publishers &Distributors, New Delhi, 2005
4. Mohammad Ali. Pharmacognosy, CBS Publishers & Distributors, New Delhi 2008
5. C.K. Kokate, Purohit, Gokhlae. Text book of Pharmacognosy, Gokhlae (2007), 37th Edition,Nirali Prakashan, Pune, 2007
6. R.D. Choudhary, Herbal Drug Industry Ist Edn, Eastern Publisher, New Delhi, 1996
7. SH.Ansari, Essentials of Pharmacognosy, IInd edition, Birla publications, New Delhi, 2007
8. C.K. Kokate, Practical Pharmacognosy, 5th edition, Vallabh Prakashan, New Delhi, 2016.
9. M.A. Iyengar, Anatomy of Crude Drugs, Manipal Press, Manipal, 2001.
10. Biren Shah & A. K. Seth, Textbook of Pharmacognosy & Phytochemistry, 2nd edition, ElsevierPublication, New Delhi, 2011.
11. Khandelwal K. R. Practical Pharmacognosy, 9th edition, Nirali Prakashan, Pune, 2009
12. Agrawal S.S., Herbal Drug Technology, 2nd edition, Orient Blackswan, New Delhi, 2012.
13. Vyas S. P. and Dixit V. K., Pharmaceutical Biotechnology, 1st edition, CBS Publisher &Distributors, New Delhi, 2016.
14. WHO: Quality Control Methods for Medicinal Plant Materials, World Health organisation, Geneva, 1988.

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Bachelor of Pharmacy
Sub Code: BP406P (Practical)
SEMESTER**:** IV
Subject Name: Medicinal Chemistry I

Scope: It deals with synthesis of drugs/intermediates and Assay of drugs.

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: Understand the lab scale process chemistry
CO 3: Analyze the percentage purity of various classes of drugs as per the monographs in pharmacopoeias
CO 4: Understand the ratio of concentrations of the un-ionized species of any compound in the mixture of 2 immiscible stages

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
-	-	4	2	-	-	35	15

Sr.No	Details of experiment
1	**Preparation of drugs/ intermediates** 1 1,3-pyrazole 2 1,3-oxazole 3 Benzimidazole 4 Benztriazole 5 2,3- diphenyl quinoxaline 6 Benzocaine 7 Phenytoin 8 Phenothiazine 9 Barbiturate
2	**Assay of drugs** 1 Chlorpromazine 2 Phenobarbitone 3 Atropine 4 Ibuprofen 5 Aspirin 6 Furosemide
3	**Determination of Partition coefficient for any two drugs**

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

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Bachelor of Pharmacy
Sub Code: BP407P (Practical)
SEMESTER**:** IV
Subject Name: Physical Pharmaceutics II

Scope: Its deals with experiments which help students learn various areas and parameters of formulation research and development and stability studies ofpharmaceutical dosage forms.

Course Outcomes: Upon successful completion of this course, students should be able to:
CO1: Learn the determination of particle size and different types of densities of powder.
CO2: Understand and find the flow properties of powder and granules.
CO3: Find the sedimentation parameters of suspension and illustrate the methods to find viscosity.
CO4**:** Determine reaction rate constants for different order of reaction and find stability of a pharmaceutical product using acceleration stability study technique.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
-	-	4	2	-	-	35	15

S.No.	Details of experiment
1	Determination of particle size, particle size distribution using sieving method
2	Determination of particle size, particle size distribution using Microscopic method.
3	Determination of bulk density, true density and porosity
4	Determine the angle of repose and influence of lubricant on angle of repose.
5	Determination of viscosity of liquid using Ostwald's viscometer.
6	Determination sedimentation volume with effect of different suspending agent.
7	Determination sedimentation volume with effect of different concentration of a single suspending agent.
8	Determination of viscosity of semisolid by using Brookfield viscometer
9	Determination of reaction rate constant first order.
10	Determination of reaction rate constant second order
11	Accelerated stability studies

Recommended Texts/Reference books/web resources:

1. H. N. More & A. A. Hajare, Practical Physical Pharmacy, Career Publications, Maharashtra.
2. CVS Subramanyam, Textbook of Physical Pharmaceutics, Vallabh Prakashan, Delhi.

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Bachelor of Pharmacy
Sub Code: BP408P (Practical)
SEMESTER**:** IV
Subject Name: Pharmacology- I

Scope: Includes various preclinical experimental techniques and models for experiments in pharmacology.

Course 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.
CO 2: Evaluate the Preclinical drug screening experiments on intact animals.
CO 3: Evaluate the effect of the drug on animals (software basis).

Teaching Scheme and Examination Scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
-	-	4	2	-	-	35	15

S.No	Details of experiment
1.	Introduction to experimental pharmacology.
2.	Commonly used instruments in experimental pharmacology.
3.	Study of common laboratory animals.
4.	Maintenance of laboratory animals as per CPCSEA guidelines.
5.	Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies.
6.	Study of different routes of drugs administration in mice/rats.
7.	Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice.
8.	Effect of drugs on ciliary motility of frog oesophagus
9.	Effect of drugs on rabbit eye.
10.	Effects of skeletal muscle relaxants using rota-rod apparatus.
11.	Effect of drugs on locomotor activity using actophotometer.
12.	Anticonvulsant effect of drugs by MES and PTZ method.
13.	Study of stereotype and anti-catatonic activity of drugs on rats/mice.
14.	Study of anxiolytic activity of drugs using rats/mice.
15.	Study of local anesthetics by different methods.

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

Recommended Texts/Reference books/web resources:

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

2. Ghosh MN. Fundamentals of Experimental pharmacology.6 th ed.Kolkata: Hilton& company; 2008.
3. Kulakarni SK. Handbook of Experimental Pharmacology.4 th ed. New Delhi: vallabh Prakashan; 2012.
4. Ramesh k.Goyal, Natvar M.Patel, Prabhakar MC, Rajendra V.Bhatt and Anitha A.Mehta. Practicals in pharmacology.8 th ed.Ahmendabad:B.S.Shah Prakashan; 2009.
5. Parmar NS, Shiv Prakash. Screening Methods in Pharmacology. New Delhi: Narosa Publishing House; 2011.

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Bachelor of Pharmacy
Sub Code: BP409P (Practical)
SEMESTER**:** IV
Subject Name: PHARMACOGNOSY AND PHYTOCHEMISTRY

Scope: The emphasis and focus of research in *Pharmacognosy* have changed significantly, from focusing on identification of drugs and to determining the microscopical features of natural crude drugs.

Course Outcomes: Upon completion of the course, the student shall be able
CO 1: Evaluate crude drugs by chemical test.
CO 2: Demonstrate knowledge on evaluation of crude drugs.
CO3: To explain the phytochemical screening for the herbal drugs
CO4: To analyze the microscopic and morphological evaluation of crude drugs

Teaching Scheme and Examination Scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
-	-	4	2	-	-	35	15

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

Recommended Texts/Reference books/web resources:

1. Biren Shah & A. K. Seth, Textbook of Pharmacognosy & Phytochemistry, 2nd edition, ElsevierPublication, New Delhi, 2011.
2. Khandelwal K. R. Practical Pharmacognosy, 9th edition, Nirali Prakashan, Pune, 2009
3. C.K. Kokate, Practical Pharmacognosy, 5th edition, Vallabh Prakashan, New Delhi, 2016
4. WHO: Quality Control Methods for Medicinal Plant Materials, World Health organisation, Geneva, 1988.

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Bachelor of Pharmacy
Sub Code: BP501T
SEMESTER**:** V
Subject Name: Medicinal Chemistry-II

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

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

CO 1: Explain chemistry of drugs with respect to their pharmacological activity, drug metabolic pathways, adverse effect and therapeutic value for Chemotherapeutic agents, drug acting on immune system, cardiovascular system.
CO 2: Acquire knowledge about the relationship between the biological activity and structure of chemotherapeutic agents and drug acting on immune and cardiovascular system. Outline the synthetic route for the selective medicinal compounds of each category, chemotherapeutic agents and drug acting on Immune system, cardiovascular system.
CO 3: Explain chemistry of drugs with respect to their pharmacological activity, drug metabolic pathways, adverse effect and therapeutic value for drug acting on endocrine system, CNS and Miscellaneous class.
CO4**:** Acquire knowledge about the relationship between the biological activity and structure of drug acting on endocrine system, CNS. Outline the synthetic route for the selective medicinal compounds of each category, drug acting on endocrine system, CNS and Miscellaneous class.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	Histamine, receptors and their distribution in the human body. • H1–Antagonists: SAR of H1 receptor antagonist; Diphenhydramine hydrochloride*, Dimenhydrinate, Doxylamines cuccinate, Clemastine fumarate, Diphenylphyraline hydrochloride, Tripelenamine hydrochloride, Chlorcyclizine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride*, Phenidamine tartarate, Promethazine hydrochloride*, Trimeprazine tartrate, Cyproheptadine hydrochloride, Azatidine maleate,	10

	Astemizole, Loratadine, Cetirizine, Levocetrazine Cromolyn sodium. • H2-Antagonists: Cimetidine*, Famotidine, Ranitidin. **Gastric Proton Pump Inhibitors** • Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole. • Acid sequestering/ neotrulizing agent. **Anti-Neoplastic Agents** • Alkylating Agents: Meclorethamine*, Cyclophosphamide, Melphalan, Chlorambucil, Busulfan, Thiotepa. • Antimetabolites: Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine. • Antibiotics: Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin. • Plant products: Etoposide, Vinblastin sulphate, Vincristin sulphate • Miscellaneous: Cisplatin, Mitotane.	
2	**Anti-Anginal** • Vasodilators: Amyl nitrite, Nitroglycerin*, Pentaerythritol tetranitrate, Isosorbide dinitrite*, Dipyridamole. • Calcium Channel Blockers**:**Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine. **Diuretics** • Carbonic anhydrase inhibitors: Acetazolamide*, Methazolamide, Dichlorphenamide. • Thiazides: Chlorthiazide*, Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide. • Loop diuretics: Furosemide*, Bumetanide, Ethacrynic acid. • Potassium sparing Diuretics: Spironolactone, Triamterene, Amiloride. • Osmotic Diuretics: Mannitol. **Anti-Hypertensive Agents** • Timolol, Captopril, Lisinopril, Enalapril, Benazepril hydrochloride, Quinapril hydrochloride, Methyldopate hydrochloride,* Clonidine hydrochloride, Guanethidine monosulphate, Guanabenz acetate, Sodium nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride. • SAR of ACE inhibitors and CCB's	10
3	**Anti-Arrhythmic Drugs** • Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcainide hydrochloride, Amiodarone, Sotalol. **Anti-Hyperlipidemic Agents** • Clofibrate, Lovastatin, Cholesteramine and Cholestipol.	10

	• HMG Co A reductase inhibitors: Lovastatin, Simvastatin, Atorvastatin etc. o SAR of HMG Co A reductase inhibitors • Fibric acid derivatives: Clofibrate, fenofibrate, • Bile acid sequestrants: Cholestyramine, choleselvelem. • LDL oridation inhibitor: Probucol • Pyridine derivatives: nicotinic acid, Nicotinamide • Cholestrol absorption: Inhibitors, Ezetimibe • Miscelleneous: B sitosterol **Coagulant and Anticoagulants** • Menadione, Acetomenadione, Warfarin*, Anisindione, clopidogrel. **Drugs used in Congestive Heart Failure** • Digoxin, Digitoxin, Nesiritide, Bosentan, Tezosentan.	
4	**Drugs acting on Endocrine System** • Nomenclature, Stereochemistry and metabolism of steroids. Sex Hormones • Testosterone, Nandralone, Progestrones, Oestriol, Oestradiol, Oestrione, Diethyl stilbestrol. **Drugs for Erectile Dysfunction** • Sildenafil, Tadalafil. **Oral Contraceptives** • Mifepristone, Norgestril, Levonorgestrol **Corticosteroids** • Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone **Thyroid and Anti-Thyroid Drugs** L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole, Iodione release and secretion of T3 and T4	8
5	**Antidiabetic Agents** • Insulin and its types. • Sulfonyl ureas: Tolbutamide*, Chlorpropamide, Glipizide, Glimepiride. Biguanides: Metformin. • Thiazolidinediones: Pioglitazone, Rosiglitazone. Meglitinides: Repaglinide, Nateglinide. Glucosidase inhibitors: Acrabose, Voglibose. • DPP_4 inhibitor: Sitagliptin, Lingliptin, Sexagliptin and alogliptin. **Local Anesthetics** • SAR of local anesthetics. • Benzoic Acid derivatives: Cocaine, Hexylcaine, Meprylcaine, Cyclomethycaine, Piperocaine. • Amino Benzoic acid derivatives: Benzocaine*, Butamben, Procaine*, Butacaine, Propoxycaine, Tetracaine, Benoxinate. • Lidocaine/Anilide derivatives: Lignocaine, Mepivacaine, Prilocaine,Etidocaine. • Miscellaneous: Phenacaine, Diperodon, Dibucaine.*	7

Total	45

Recommended Texts/Reference books/web resources:

Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.

1. Foye's Principles of Medicinal Chemistry.
2. Burger's Medicinal Chemistry, Vol I to IV.
3. Introduction to principles of drug design- Smith and Williams.
4. Remington's Pharmaceutical Sciences.
5. Martindale's extra pharmacopoeia.
6. Organic Chemistry by I.L. Finar, Vol. II.
7. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1to5.
8. Indian Pharmacopoeia.
9. Text book of practical organic chemistry- A. I. Vogel.
10. Text book of Medicinal Chemistry by Dr. M.N.Noolvi, Dr. Anurekha Jain, Dr. H.M.Patel.

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Bachelor of Pharmacy
Sub Code: BP502T
SEMESTER: V
Subject Name: Pharmacology-II

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

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: Understand the mechanism of drug action and its relevance in the treatment of different cardio vascular diseases.
CO2. Understand the mechanism of drug action and its relevance in the treatment of different respiratory and GI diseases
CO3. Understand the mechanism of drug action on hormonal system
CO4. Appreciate correlation of pharmacology with related medical sciences

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	**Pharmacology of drugs acting on cardio vascular system** a. Introduction to hemodynamic and electrophysiology of heart. b. Drugs used in congestive heart failure c. Anti-anginal drugs. d. Anti-hypertensive drugs e. Anti-arrhythmic drugs. f. Anti-hyperlipidemic drugs	10
2	**Pharmacology of Drugs acting on hematopoietic system** a.coagulants , anticoagulants, b. Drug used in the therapy of shoc, Hematinics. c. Fibrinolytics and anti-platelet drugs d. Plasma volume expanders **Pharmacology of Drugs acting on urinary system** a.Diuretics and Anti-diuretics	10
3	**Hormones and their antagonists** a. Insulin, Oral hypoglycemic agents b. Thyroid and anti-thyroid drugs c.Anterior Pituitary hormones- analogues and their inhibitors. d. Hormones regulating plasma calcium level Parathormone, Calcitonin and Vitamin-D	10

	e. Adrenocortical steroids and their analogues	
4	**Pharmacology of drugs acting on Respiratory system** a. Anti -asthmatic drugs b. Drugs used in the management of COPD c. Expectorants and antitussives d. Nasal decongestants e. Respiratory stimulants	5
5	**Pharmacology of drugs acting on the Gastrointestinal Tract** a. Antiulcer agents. b. Drugs for constipation and diarrhoea. c. Appetite stimulants and suppressants. d. Digestants and carminatives. e. Emetics and anti-emetics.	
6	**Bioassay** a. Principles and applications of bioassay. b.Types of bioassay c. Bioassay of insulin, oxytocin, vasopressin, ACTH,d-tubocurarine,digitalis, histamine and 5-HT	
	Total	45

Recommended Texts/Reference books/web resources:

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata McGraw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. 4Marry 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. Vallabh Prakashan

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Bachelor of Pharmacy
Sub Code: BP503T
SEMESTER**:** V
Subject Name: Pharmacognosy and Phytochemistry II

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

Course Outcomes: Upon completion of the course, the student shall be able to
CO1: To know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents.
CO2: To understand the preparation and development of herbal formulation
CO3: To understand the herbal drug interactions
CO4: To carry out isolation and identification of phytoconstituents

Teaching Scheme and Examination Scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1.	**Metabolic pathways in higher plants and their determination:** Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways: • Shikimic acid pathway • Acetate pathways • Amino acid pathway. Study of utilization of radioactive isotopes in the investigation of Biogenetic Studies.	7
2.	**Secondary metabolites:** General introduction, composition, chemistry & chemical classes, biological sources, therapeutic uses and commercial applications of following: • **Alkaloids:** Vinca, Rauwolfia, Belladonna, Opium, • **Phenylpropanoids and Flavonoids:** Lignans, Tea, Ruta • **Steroids, Cardiac Glycosides & Triterpenoids**: Liquorice, Dioscorea,Digitalis • **Volatile oils**: Mentha, Clove, Cinnamon, Fennel, Coriander,	14

	• **Tannins:** Catechu, Pterocarpus • **Resins:** Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony • **Glycosides:** Senna, Aloes, Bitter Almond **Iridoids, Other terpenoids & Naphtha quinones:** Gentian, Artemisia, taxus, carotenoids	
3.	**Isolation, Identification and Analysis of Phytoconstituents:** • **Terpenoids**: Menthol, Citral, Artemisin • **Glycosides**: Glycyrhetinic acid & Rutin • **Alkaloids**: Atropine, Quinine, Reserpine, Caffeine • **Resins**: Podophyllotoxin, Curcumin	6
4.	**Industrial production, estimation and utilization of the following phytoconstituents**: • Forskolin • Sennoside • Artemisinin • Diosgenin • Digoxin • Atropine • Podophyllotoxin • Caffeine • Taxol • Vincristine and Vinblastine	10
5.	**Basics of Phytochemistry:** • Modern methods of extraction, application of latest techniques like Spectroscopy, chromatography and electrophoresis in the isolation, purificationand identification of crude drugs.	8
	Total	45

Recommended Texts/Reference books/web resources:

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009.
2. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
3. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
4. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
5. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007
6. Herbal Cosmetics by H.Pande, Asia Pacific Business press, Inc, New Delhi.
7. A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.
8. R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994.
9. Pharmacognosy & Pharmacobiotechnology. James Bobbers, Marilyn KS, VE Tylor.
10. The formulation and preparation of cosmetic, fragrances and flavours.
11. Remington's Pharmaceutical sciences.
12. Text Book of Biotechnology by Vyas and Dixit.
13. Text Book of Biotechnology by R.C. Dubey.

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Bachelor of Pharmacy
Sub Code: BP504T
SEMESTER**:** V
Subject Name: Industrial Pharmacy-I

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

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: Study of physicochemical characteristics of drug substances.
CO 2: Know the various pharmaceutical dosage forms and their manufacturing Techniques
CO 3: Know various considerations in development of pharmaceutical dosage forms
CO4**:** Formulate solid,liquid and semisolid dosage forms and evaluate them for their quality.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	**Preformulation Studies:** Introduction to preformulation, goals and objectives, study of physicochemical characteristics of drug substances. **a. Physical properties:** Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism **b. Chemical Properties:** Hydrolysis, oxidation, reduction, racemisation, polymerization BCS classification of drugs & its significant, Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms	07
2	**Tablets:** **a.** Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipments and tablet tooling. **b.** Tablet coating: Types of coating, coating materials,	10

	formulation of coating composition, methods of coating, equipment employed and defects in coating. **c.** Quality control tests: In process and finished product test **Liquid orals:** Formulation and manufacturing consideration of syrups and elixirs suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia	
3	**Capsules:** **a. Hard gelatin capsules:** Introduction, Production of hard gelatin capsule shells. size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. In process and final product quality control tests for capsules. **b. Soft gelatin capsules:** Nature of shell and capsule content, size of capsules,importance of base adsorption and minim/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules and their applications. **Pellets:** Introduction, formulation requirements, pelletization process, equipments for manufacture of pellets	08
4.	**Parenteral Products:** **a.** Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity **b.** Production procedure, production facilities and controls, aseptic processing **c.** Formulation of injections, sterile powders, large volume parenterals and lyophilized products. **d.** Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests of parenteral products. **Ophthalmic Preparations:** Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations	10
5.	**Cosmetics:** Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens. **Pharmaceutical Aerosols:** Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies. **Packaging Materials Science:** Materials used for packaging of pharmaceutical products, factors influencing choice of containers, legal and official requirements	10

	for containers, stability aspects of packaging materials, quality control tests.	
	Total	45

Recommended Texts/Reference books/web resources:

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

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Bachelor of Pharmacy
Sub Code: BP505T
SEMESTER**:** V
Subject Name: Pharmaceutical Jurisprudence

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

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.
CO 4: Understand the quantitative standardization and assay methods.

Teaching scheme and examination scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Topics	Hours
1.	**Drugs and Cosmetics Act, 1940 and its rules 1945:** Objectives, Definitions, Legal definitions of schedules to the Act and Rules Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties. Manufacture of drugs – Prohibition of manufacture and sale of certain drugs, Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.	10
2.	**Drugs and Cosmetics Act, 1940 and its rules 1945** Detailed study of Schedule G, H, M, N, P,T,U, V, X, Y, Part XII B, Sch F & DMR (OA) Sale of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties Labeling & Packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties. Administration of the Act and Rules – Drugs Technical Advisory Board, Central drugs Laboratory, Drugs Consultative Committee, Government drug analysts, Licensing authorities, controlling	10

	authorities, Drugs Inspectors	
3.	**Pharmacy Act –1948:** Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of Pharmacists, Offences and Penalties **Medicinal and Toilet Preparation Act –1955:** Objectives, Definitions, Licensing, Manufacture In bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations. Offences and Penalties. **Narcotic Drugs and Psychotropic substances Act-1985 and Rules**: Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties	10
4.	**Study of Salient Features of Drugs and Magic Remedies Act and its rules:** Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties **Prevention of Cruelty to animals Act-1960:** Objectives, Definitions, Institutional Animal Ethics Committee, CPCSEA guidelines for Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties **National Pharmaceutical Pricing Authority**: Drugs Price Control, Order (DPCO)- 2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of EssentialMedicines (NLEM)	8
5.	**Pharmaceutical Legislations** – A brief review, Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee **Code of Pharmaceutical ethics** Definition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath **Medical Termination of Pregnancy Act** **Right to Information Act** **Introduction to Intellectual Property Rights (IPR)**	7
	Total	45

Recommended books:(Latest Edition)

1. Forensic Pharmacy by B. Suresh 123
2. Text book of Forensic Pharmacy by B.M. Mithal

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

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Bachelor of Pharmacy
Sub Code: BP506P (Practical)
SEMESTER**:** V
Subject Name: Pharmacology-II

Scope: It deals with the application of fundamentals of Drug receptor interaction and principles of various class of drugs acting on different systems of body and in addition,emphasis on the basic concepts of bioassay.

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO1. Understand the mechanism of drug action and its relevance in the treatment of different diseases
CO2. Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments
CO3. Demonstrate the various receptor actions using isolated tissue preparation
CO4. Appreciate correlation of pharmacology with related medical sciences

Teaching Scheme and Examination Scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
-	-	4	2	-	-	35	15

S.No	Details of experiment
1	Introduction to in-vitro pharmacology and physiological salt solutions.
2	Effect of drugs on isolated frog heart.
3	Effect of drugs on blood pressure and heart rate of dog.
4	Study of diuretic activity of drugs using rats/mice.
5	DRC of acetylcholine using frog rectus abdominis muscle.
6	Effect of physostigmine and atropine on DRC of acetylcholine using frog rectus abdominis muscle and rat ileum respectively.
7.	Bioassay of histamine using guinea pig ileum by matching method.
8.	Bioassay of oxytocin using rat uterine horn by interpolation method.
9.	Bioassay of serotonin using rat fundus strip by three point bioassay.
10.	Bioassay of acetylcholine using rat ileum/colon by four point bioassay.
11.	Determination of PA2 value of prazosin using rat anococcygeus muscle (by Schilds plot method).
12.	Determination of PD2 value using guinea pig ileum.
13.	Study of effect of drugs on gastrointestinal motility.
14.	Insulin hypoglycemic effect in rabbit.
15.	Introduction to in-vitro pharmacology and physiological salt solutions.
16.	Effect of drugs on isolated frog heart.

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

Recommended Books (Latest Editions)

1. 1Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata McGraw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews Pharmacology
6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company Kolkata.
10. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan

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Bachelor of Pharmacy
Sub Code: BP507P (Practical)
SEMESTER: V
Subject Name: Pharmacognosy and Phytochemistry II

Scope: The emphasis and focus of practical in *Pharmacognosy* have changed significantly, from focusing on identification of drugs, including the isolation of active principles, and more recently, the investigation of biological activity.

Course Outcomes: Upon completion of the course, the student shall be able to
CO 1: Demonstrate the skills on Morphology, histology and powder characteristics & extraction & detection of crude drugs.
CO 2: Illustrate isolation & detection of active principles.
CO 3: Analysis of crude drugs by chemical tests.
CO4: Analysis of crude drugs by chromatographic methods.

Teaching Scheme and Examination Scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
-	-	4	2	-	-	35	15

S. No	Details of experiment
1.	**Morphology, histology and powder characteristics & extraction & detection of:** • Cinchona • Cinnamon • Senna • Clove • Ephedra • Fennel • Coriander
2.	**Exercise involving isolation & detection of active principles:**
	• Caffeine - from tea dust.
	• Diosgenin from Dioscorea
	• Atropine from Belladonna
	• Sennosides from Senna
3.	Separation of sugars by Paper chromatography
4.	TLC of herbal extract
5.	Distillation of volatile oils and detection of phytoconstitutents by TLC

6.	Analysis of crude drugs by chemical tests: Asafoetida, Benzoin, Colophony, Aloes, Myrrh

Recommended Texts/Reference books/web resources:

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London,2009.
2. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, NewDelhi.
3. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, NiraliPrakashan, New Delhi.
4. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
5. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi,2007
6. Herbal Cosmetics by H.Pande, Asia Pacific Business press, Inc, New Delhi.
7. A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.
8. R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994.
9. Pharmacognosy & Pharmacobiotechnology. James Bobbers, Marilyn KS, VE Tylor.
10. The formulation and preparation of cosmetic, fragrances and flavours.
11. Remington's Pharmaceutical sciences.
12. Text Book of Biotechnology by Vyas and Dixit.
13. Text Book of Biotechnology by R.C. Dubey.

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Bachelor of Pharmacy
Sub Code: BP508P (Practical)
SEMESTER**:** V
Subject Name: Industrial Pharmacy-I

Scope: It deals with the formulation and evaluation of certain dosage forms.

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO1: To study Preformulation parameters of drugs.
CO2: Preparation and evaluation of tablets and capsules.
CO3: Preparation and evaluation of ophthalmic dosage forms.
CO4**:** Formulate different cosmetics products.

Teaching Scheme and Examination Scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
-	-	4	2	-	-	35	15

S.No.	Details of experiment
1	Preformulation studies on paracetamol/aspirin/or any other drug
2	Preparation and evaluation of Paracetamol tablets
3	Preparation and evaluation of Aspirin tablets
4	Coating of tablets- film coating of tables/granules
5	Preparation and evaluation of Tetracycline capsules
6	Preparation of Calcium Gluconate injection
7	Preparation of Ascorbic Acid injection
8	Quality control test of (as per IP) marketed tablets/capsules
9	Preparation of Eye drops/ and Eye ointments
10	Preparation of Creams (cold / vanishing cream)
11	Preparation and evaluation of toothpaste.
12	Evaluation of Glass containers (as per

Recommended Texts/Reference books/web resources:

1. Kamlesh D Mali, Kalpeshkumar S. Wagh , Vivek P. Rajkule Dr. Sanjay J. Practical Book

of Industrial Pharmacy-I. First ed. AITBS Publishers,2022. INDIA. ISBN 9789374736951.

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

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Bachelor of Pharmacy
Sub Code: BP509ET
SEMESTER**: V**
Subject Name: Pharma Marketing Management

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

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: Know the different types of Marketing
CO 2: Understand the principles and general scope of Marketing
CO 3: Understand the marketinh Environment and industry competitive analysis
CO4**:** Understand the different types of products and products management

Teaching Scheme and Examination Scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	**Marketing** :Definition, general concepts and scope of marketing; Distinction between marketing & selling; Marketing environment; Industry and competitive analysis; Analyzing consumer buying behavior; industrial buying behavior Pharmaceutical market: Quantitative and qualitative aspects; size and composition of the market; demographic descriptions and socio-psychological characteristics of the **consumer**; market segmentation& targeting Consumer profile; Motivation and prescribing habits of the physician; patients' choice of physician and retail pharmacist. Analyzing the Market Role of market research.	10
2	**Product decision**: Classification, product line and product mix decisions, product life cycle, product portfolio analysis; product positioning; New product decisions; Product branding, packaging and labeling decisions, Product management in pharmaceutical industry.	10

3	**Promotion**: Methods, determinants of promotional mix, promotional budget; An overview of personal selling, advertising, direct mail, journals, sampling, retailing, medical exhibition, public relations, online promotional techniques for OTC Products.	10
4	**Pharmaceutical marketing channels:** Designing channel, channel members, selecting the appropriate channel, conflict in channels, physical distribution management: Strategic importance, tasks in physical distribution management. **Professional sales representative (PSR):**Duties of PSR, purpose of detailing, selection and training, supervising, norms for customer calls, motivating, evaluating, compensation and future prospects of the PSR	10
5	**Pricing**: Meaning, importance, objectives, determinants of price; pricing methods and strategies, issues in price management in pharmaceutical industry. An overview of DPCO (Drug Price Control Order) and NPPA (National Pharmaceutical Pricing Authority).Emerging concepts in marketing:Vertical & Horizontal Marketing; **Rural Marketing**; Consumerism; Industrial Marketing; Global Marketing.	10
	Total	45

Recommended Texts/Reference books/web resources:

1. Philip Kotler and Kevin Lane Keller: Marketing Management, Prentice Hall of India, New Delhi
2. Walker, Boyd and Larreche : Marketing Strategy- Planning and Implementation, Tata MC GrawHill, New Delhi.
3. Dhruv Grewal and Michael Levy: Marketing, Tata MC Graw Hill
4. Arun Kumar and N Menakshi: Marketing Management, Vikas Publishing, India
5. Rajan Saxena: Marketing Management; Tata MC Graw-Hill (India Edition)
6. Ramaswamy, U.S & Nanakamari, S: Marketing Managemnt:Global ,IndianContext,Macmilan India, New Delhi.
7. Shanker, Ravi: Service Marketing, Excell Books, New Delhi
8. Subba Rao Changanti, Pharmaceutical Marketing in India (GIFT – Excel series) Excel Publications.

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Bachelor of Pharmacy
Sub Code: BP510ET
SEMESTER**:** V
Subject Name: Healthcare Dietary Supplements

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

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

CO1: To Understand the need of supplements by the different group of people to maintain healthy life.
CO2: To Understand the outcome of deficiencies in dietary supplements.
CO3: To know about the components in dietary supplements and the application.
CO4: To know about the regulatory and commercial aspects of dietary supplements including health claims.

Teaching Scheme and Examination Scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1.	• Definitions of Functional foods, Nutraceuticals and Dietary supplements. Classification of Nutraceuticals, Health problems and diseases that can be prevented or cured by Nutraceuticals i.e. weight control, diabetes, cancer, heart disease, stress, osteoarthritis, hypertension etc. • Public health nutrition, maternal and child nutrition, nutrition and ageing, nutrition education in community. • Source, Name of marker compounds and their chemical nature, Medicinal uses and health benefits of following used as nutraceuticals/functional foods: Spirulina, Soyabean, Ginseng, Garlic, Broccoli, Gingko, Flaxseeds	7
2.	**Phytochemicals as nutraceuticals:** Occurrence and characteristicfeatures (chemical nature medicinal benefits) of following: • **Carotenoids**- α and β-Carotene, Lycopene, Xanthophylls, leutin • **Sulfides**: Diallyl sulfides, Allyl trisulfide. • **Polyphenolics**: Reservetrol • **Flavonoids**- Rutin , Naringin, Quercitin, Anthocyanidins, catechins, Flavones	15

	• **Prebiotics / Probiotics**.: Fructo oligosaccharides, Lacto bacillum • **Phyto estrogens** : Isoflavones, daidzein, Geebustin, lignans • **Tocopherols** • **Proteins, vitamins, minerals, cereal, vegetables and beverages as functionalfoods**: • Oats, wheat bran, rice bran, sea foods, coffee, tea and the like.	
3.	**Introduction to free radicals:** Free radicals, reactive oxygen species, production of free radicals in cells, damaging reactions of free radicals on lipids, proteins, Carbohydrates, nucleic acids. **Dietary fibers and complex carbohydrates as functional food ingredients**.	7
4.	**Free radicals involvement in following diseases:** • Free radicals in Diabetes mellitus, Inflammation, Ischemic reperfusion injury,Cancer, Atherosclerosis, Free radicals in brain metabolism and pathology,kidney damage, muscle damage. • Free radicals involvement in other disorders. • Free radicals theory of ageing. **Antioxidants:** • Endogenous antioxidants – enzymatic and non enzymatic antioxidant defence, Superoxide dismutase, catalase, Glutathione peroxidase, Glutathione Vitamin C, Vitamin E, α- Lipoic acid, melatonin • Synthetic antioxidants: Butylated hydroxy Toluene, Butylated hydroxy Anisole. **Functional foods for chronic disease prevention**	10
5.	**Impact of environmental factors on nutraceuticals:** • Effect of processing, storage and interactions of various environmental factorson the potential of nutraceuticals. **Regulatory Aspects**; • FSSAI, FDA, FPO, MPO, AGMARK. HACCP. • GMPs on Food Safety. • Adulteration of foods. **Pharmacopoeial Specifications:** • Dietary supplements. • Nutraceuticals.	6
	Total	45

Recommended Texts/Reference books/web resources:

1. Dietetics by Sri Lakshmi
2. Role of dietary fibres and neutraceuticals in preventing diseases by K.T Agusti and P.Faizal:BSPunblication.
3. Advanced Nutritional Therapies by Cooper. K.A., (1996).
4. The Food Pharmacy by Jean Carper, Simon & Schuster, UK Ltd., (1988).

5. Prescription for Nutritional Healing by James F.Balch and Phyllis A.Balch 2nd Edn., AveryPublishing Group, NY (1997).
6. G. Gibson and C.williams Editors *2000 Functional foods* Woodhead Publ.Co.London.
7. Goldberg, I. *Functional Foods.* 1994. Chapman and Hall, New York.
8. Labuza, T.P. 2000 Functional Foods and Dietary Supplements: Safety, Good Manufacturing Practice (GMPs) and Shelf Life Testing in *Essentials of Functional Foods* M.K. Sachmidl and
   T.P. Labuza eds. Aspen Press.
9. Handbook of Nutraceuticals and Functional Foods, Third Edition (Modern Nutrition)
10. Shils, ME, Olson, JA, Shike, M. 1994 *Modern Nutrition in Health and Disease*. Eighth edition.Lea and Febiger

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Bachelor of Pharmacy
Sub Code: BP511ET
SEMESTER**:** V
Subject Name: Entrepreneurship Development

Scope: The goals of this programme are to inspire students and help them imbibe an entrepreneurial mind-set. The students will learn what entrepreneurship is and how it has impacted the world and their country. They will be introduced to key traits and the DNA of an entrepreneur, and be given an opportunity to assess their own strengths and identify gaps that need to be addressed to become a successful entrepreneur.

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

CO1: To learn what entrepreneurship is and how it has impacted the world and their country.
CO2: Focusing on a specific entrepreneurial knowledge or skill requirement.
CO3: Acquire knowledge about the creative thinking, communication, risk taking, and resilience.
CO4: Understand about career, whether it is entrepreneurship or any other career.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	**Introduction to Entrepreneurship** Meaning and concept of entrepreneurship, the history of entrepreneurship development, role of entrepreneurship in economic development, Myths about entrepreneurs, agencies in entrepreneurship management and future of entrepreneurship types of entrepreneurs.	10
2	**The Entrepreneur** Why to become entrepreneur, the skills/ traits required to be an entrepreneur, Creative and Design Thinking, the entrepreneurial decision process, skill gap analysis, and role models, mentors and support system, entrepreneurial success stories.	10
3	**E-Cell** Meaning and concept of E-cells, advantages to join E-cell, significance of E-cell, various activities conducted by E-cell	10
4	**Communication** Importance of communication, barriers and gateways to communication, listening to people, the power of talk, personal selling, risk taking & resilience, negotiation.	8
5	**Introduction to various form of business organization**	7

	Sole proprietorship, partnership, corporations, Limited Liability company, mission, vision and strategy formulation.	
	Total	45

Recommended Texts/Reference books/web resources:

Web based learning materials

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Bachelor of Pharmacy
Sub Code: BP601T
SEMESTER**:** VI
Subject Name: Medicinal Chemistry-III

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

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: Understand the Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the antibiotics like Beta lactum, Tetracycline, Amino glycoside and Macrolide.
CO 2: Understand the Chemistry of drugs with their pharmacological activity, metabolic pathway, Mechanism of action, SAR, Synthesis, Side effects of Anti-malarial and Pro drug.
CO 3: Understand the Chemistry of drugs with their pharmacological activity, metabolic pathway, Mechanism of action, SAR, Synthesis, Side effects of Anti tubercular, Anti-viral, Urinary tract infection and Anti-Fungal.
CO4**:** Understand the Drug Design and Combinatorial Chemistry.

Teaching Scheme and Examination Scheme

Teaching Scheme				**Evaluation Scheme**			
Theory	**Tutorial**	**Practical**	**Total**	**Theory**		**Practical**	
				External	**Internal**	**External**	**Internal**
3	**1**	**-**	**4**	**75**	**25**	**-**	**-**

Unit	**Course Content**	**Hours**
1	**Antibiotics** Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes • **β-Lactam antibiotics:** Penicillin, Cepholosporins, β-Lactamase inhibitors, Monobactams • **Aminoglycosides:** Streptomycin, Neomycin, Kanamycin • **Tetracyclines:** Tetracycline, Oxytetracycline, Chlortetracycline, Minocycline, Doxycycline	10
2	**Antibiotics** Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes	10

	• **Macrolide:** Erythromycin Clarithromycin, Azithromycin • **Miscellaneous:** Chloramphenicol*, Clindamycin • **Prodrugs:** Basic concepts and application of prodrugs design. • **Antimalarials:** Etiology of malaria • **Quinolines:** SAR, Quinine sulphate, Chloroquine*, Amodiaquine, Primaquine phosphate, Pamaquine*, Quinacrine hydrochloride, Mefloquine. • **Biguanides and dihydro triazines:** Cycloguanil pamoate, Proguanil. • **Miscellaneous:** Pyrimethamine, Artesunete, Artemether, Atovoquone.	
3	**Anti-tubercular Agents** • **Synthetic anti tubercular agents:** Isoniozid*, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid.* • **Anti-tubercular antibiotics:** Rifampicin, Rifabutin, Cycloserine, Streptomycine, Capreomycin sulphate **Urinary tract anti-infective agents** • **Quinolones:** SAR of quinolones, Nalidixic Acid,Norfloxacin, Enoxacin, Ciprofloxacin*, Ofloxacin, Lomefloxacin, Sparfloxacin, Gatifloxacin, Moxifloxacin • **Miscellaneous:** Furazolidine, Nitrofurantoin*, Methanamine **Antiviral agents:** • Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridinetrifluoride, Acyclovir*, Gancyclovir, Zidovudine, Didanosine, Zalcitabine, Lamivudine, Loviride, Delavirding, Ribavirin, Saquinavir, Indinavir, Ritonavir.	10
4	**Antifungal agents:** • **Antifungal antibiotics:** Amphotericin-B, Nystatin, Natamycin, Griseofulvin • **Synthetic Antifungal agents:** Clotrimazole, Econazole, Butoconazole, Oxiconazole Tioconozole, Miconazole*, Ketoconazole, Terconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate*.	8

	• **Anti-protozoal Agents:** Metronidazole*, Tinidazole, Ornidazole, Diloxanide, Iodoquinol, Pentamidine Isethionate, Atovaquone, Eflornithine. • **Anthelmintics:** Diethylcarbamazine citrate*, Thiabendazole, Mebendazole*, Albendazole, Niclosamide, Oxamniquine, Praziquantal, Ivermectin. **Sulphonamides and Sulfones** Historical development, chemistry, classification and SAR of Sulfonamides: Sulphamethizole, Sulfisoxazole, Sulphamethizine, Sulfacetamide*, Sulphapyridine, Sulfamethoxaole*, Sulphadiazine, Mefenide acetate, Sulfasalazine • **Folate reductase inhibitors:** Trimethoprim*, Cotrimoxazole • **Sulfones:** Dapsone*.	
5	**Introduction to Drug Design** • Various approaches used in drug design. • Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient, Hammet's electronic parameter, Tafts steric parameter and Hansch analysis. • Pharmacophore modeling and docking techniques. • **Combinatorial Chemistry:** Concept and applications of Combinational chemistry: solid phase and solution phase synthesis.	7
	Total	45

Recommended Texts/Reference books/web resources:

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

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Bachelor of Pharmacy
Sub Code: BP602T
SEMESTER**:** VI
Subject Name: Pharmacology-III

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

Course Outcomes: Upon completion of this course the student should be able to:
CO1: Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases
CO2: Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases
CO3: Comprehend the principles of toxicology and treatment of various poisonings
CO4: Appreciate correlation of pharmacology with related medical sciences.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	-	-	75	25

Unit	Course Content	Hours
1	**Chemotherapeutic agents -I** a. General principles of chemotherapy. b. Sulphonamides, co-trimoxazole c.β-lactam antibiotics **Chemotherapeutic agents -II** a.Tetracyclines, Chloramphenicol b. Amino glycosides c. Macrolides d. Quinolones, Fluoroquinolones	10
2	**Chemotherapeutic agents -III** a. Chemotherapy of Tuberculosis b. Chemotherapy of Leprosy c.Chemotherapy of Fungal diseases d.Chemotherapy of Viral diseases e. Chemotherapy of Helmintic infections	10

	f. Chemotherapy of malaria g.Chemotherapy of amoebiasis. h. . Chemotherapy of Urinary tract infections and sexually transmitted diseases. i. Chemotherapy of malignancy	
3	**Chronopharmacology** a. Definition of rhythm and cycles. b. Biological clock and their significance leading to chronotherapy.	3
4	**Immunopharmacology** a. Immunostimulants b. Immunosupressants. **monoclonal antibodies, target drugs to antigen, biosimilars**	5
5	**Principles of toxicology** **a.** Definition of Poison, General principles of treatment of poisoning. **b.** Treatment of Barbiturate, Opioid, Organophosphorus and Atropine poisoning, **c.** Principles of Animal toxicology: Acute, sub acute and chronic toxicity studies.	7
6	**Autacoids and their antagonists** a. Amine autacoids- Histamine, 5-HT. Antagonists including Antihistamines and Serotonin blockers b. Lipid derived autacoids-Prostaglandins, Thromboxanes and Leukotrienes c. Peptide autacoids- Angiotensin, Bradykinin	10
	Total	45

Recommended Texts/Reference books/web resources:

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs. The Point Lippincott Williams &Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology
6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert, Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata,
9. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan,
10. N.Udupa and P.D. Gupta, Concepts in Chronopharmacology.

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Bachelor of Pharmacy
Sub Code: BP603T
SEMESTER**:** VI
Subject Name: Herbal Drug Technology

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

Course Outcomes: Upon completion of this course the student should be able to:
CO1: To understand raw material as source of herbal drugs from cultivation to herbal drug product
CO2: To know the WHO and ICH guidelines for evaluation of herbal drugs
CO3: To know the herbal cosmetics, natural sweeteners & nutraceuticals
CO4: To understand patenting of herbal drugs & GMP.

Teaching Scheme and Examination Scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1.	**Herbal Extracts**: Types of Extraction methods such as: Maceration & Percolation Super critical fluid extraction and Ultra – Sonic extraction **Equipment for preparing herbal extracts:** Process and equipments-Name of the equipment and its uses with merits and demerits in each of the following unit operations in the extraction process: Size reduction Evaporation/Distillation Extraction Solvent recovery Filtration Drying of extracts	11

2.	**Herbal drug Standardization:** Definition and Need for the study of standardization. General flow of activities instandardization. ICH & WHO guidelines on standardization Parameters: Botanical, Physical, Chemical,Pharmacological, Toxicological standardization. Stability testing of herbal drugs.	7
3.	**Herbal Cosmetics** Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products. **Herbal excipients:** **Definition, classification of natural Excipients:** Source, chemical, nature, descriptionparameters pharmaceutical uses and storage condition of following natural excipients, binding agents, disintegrating agents, diluents, emulsifying agent: Acacia & Tragacanth Alginates & CMC Gelatine & Pectin Lactose & Starches Talc, Ointment bases, suppository bases. **Hardening agents:** Bees wax, Cocoa butter, Lanolin, Hard Paraffin. **Herbal formulations :** Conventional herbal formulations like syrups, mixtures and tablets and Noveldosage forms like phytosomes	10
4.	**Nutraceuticals** **General aspects**, Market, growth, scope and types of products available in the market. **Health benefits and role of Nutraceuticals** in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases. **Study of following herbs as health food**: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina **Herbal-Drug and Herb-Food Interactions:** General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra.	10
5.	**General Introduction to Herbal Industry:** Herbal drugs industry: Present scope and future prospects. A brief account of plant based industries and institutions involved in work onmedicinal and aromatic plants in India. **Patenting and Regulatory requirements of natural products:** Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting and Biopiracy. Patenting aspects of Traditional Knowledge and Natural Products. Case studyof Curcuma & Neem.	7
	Total	45

Recommended Texts/Reference books/web resources:

1. Textbook of Pharmacognosy by Trease & Evans.
2. Textbook of Pharmacognosy by Tyler, Brady & Robber.
3. Pharmacognosy by Kokate, Purohit and Gokhale
4. Essential of Pharmacognosy by Dr.S.H.Ansari
5. Pharmacognosy & Phytochemistry by V.D.Rangari
6. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy)
7. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals.Business Horizons Publishers, New Delhi, India, 2002.
8. Textbook of HPTLC by P.D. Seth.
9. Herbal Perfumes and cosmetics by Panda

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Bachelor of Pharmacy
Sub Code: BP604T
SEMESTER**:** VI
Subject Name: Biopharmaceutics and Pharmacokinetics

Scope: This subject is designed to impart knowledge and skills of Biopharmaceutics and pharmacokinetics and their applications in pharmaceutical development, design of dose and dosage regimen and in solving the problems arised therein

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance.
CO 2: Use of plasma drug concentration-time data to calculate the pharmacokinetic parameter to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.
CO 3: To understand the concepts of bioavailability and bioequivalence of drug products and their significance.
CO4**:** Understand various pharmacokinetic parameter, their significance and applications.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hrs.
1	**Introduction** **Biopharmaceutics to Absorption:** Mechanisms of drug absorption through GIT, factors influencing drug absorption though GIT, absorption of drug from Non per oral extra-vascular routes, **Distribution:** Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting protein-drug binding. Kinetics of protein binding, Clinical significance of protein binding of drugs	10
2	**Elimination:** Drug metabolism and basic understanding metabolic pathways renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non renal routes of drug excretion of drugs	10

	Bioavailability and Bioequivalence: Definition and Objectives of bioavailability, absolute and relative bioavailability, measurement of bioavailability, in-vitro drug dissolution models, in-vitro-in-vivo correlations, bioequivalence studies, methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.	
3	**Pharmacokinetics:** Definition and introduction to Pharmacokinetics, Compartment models, Non compartment models, physiological models, One compartment open model. (a). Intravenous Injection (Bolus) (b). Intravenous infusion and (c) Extra vascular administrations. **Pharmacokinetics parameters** - KE ,t1/2,Vd,AUC,Ka, Clt and CLR- definitions methods of eliminations, understanding of their significance and Application	10
4	**Clinical pharmacokinetics**: Definition and scope. Dosage adjustment in patients with renal and hepatic failure. Pharmacokinetic drug interactions and its significance in combination therapy. Design of dosage regimen, Individualization of therapy, Drug accumulation during multiple dosing	8
5	**Nonlinear Pharmacokinetics:** a. Introduction, b. Factors causing Nonlinearity. c. Michaelis-menton method of estimating parameters, Explanation with example of drugs	7
	Total	45

Recommended Texts/Reference books/web resources:

1. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi.
2. Biopharmaceutics and Pharmacokinetics; By Robert F Notari
3. Applied biopharmaceutics and pharmacokinetics, Leon Shargel and Andrew B.C.YU 4th edition,Prentice-Hall Inernational edition. USA.
4. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B.Jaiswal,Vallabh Prakashan Pitampura, Delhi
5. Pharmacokinetics: ByMilo Glbaldi Donald, R. Mercel Dekker Inc.
6. Hand Book of Clinical Pharmacokinetics, ByMilo Gibaldi and Laurie Prescott by ADIS Health Science Press.
7. Biopharmaceutics; By Swarbrick
8. Clinical Pharmacokinetics, Concepts and Applications: ByMalcolm Rowland and Thomas, N. Tozen, Lea and Febrger, Philadelphia, 1995.

9. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company, Pennsylvania 1989.
10. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Rebort F Notari Marcel Dekker Inn, New York and Basel, 1987.
11. Remington's Pharmaceutical Sciences, ByMack Publishing Company, Pennsylvnia

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Bachelor of Pharmacy
Sub Code: BP605T
SEMESTER**:** VI
Subject Name: Pharmaceutical Biotechnology

Scope: Biotechnology has a long promise to revolutionize the biological sciences and technology. Scientific application of biotechnology in the field of genetic engineering, medicine, and fermentation technology makes the subject interesting. Biotechnology is leading to new biological revolutions in diagnosing, preventing, and curing diseases and new and cheaper pharmaceutical drugs. Biotechnology has already produced transgenic crops and animals and the future promises a lot more. It is a research-based subject.

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: Understand the Importance of Immobilized Enzymes in Pharmaceutical Industries.
CO 2: Understand applications of genetic engineering in relation to the production of Pharmaceuticals.
CO 3: Study the importance of immunoglobulin's, hypersensitivity, and stability of vaccines in industries.
CO4**:** Study and Understand the use of blotting techniques, genetic mutations and different methods of fermentation, and information related to blood products.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	a) Brief introduction to Biotechnology with reference to Pharmaceutical Sciences. b) Enzyme Biotechnology- Methods of enzyme immobilization and applications. c) Biosensors- Working and applications of biosensors in Pharmaceutical Industries. d) Brief introduction to Protein Engineering. e) Use of microbes in industry. Production of Enzymes- General consideration -Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase. f) Basic principles of genetic engineering.	10
2	a) Study of cloning vectors, restriction endonucleases, and DNA ligase.	10

	b) Recombinant DNA technology. Application of genetic engineering in medicine. c) Application of r DNA technology and genetic engineering in the production of: i) Interferon ii) Vaccines- hepatitis- B iii) Hormones- Insulin. d) Brief introduction to PCR	
3	Types of immunity- humoral immunity, cellular immunity a) Structure of Immunoglobulins b) Structure and Function of MHC c) Hypersensitivity reactions, Immune stimulation and Immune suppressions. d) General method of the preparation of bacterial vaccines, toxoids, viral vaccines, and antitoxins. e) Storage conditions and stability of official vaccines	**10**
4.	a) Immuno blotting techniques- ELISA, Western blotting, Southern blotting. b) Genetic organization of Eukaryotes and Prokaryotes c) Microbial genetics including transformation, transduction, conjugation, plasmids and transposons. d) Introduction to Microbial biotransformation and applications. e) Mutation: Types of mutation/mutants	**8**
5.	a) Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring. b) Large scale production fermenter design and its various controls. c) Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin, d) Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substituties.	**7**
	Total	45

Recommended Texts/Reference books/web resources:

1. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of recombinant DNA: ASM Press Washington D.C.
2. RA Goldshy et. al.,: Kuby Immunology.
3. J.W. Goding: Monoclonal Antibodies.
4. J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by Royal Society of Chemistry.
5. Zaborsky: Immobilized Enzymes, CRC Press, Degraland, Ohio.
6. S.B. Primrose: Molecular Biotechnology. Blackwell Scientific Publication.
7. Stanbury F., P., Whitaker A., and Hall J., S., Principles of fermentation technology, Aditya Books Ltd., New Delhi.

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Bachelor of Pharmacy
Sub Code: BP606P (Practical)
SEMESTER**:** VI
Subject Name: Medicinal Chemistry-III

Scope: It deals with the application of fundamentals of analytical chemistry and principles of analysis of drugs.

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: Understand the Preparation, Spectral characterization of drugs and intermediates
CO 2: Understand the quantitative standardization and assay methods
CO 3: Understand the microwave synthesis method of drugs
CO 4: Understand the drawing structures and reactions using Chemdraw software

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
-	-	4	2	-	-	35	15

S.No	Details of experiment
1	**Preparation of drugs and intermediates** 1 Sulphanilamide 2. 7-Hydroxy, 4-methyl coumarin 3. Chlorobutanol 4. Triphenyl imidazole 5. Tolbutamide 6. Hexamine
2	Spectral Analysis of drug synthesized
3	**Assay of drugs** 1. Isonicotinic acid hydrazide 2. Chloroquine 3. Metronidazole 4. Dapsone 5. Chlorpheniramine maleate 6. Benzyl penicillin
4	Preparation of medicinally important compounds or intermediates by Microwave irradiation technique
5	Drawing structures and reactions using chem draw®

Recommended Texts/Reference books/web resources:

1. Vogel A. L. Vogel's Textbook of Practical Organic Chemistry, 5th ed. Pearson Prentice Hall: Dorling. Kindersley (India) Pvt, Ltd; 2007.
2. Mann F. G. & Saunders B. C. Practical Organic Chemistry, 4th ed.: Pearson Publishers; 2007.
3. Indian pharmacopoeia 2007/2010.
4. Burger's Medicinal Chemistry, Vol I to IV.
5. Introduction to principles of drug design- Smith and Williams.

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Bachelor of Pharmacy
Sub Code: BP607P (Practical)
SEMESTER**:** VI
Subject Name: Pharmacology-III

Scope: This subject is intended to impart the fundamental knowledge on various aspects of biostatistics in addition, emphasis on the principles of toxicology.

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

CO 1: Demonstrate isolation of different organs/tissues toxicity by simulated experiments

CO 2: Demonstrate the various receptor actions using isolated tissue preparation.

CO 3: Appreciate correlation of pharmacology with related calculations.

CO 4: Appreciate correlation of pharmacology with biostatistics.

Teaching Scheme and Examination Scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	4	8	75	25	75	25

S.No	Details of experiment
1	Dose calculation in pharmacological experiments
2	Antiallergic activity by mast cell stabilization assay
3	Estimation of serum biochemical parameters by using semi- autoanalyser
4	Determination of acute oral toxicity (LD50) of a drug from a given data
5	Determination of acute skin irritation / corrosion of a test substance
6	Determination of acute eye irritation / corrosion of a test substance
7.	Calculation of pharmacokinetic parameters from a given data
8.	Biostatistics methods in experimental pharmacology(student's t test)
9.	Biostatistics methods in experimental pharmacology(ANOVA)
10.	Biostatistics methods in experimental pharmacology (Chi square test)
11.	Biostatistics methods in experimental pharmacology (Wilcoxon Signed Rank test)
12.	Test for pyrogens (rabbit method)
13.	Anti-inflammatory activity of drugs using carrageenan induced paw-edema model.
14.	Analgesic activity of drug using central and peripheral methods.
15.	Demo- software's / AI tools for biological data analysis.

* All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares 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 McGraw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews Pharmacology
6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company Kolkata.
10. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan

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Bachelor of Pharmacy
Sub Code: BP608P (Practical)
SEMESTER**:** VI
Subject Name: Herbal Drug Technology

Scope: The emphasis and focus of practical in *Pharmacognosy* have changed significantly, from focusing on identification of drugs, including the isolation of active principles, and more recently, the investigation of biological activity and research into ethnobotany, ethnomedicine, and ethnopharmacology has also become an important element in *Pharmacognosy*.

Course Outcomes: Upon completion of this course the student should be able to:
CO 1: Learn preliminary phytochemical screening of crude drugs.
CO 2: Illustrate cosmeceutical formulation and their evaluation.
CO 3: Analysis herbal pharmaceutical formulations
CO 4: Monograph analysis of herbal drugs

Teaching Scheme and Examination Scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
-	-	4	4	-	-	35	15

S. No	Details of experiment
1.	To perform preliminary phytochemical screening of crude drugs.
2.	Determination of the alcohol content of Asava and Arista
3.	Evaluation of excipients of natural origin
4.	Incorporation of prepared and standardized extract in cosmetic formulations like creams, lotionsand shampoos and their evaluation.
5.	Incorporation of prepared and standardized extract in formulations like syrups, mixtures andtablets and their evaluation as per Pharmacopoeial requirements.
6.	Monograph analysis of herbal drugs from recent Pharmacopoeias
7.	Determination of Aldehyde content
8.	Determination of Phenol content
9.	Determination of total alkaloids

Recommended Texts/Reference books/web resources:

1. Textbook of Pharmacognosy by Trease & Evans.
2. Textbook of Pharmacognosy by Tyler, Brady & Robber.
3. Pharmacognosy by Kokate, Purohit and Gokhale
4. Essential of Pharmacognosy by Dr.S.H.Ansari

5. Pharmacognosy & Phytochemistry by V.D.Rangari
6. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy)
7. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals.Business Horizons Publishers, New Delhi, India, 2002.
8. Textbook of HPTLC by P.D. Seth.
9. Herbal Perfumes and cosmetics by Panda

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Bachelor of Pharmacy
Sub Code: BP701T
SEMESTER**:** VII
Subject Name: Instrumental methods of Analysis

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

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: To understand fundamentals of Spectroscopy and theory and practical concept of UV spectroscopy and fluorimetry
CO 2: TO understand theory and practical concept of Fluorescence spectroscopy, Flame Photometry, Atomic absorption spectroscopy and Nepheloturbidometry
CO 3: To understand fundamentals of Chromatography and different Chromatography technique like Adsorption and partition column chromatography, Thin layer chromatography, Paper chromatography, Electrophoresis.
CO4**:** To understand theory and practical concept of Gas chromatography, High performance liquid chromatography, Ion exchange chromatography, Gel chromatography

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	**UV Visible spectroscopy** Electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra, Beer and Lambert's law, Derivation and deviations. *Instrumentation* - Sources of radiation, wavelength selectors, sample cells, detectors- Photo tube, Photomultiplier tube, Photo voltaic cell, Silicon Photodiode. *Applications* - Spectrophotometric titrations, Single component and multi component analysis	10

	Fluorimetry Theory, Concepts of singlet, doublet and triplet electronic states, internal andexternal conversions, factors affecting fluorescence, quenching, instrumentation and applications	
2	**IR spectroscopy** Introduction, fundamental modes of vibrations in poly atomic molecules, samplehandling, factors affecting vibrations. *Instrumentation* - Sources of radiation, wavelength selectors, detectors - Golay cell, Bolometer, Thermocouple, Thermister, Pyroelectric detector and applications **Flame Photometry-**Principle, interferences, instrumentation and applications **Atomic absorption spectroscopy-** Principle, interferences, instrumentation andApplications **Nepheloturbidometry**- Principle, instrumentation and applications	10
3	**Introduction to chromatography** **Adsorption and partition column chromatography-** Methodology,advantages, disadvantages and applications **Thin layer chromatography-** Introduction, Principle, Methodology, Rf values,advantages, disadvantages and applications **Paper chromatography-**Introduction, methodology, development techniques,advantages, disadvantages and applications **Electrophoresis**– Introduction, factors affecting electrophoretic mobility,Techniques of paper, gel, capillary electrophoresis, applications	10
4	**Gas chromatography -** Introduction, theory, instrumentation, derivatization,temperature programming, advantages, disadvantages and applications **High performance liquid chromatography (HPLC)-** Introduction, theory, instrumentation, advantages and applications	8
5	**Ion exchange chromatography-** Introduction, classification, ion exchange resins, properties, mechanism of ion exchange process, factors affecting ion exchange, methodology and applications **Gel chromatography-** Introduction, theory, instrumentation and applications **Affinity chromatography-** Introduction,theory, instrumentation and applications	7
	Total	45

Recommended Texts/Reference books/web resources:

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel

5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein

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Bachelor of Pharmacy
Sub Code: BP702T
SEMESTER**:** VII
Subject Name: Industrial Pharmacy II

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

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

CO1. Know the process of pilot plant and scale up of pharmaceutical dosage forms

CO2. Understand the process of technology transfer from lab scale to commercial batch

CO3. Know different Laws and Acts that regulate pharmaceutical industry

CO4. Understand the approval process and regulatory requirements for drug products

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	Pilot plant scale up techniques: General considerations - including significance of personnel requirements, space requirements, raw materials, Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation, SUPAC guidelines, Introduction to platform technology	10
2	Technology development and transfer: WHO guidelines for Technology Transfer(TT): Terminology, Technology transfer protocol, Quality risk management, Transfer from R & D to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packaging materials) Documentation, Premises and equipment, qualification and validation, quality control, analytical method transfer, Approved regulatory bodies and agencies, Commercialization - practical aspects and problems (case studies), TT agencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE / SIDBI; TT related documentation - confidentiality agreement, licensing, MoUs, legal issues	10

3	**Regulatory affairs:** Introduction, Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals	2
	Regulatory requirements for drug approval: Drug Development Teams, Non-Clinical Drug Development, Pharmacology, Drug Metabolism and Toxicology, General considerations of Investigational New Drug (IND) Application, Investigator's Brochure (IB) and New Drug Application (NDA), Clinical research / BE studies, Clinical Research Protocols, Biostatistics in Pharmaceutical Product Development, Data Presentation for FDA Submissions, Management of Clinical Studies.	8
4	**Quality management systems:** Quality management & Certifications: Concept of Quality, Total Quality Management, Quality by Design (QbD), Six Sigma concept, Out of Specifications (OOS), Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP	8
5	**Indian Regulatory Requirements:** Central Drug Standard Control Organization (CDSCO) and State Licensing Authority: Organization, Responsibilities, Certificate of Pharmaceutical Product (COPP), Regulatory requirements and approval procedures for New Drugs	7
	Total	45

Recommended Texts/Reference books/web resources:

1. Regulatory Affairs from Wikipedia, the free encyclopedia modified on 7th April available at http, //en.wikipedia.org/wiki/Regulatory_ Affairs.
2. International Regulatory Affairs Updates, 2005. available at http://www.iraup.com/about.php
3. Douglas J Pisano and David S. Mantus. Text book of FDA Regulatory Affairs A Guide for Prescription Drugs, Medical Devices, and Biologics' Second Edition.
4. Regulatory Affairs brought by learning plus, inc. available at http.//www.cgmp.com/ra.htm.

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Bachelor of Pharmacy
Sub Code: BP703T
SEMESTER**:** VII
Subject Name: Pharmacy Practice

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

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO1: Students will demonstrate knowledge of and ability to use principles of therapeutics, quality improvement, communication, economics, health behavior, social and administrative aspects, health policy and legal issues in the practice of pharmacy.
CO2: Students will provide patient-centered care to diverse patients using the best available evidence and monitor drug therapy of patient through medication chart review, obtain medication history interview and counsel the patients, identify drug related problems. Students will use knowledge of drug distribution methods in hospital and apply it in the practice of pharmacy.
CO3: Students will exhibit professional ethics by producing safe and appropriate medication use throughout society.
CO4: Students will engage in innovative activities by making use of the knowledge of clinical trials. Students will effectively apply principles of drug store management and inventory control to medication use.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	**a) Hospital and it's organization** Definition, Classification of hospital- Primary, Secondary and Tertiary hospitals, Classification based on clinical and non- clinical basis, Organization Structure of a Hospital, and Medical staffs involved in the hospital and their functions.	8

	b) Hospital pharmacy and its organization Definition, functions of hospital pharmacy, Organization structure, Location, Layout and staff requirements, and Responsibilities and functions of hospital pharmacists. **c) Adverse drug reaction** Classifications - Excessive pharmacological effects, secondary pharmacological effects, idiosyncrasy, allergic drug reactions, genetically determined toxicity, toxicity following sudden withdrawal of drugs, Drug interaction- beneficial interactions, adverse interactions, and pharmacokinetic drug interactions, Methods for detecting drug interactions, spontaneous case reports and record linkage studies, and Adverse drug reaction reporting and management. **d) Community Pharmacy** Organization and structure of retail and wholesale drug store, types and design,Legal requirements for establishment and maintenance of a drug store, Dispensing of proprietary products, maintenance of records of retail and wholesale drug store.	
2	**a) Drug distribution system in a hospital** Dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labelling, Dispensing of drugs to ambulatory patients, and Dispensingof controlled drugs. **b) Hospital formulary** Definition, contents of hospital formulary, Differentiation of hospital formulary and Drug list, preparation and revision, and addition and deletion of drug from hospital formulary. **c) Therapeutic drug monitoring** Need for Therapeutic Drug Monitoring, Factors to be considered during the Therapeutic Drug Monitoring, and Indian scenario for Therapeutic DrugMonitoring. **d) Medication adherence** Causes of medication non-adherence, pharmacist role in the medication adherence, and monitoring of patient medication adherence. **e) Patient medication history interview** Need for the patient medication history interview, medication interview forms. **f) Community pharmacy management** Financial, materials, staff, and infrastructure requirements.	13
3	**a) Pharmacy and therapeutic committee** Organization, functions, Policies of the pharmacy and therapeutic committee inincluding drugs into formulary, inpatient and outpatient prescription, automatic stop order, and emergency drug list preparation. **b) Drug information services**	11

	Drug and Poison information centre, Sources of drug information, Computerised services, and storage and retrieval of information. **c) Patient Counseling** Definition of patient counseling; steps involved in patient counseling, and patient counseling for Asthma, Diabetes, Hypertension and Tuberculosis. **d) Education and training program in the hospital** Role of pharmacist in the education and training program, Internal and externaltraining program, Services to the nursing homes/clinics, Code of ethics for community pharmacy, and Role of pharmacist in the interdepartmental communication and community health education. **e) Prescribed medication order and communication skill** Prescribed medication order- interpretation and legal requirements, and Communication skills- communication with prescribers and patients.	
4	**a) Budget preparation and implementation** Budget preparation and implementation **b) Clinical pharmacy** Introduction to Clinical Pharmacy, Concept of clinical pharmacy, functions and responsibilities of clinical pharmacist, Drug therapy monitoring - medication chart review, clinical review, pharmacist intervention, Ward round participation, Medication history and Pharmaceutical care. Dosing pattern and drug therapy based on Pharmacokinetic & disease pattern. **c) Over the counter (OTC) sales** Introduction and sale of over the counter, and Rational use of common over thecounter medications.	7
5	**a) Drug store management and inventory control** Organisation of drug store, types of materials stocked and storage conditions, Purchase and inventory control: principles, purchase procedure, purchase order, procurement and stocking, Economic order quantity, Reorder quantity level, and Methods used for the analysis of the drug expenditure **b) Investigational use of drugs** Description, principles involved, classification, control, identification, role of hospital pharmacist, advisory committee. **c) Interpretation of Clinical Laboratory Tests** Blood chemistry, hematology, urinalysis and Liver function test.	6
	Total	45

Recommended Texts/Reference books/web resources:

1. Merchant S.H. and Dr. J.S.Quadry. *A textbook of hospital pharmacy*, 4th ed. Ahmadabad: B.S. Shah Prakakshan; 2001.
2. Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. *A textbook of Clinical Pharmacy Practice- essential concepts and skills,* 1st ed. Chennai: Orient Longman Private Limited; 2004.
3. William E. Hassan. *Hospital pharmacy*, 5th ed. Philadelphia: Lea & Febiger;1986.
4. Tipnis Bajaj. *Hospital Pharmacy*, 1st ed. Maharashtra: Career Publications; 2008.
5. Scott LT. *Basic skills in interpreting laboratory data*, 4thed. American Society of Health System Pharmacists Inc; 2009.
6. Parmar N.S. *Health Education and Community Pharmacy,* 18th ed. India: CBS Publishers & Distributers; 2008.
7. Therapeutic drug monitoring. ISSN: 0163-4356
8. Journal of pharmacy practice. ISSN : 0974-8326
9. American journal of health system pharmacy. ISSN: 1535-2900 (online)
10. Pharmacy times (Monthly magazine)

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Bachelor of Pharmacy
Sub Code: BP704TT
SEMESTER**:** VII
Subject Name: Novel Drug Delivery Systems

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

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: To understand the design of controlled drug delivery system and polymers used in CRDDS
CO 2: Formulation & Evaluation of microspheres, microcapsules, Muosal, Implantable and transdermal drug delivery system
CO 3: Formulation & Evaluation of Gaso-retentive, Nasopulmonary drug delivery system
CO4**:** Formulation & Evaluation of Nano Sized formulations, ocular and intrauterine drug delivery system

Teaching Scheme and Examination Scheme

Teaching Scheme				**Evaluation Scheme**			
Theory	**Tutorial**	**Practical**	**Total**	**Theory**		**Practical**	
				External	**Internal**	**External**	**Internal**
3	**1**	**-**	**4**	**75**	**25**	**-**	**-**

Unit	**Course Content**	**Hours**
1	**Controlled drug delivery systems:** Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design controlled release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations **Polymers:** Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug delivery systems.	10
2	**Microencapsulation:** Definition, advantages and disadvantages, microspheres/microcapsules, microparticles, methods of microencapsulation, applications **Mucosal Drug Delivery system:** Introduction, Principles of bioadhesion/mucoadhesion, concepts, advantages and disadvantages,	10

	transmucosal permeability and formulation considerations of buccal delivery systems **Implantable Drug Delivery Systems:** Introduction, advantages and disadvantages, concept of implantsand osmotic pump	
3	**Transdermal Drug Delivery Systems:** Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches **Gastro-retentive drug delivery systems:** Introduction, advantages, disadvantages, approaches for GRDDS – Floating, high density systems, inflatable and gastro adhesive systems and their applications **Nasopulmonary drug delivery system:** Introduction to Nasal and Pulmonary routes of drug delivery, Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers	10
4	**Nanotechnology and its concepts:** Concepts and approaches advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications **Prodrug:** Introduction, Classification, Applications and Limitations of Prodrug.	8
5	**Ocular Drug Delivery Systems:** Introduction, intra ocular barriers and methods to overcome –Preliminary study, ocular formulations and ocuserts **Intrauterine Drug Delivery Systems:** Introduction, advantages and disadvantages, development of intra uterine devices (IUDs) and applications	7
	Total	45

Recommended Texts/Reference books/web resources:

1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.
2. Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker, Inc., New York, 1992.
3. Encyclopedia of Controlled Delivery. Edith Mathiowitz, Published by Wiley Interscience Publication, John Wiley and Sons, Inc, New York. Chichester/Weinheim
4. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).
5. S.P. Vyas and R.K. Khar, Controlled Drug Delivery -concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002.

Journals:

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

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Bachelor of Pharmacy
Sub Code: BP705T
SEMESTER: VII
Subject Name: Quality Assurance

Scope: This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It deals with the important aspects like cGMP, QC tests, documentation, quality certifications and regulatory affairs.

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: Understand the cGMP aspects in a pharmaceutical industry
CO 2: Appreciate the importance of documentation
CO 3: Understand the scope of quality certifications applicable to pharmaceutical industries
CO4**:** Understand the responsibilities of QA & QC departments.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	**Quality Assurance and Quality Management concepts:** Definition and concept of Quality control, Quality assurance and GMP **Total Quality Management (TQM):** Definition, elements, philosophies **ICH Guidelines: p**urpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines **Quality by design (QbD**): Definition, overview, elements of QbD program, tools **ISO 9000 & ISO14000**: Overview, Benefits, Elements, steps for registration **NABL accreditation** : Principles and procedures	10
2	**Organization and personnel**: Personnel responsibilities, training, hygiene and personal records. **Premises**: Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination.	10

	Equipments and raw materials: Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw material	
3	**Quality Control:** Quality control test for containers, rubber closures and secondary packing materials. **Good Laboratory Practices**: General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities	10
4	**Complaints**: Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal. **Document maintenance in pharmaceutical industry**: Batch Formula Record, Master Formula Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, distribution records	8
5	**Calibration and Validation**: Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation. **Warehousing**: Good warehousing practice, materials management	7
	Total	45

Recommended Texts/Reference books/web resources:

1. Quality Assurance Guide by organization of Pharmaceutical Products of India.
2. Good Laboratory Practice Regulations, 2nd Edition, SandyWeinberg Vol. 69.
3. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Related materials Vol IWHO Publications.
4. A guide to Total QualityManagement- Kushik Maitra and Sedhan K Ghosh How to Practice GMP's – P P Sharma.
5. ISO 9000 and Total Quality Management – Sadhank G Ghosh
6. The International Pharmacopoeia – Vol I, II, III, IV- General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excipients and Dosage forms
7. Good laboratory Practices – Marcel Deckker Series
8. ICH guidelines, ISO 9000 and 14000 guidelines

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Bachelor of Pharmacy

Sub Code: BP706P (Practical)

SEMESTER**:** VII

Subject Name: Instrumental methods of Analysis

Scope: describes the fundamentals of instrumental techniques and their applications. It provides the significant skills on the handling of instruments and equipment such as UV, IR and HPLC.

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

CO1: Analyze to carry out the handling of instrument and equipment independently

CO2: Perform quantitative analysis for drug substance/drug product with different Spectroscopic and Chromatographic instruments

CO3: Design and deepen their practical skills so as to be capable of solving practically associated problems

CO4: Judge the result outcome of the drug analysis performed by self with monographs.

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
-	-	4	2	-	-	35	15

S.No	Details of experiment
1.	Determination of absorption maxima and effect of solvents on absorption maxima of organic compounds
2.	Estimation of dextrose by colorimetry
3.	Estimation of sulfanilamide by colorimetry
4.	Simultaneous estimation of ibuprofen and paracetamol by UV spectroscopy
5.	Assay of paracetamol by UV- Spectrophotometry
6.	Estimation of quinine sulfate by fluorimetry
7.	Study of quenching of fluorescence
8.	Determination of sodium by flame photometry
9.	Determination of potassium by flame photometry
10.	Determination of chlorides and sulphates by nephelo turbidometry
11.	Separation of amino acids by paper chromatography
12.	Separation of sugars by thin layer chromatography

13.	Separation of plant pigments by column chromatography
14.	Demonstration experiment on HPLC
15.	Demonstration experiment on Gas Chromatography

Recommended Texts/Reference books/web resources

1. Indian pharmacopeia. (2014). Government of India, Ministry of health and family welfare. Vol 1, 2, 3. Ghaziabad: Published by Indian pharmacopeial commission.
2. 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).
3. The United states pharmacopoeia-National formulary. (USP 37-NF 32). Rockville: Published by the united states pharmacopoeial convention.
4. The European pharmacopoeia. (2008). 6th ed., Strasbourg: Published by the council of Europe.
5. The Japanese Pharmacopoeia. (2006). 13th ed., Japan: Published by the society ofJapanese Pharmacopoeia, under the supervision of the R & D division, Pharmaceutical affairs bureau, Ministry of health & welfare.
6. Martindale- The extra pharmacopoeia. 35th ed., London: Published by the royal pharmaceutical society.
7. Analytical profiles of drug substances. Vol. 1 to Vol. 20. Edited by Klaus Florey. United States of America: Published by Academic Press, Inc. ISBN: 978-0-12-260820-9
8. Analytical profiles of drug substances. Vol. 21 to Vol. 30. Edited by Harry G Brittain. United States of America: Published by Academic Press, Inc.
9. A Series of Analytical chemistry by open learning. Edited by David J. Ando.India: Published by Wiley India.

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Bachelor of Pharmacy
Sub Code: BP801T
SEMESTER**:** VIII
Subject Name: Biostatistics and Research Methodology

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

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO1: Understand the basic concepts of biostatistics, biostatistics arrangement, presentation and formation of tables and charts.
CO2: Teaching Scheme Acquire knowledge about the correlation and regression & application of different methods, analysis of data different parametric and non- parametric tests and Examination Scheme.
CO3: Learn general research methodology and compute statistical problems using various softwares.
CO4: Understand the process of designing an experiment including factorial, fractional factorial designs, response surface methodology.

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	0	4	75	25	-	-

Unit	Course Content	Hours
1	**Introduction:** Statistics, Biostatistics, Frequency distribution	2
	Measures of central tendency: Mean, Median, Mode- Pharmaceutical examples	3
	Measures of dispersion: Dispersion, Range, standard deviation, Pharmaceutical Problems	2
	Correlation: Definition, Karl Pearson's coefficient of correlation, Multiple correlation - Pharmaceuticals examples	3

2	Regression: Curve fitting by the method of least squares, fitting the lines y= a + bx and x = a + by, Multiple regression, standard error of regression– Pharmaceutical Examples	3
	Probability: Definition of probability, Binomial distribution, Normal distribution Poisson's distribution, properties – problems Sample, Population, large sample, small sample, Null hypothesis, alternative hypothesis, sampling, essence of sampling, types of sampling, Error-I type, Error-II type, Standard error of mean (SEM) - Pharmaceutical examples	4
	Parametric test: t-test(Sample, Pooled or Unpaired and Paired) , ANOVA, (One way and Two way), Least Significance difference	3
3	**Non-Parametric tests:** Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Walli's test, Friedman Test	2
	Introduction to Research: Need for research, Need for design of Experiments, Experiential Design Technique, plagiarism	3
	Graphs: Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph	2
	Designing the methodology: Sample size determination and Power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases.	3
4	Blocking and confounding system for Two-level factorials	2
	Regression modeling: Hypothesis testing in Simple and Multiple regression models	2
	Introduction to Practical components of Industrial and Clinical Trials Problems: Statistical Analysis Using Excel, SPSS, MINITAB®, DESIGN OF EXPERIMENTS, R - Online Statistical Software's to Industrial and Clinical trial approach	4
5	**Design and Analysis of experiments-Factorial Design:** Definition, 22, 23design. Advantage of factorial design	3
	Response Surface methodology: Central composite design, Historical design, Optimization Techniques	4
	Total	45

Recommended Texts/Reference books/web resources:

1. Pharmaceutical statistics- Practical and clinical applications, Sanford Bolton, publisher Marcel Dekker Inc. NewYork.
2. Fundamental of Statistics – Himalaya Publishing House- S.C.Guptha
3. Design and Analysis of Experiments –PHI Learning Private Limited, R. Pannerselvam
4. Design and Analysis of Experiments – Wiley Students Edition, Douglas and C. Montgomery

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Bachelor of Pharmacy
Sub Code: BP802T
SEMESTER: VIII
Subject Name: Social and Preventive Pharmacy

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

Course 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: Have a critical way of thinking based on current healthcare development
CO3: Evaluate alternative ways of solving problems related to health and pharmaceutical issues.
CO4 : Health promotion and control

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	**Concept of health and disease:** Definition, concepts and evaluation of public health. Understanding the concept of prevention and control of disease, social causes of diseases and social problems of the sick. **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	10
2	**Preventive medicine:** General principles of prevention and control of diseases such as cholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic	10

	filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse	
3	**National health programs, its objectives, functioning and outcome of the following:**HIV AND AIDS control programme, TB, Integrated disease surveillance program (IDSP), National leprosy control programme, National mental health program, National programme for prevention and control of deafness, Universal immunization programme, National programme for control of blindness, Pulse polio programme	10
4	**National health intervention program** for mother and child, National family welfare program, National tobacco control program, National Malaria Prevention Program, National program for the health care for the elderly, Social health program; role of WHO in Indian national program	8
5	**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.	7
	Total	45

Recommended Texts/Reference books/web resources:

1. Short Textbook of Preventive and Social Medicine, Prabhakara GN, 2nd Edition, 2010, ISBN: 9789380704104, JAYPEE Publications
2. Textbook of Preventive and Social Medicine (Mahajan and Gupta), Edited by Roy Rabindranath, Saha Indranil, 4th Edition, 2013, ISBN: 9789350901878, JAYPEE Publication
3. Review of Preventive and Social Medicine (Including Biostatistics), Jain Vivek, 6th Edition, 2014, ISBN: 9789351522331, JAYPEE Publications
4. Essentials of Community Medicine—A Practical Approach, Hiremath Lalita D, Hiremath Dhananjaya A, 2nd Edition, 2012, ISBN: 9789350250440, JAYPEE Publication
5. Community Pharmacy Practice, Ramesh Adepu, BSP publishers, Hyderabad

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Bachelor of Pharmacy

Sub Code: BP804ET

SEMESTER: VIII

Subject Name: Pharmaceutical Regulatory science

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

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

CO 1. Know about the process of drug discovery and development

CO 2. Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals

CO 3. Know the regulatory approval process and their registration in Indian and international markets

CO 4**:** Understand the quantitative standardization and assay methods

Teaching Scheme and Examination Scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	New Drug Discovery and development Stages of drug discovery, Drug development process, pre-clinical studies, nonclinical activities, clinical studies, Innovator and generics, Concept of generics, Generic drug product development	10
2	Regulatory Approval Process Approval processes and timelines involved in Investigational New Drug (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA). Changes to an approved NDA / ANDA. Regulatory authorities and agencies Overview of regulatory authorities of India, United States, European Union, Australia, Japan, Canada (Organization structure and types of applications)	10

3	Registration of Indian drug product in overseas market Procedure for export of pharmaceutical products, Technical documentation, Drug Master Files (DMF), Common Technical Document (CTD), electronic Common Technical Document (eCTD), ASEAN Common Technical Document (ACTD)research	10
4	Clinical trials Developing clinical trial protocols, Institutional Review Board / Independent Ethics committee - formation and working procedures, Informed consent process and procedures, GCP obligations of Investigators, sponsors & Monitors, Managing and Monitoring clinical trials, Pharmacovigilance - safetymonitoring in clinical trial	8
5	Regulatory Concepts Basic terminology, guidance, guidelines, regulations, Laws and Acts, Orange book, Federal Register, Code of Federal Regulatory, Purple book	7
	Total	45

Recommended Books: (Latest Editions)

1. Drug Regulatory Affairs by Sachin Itkar, Dr. N.S. Vyawahare, Nirali Prakashan.
2. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P. Martin, Drugs and the Pharmaceutical Sciences,Vol.185. Informa Health care Publishers.
3. New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino, MD, 5th edition, Drugs and the Pharmaceutical Sciences,Vol.190.
4. Guidebook for drug regulatory submissions / SandyWeinberg. By John Wiley & Sons. Inc.
5. FDA Regulatory Affairs: a guide for prescription drugs, medical devices, and biologics /edited by Douglas J. Pisano, David Mantus.
6. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and Isader Kaufer, Marcel Dekker series, Vol.143
7. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance By Fay A. Rozovsky and Rodney K. Adams
8. Principles and Practices of Clinical Research, Second Edition Edited by John I. Gallin and Frederick P. Ognibene
9. Drugs: From Discovery to Approval, Second Edition By Rick N

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Bachelor of Pharmacy
Sub Code: BP805ET
SEMESTER**:** VIII
Subject Name: Advanced Medicinal Chemistry

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

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: Explain the various stages of drug discovery, Learn the concept of bioisosterism to understand Analog Based Drug Design along with case studies.
CO 2: Describe physicochemical Properties and the techniques involved in QSAR. Learn the concept of 3D-QSAR approaches like COMFA and COMSIA.
CO 3: Explain the various techniques in Virtual Screening. Learn the concept of pharmacophore and modelling techniques. Explain various structure-based drug design methods (Molecular docking, Denovo drug design).
CO4**:** Learn introduction to Bioinformatics and Cheminformatics. Learn methods in molecular and quantum mechanics

Teaching Scheme and Examination Scheme

Teaching Scheme				**Evaluation Scheme**			
Theory	**Tutorial**	**Practical**	**Total**	**Theory**		**Practical**	
				External	**Internal**	**External**	**Internal**
3	**1**	**-**	**4**	**75**	**25**	**-**	**-**

Unit	Course Content	Hours
1	**Introduction to Drug Discovery and Development** Stages of drug discovery and development **Lead discovery and Analog Based Drug Design** Rational approaches to lead discovery based on traditional medicine, Random screening, Non-random screening, serendipitous drug discovery, lead discovery based on drug metabolism, lead discovery based on clinical observation. **Analog Based Drug Design:** Bioisosterism, Classification, Bioisosteric replacement. Any three case studies	9
2	**Quantitative Structure Activity Relationship (QSAR)** SAR versus QSAR, History and development of QSAR, Types of physicochemical parameters, experimental and theoretical approaches	9

	for the determination of physicochemical parameters such as Partition coefficient, Hammet's substituent constant and Tafts steric constant. Hansch analysis, Free Wilson analysis, 3D-QSAR approaches like COMFA and COMSIA.	
3	**Molecular Modeling and virtual screening techniques** **Virtual Screening techniques:** Drug likeness screening, Concept of pharmacophore mapping and pharmacophore-based Screening, **Molecular docking**: Rigid docking, flexible docking, manual docking, Docking based screening. *De novo* drug design.	9
4	**Informatics & Methods in drug design** Introduction to Bioinformatics, chemoinformatics. ADME databases, chemical, biochemical and pharmaceutical databases.	8
5	**Molecular Modeling:** Introduction to molecular mechanics and quantum mechanics. Energy Minimization methods and Conformational Analysis, global conformational minima determination.	7
6	**Advance Computing technology:** Introduction to AI, Ml in drug discovery, Various AI, Ml Methods involved in drug discovery	3
	Total	45

Recommended Texts/Reference books/web resources:

1. Robert GCK, ed., "Drug Action at the Molecular Level" University Prak Press Baltimore.
2. Martin YC. "Quantitative Drug Design" Dekker, New York.
3. Delgado JN, Remers WA eds "Wilson & Gisvolds's Text Book of Organic Medicinal & Pharmaceutical Chemistry" Lippincott, New York.
4. Foye WO "Principles of Medicinal chemistry 'Lea & Febiger.
5. Koro lkovas A, Burckhalter JH. "Essentials of Medicinal Chemistry" Wiley Interscience.
6. Wolf ME, ed "The Basis of Medicinal Chemistry, Burger's Medicinal Chemistry" JohnWiley& Sons, New York.
7. Patrick Graham, L., An Introduction to Medicinal Chemistry, Oxford University Press.
8. Smith HJ, Williams H, eds, "Introduction to the principles of Drug Design" Wright Boston.
9. Silverman R.B. "The organic Chemistry of Drug Design and Drug Action" Academic Press New York.
10. Heifetz A, editor. Artificial Intelligence in Drug Design. Humana Press; 2022.

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Bachelor of Pharmacy
Sub Code: BP806ET
SEMESTER: VIII
Subject Name: Cell and Molecular Biology

Scope: Cell biology is a branch of biology that studies cells-their physiological properties, their structure, the organelles they contain, interactions with their environment, their life cycle, division, death and cell function.

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: Summarize cell and molecular biology history.
CO 2: Summarize cellular functioning and composition.
CO 3: Describe the chemical foundations of cell biology.
CO4**:** Summarize the DNA properties of cell biology.

Teaching Scheme and Examination Scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	a) Cell and Molecular Biology: Definitions theory and basics and Applications. b) Cell and Molecular Biology: History and Summation. c) Properties of cells and cell membrane. d) Prokaryotic versus Eukaryotic e) Cellular Reproduction f) Chemical Foundations – an Introduction and Reactions (Types)	10
2	a) DNA and the Flow of Molecular Information b) DNA Functioning c) DNA and RNA d) Types of RNA e) Transcription and Translation	10
3	a) Proteins: Defined and Amino Acids b) Protein Structure 173 c) Regularities in Protein Pathways d) Cellular Processes e) Positive Control and significance of Protein Synthesis	10
4	a) Science of Genetics b) Transgenics and Genomic Analysis c) Cell Cycle analysis d) Mitosis and Meiosis e) Cellular Activities and Checkpoints	8

5	a) Cell Signals: Introduction b) Receptors for Cell Signals c) Signaling Pathways: Overview d) Misregulation of Signaling Pathways e) Protein-Kinases: Functioning	7
	Total	45

Recommended Texts/Reference books/web resources:

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. Edward: Fundamentals of Microbiology.
10. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
11. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company
12. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of RecombinantDNA: ASM Press Washington D.C.
13. RA Goldshy et. al., : Kuby Immunology

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Bachelor of Pharmacy
Sub Code: BP807ET
SEMESTER: VIII
Subject Name: Cosmetic Science

Scope: To understand the classification of cosmetics and cosmeceutical products as per Indian and EU regulations. This subject deals with principles of formulation and the building blocks of skin care products, classification of sunscreens and sun protection factor, the role of herbs in cosmetics with their analytical methods, principles of cosmetic evaluation. The subject also includes about oily and dry skin, causes leading to dry skin, skin miniaturization as well as a basic understanding of the terms covering cosmetics.

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1. To know and explain about cosmetics, and related sciences, cosmeceuticals (cosmetics with skin, hair and oral care benefits) and personal care and hygiene products.
CO 2. To demonstrate practical skills in the area of biology, formulation science and analytical techniques required to scientifically design and develop various cosmetic products.
CO 3. To describe about basic cosmetic problems associated with skin, hair and oral care.

Teaching Scheme and Examination Scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	Classification of cosmetic and cosmeceutical products Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticals from cosmetics, cosmetics as quasi and OTC drugs Cosmetic excipients: Surfactants, rheologymodifiers, humectants, emollients, preservatives. Classification and application Skin: Basic structure and function of skin. Hair: Basic structure of hair. Hair growth cycle. Oral Cavity: Common problem associated with teeth and gums.	10
2	Principles of formulation and building blocks of skin care products: Face wash, Moisturizing cream, Cold Cream, Vanishing cream and their advantages and disadvantages. Application of these products in formulation of cosmecuticals. Antiperspants & deodorants- Actives &	12

	mechanism of action. Principles of formulation and building blocks of Hair care products: Conditioning shampoo, Hair conditioner,anti-dandruff shampoo. Hair oils. Chemistry and formulation of Para-phylene diamine based hair dye. Principles of formulation and building blocks of oral care products: Toothpaste for bleeding gums, sensitive teeth. Teeth whitening, Mouthwash	
3	Sun protection, Classification of Sunscreens and SPF. Role of herbs in cosmetics: Skin Care: Aloe and turmeric Hair care: Henna and amla. Oral care: Neem and clove Analytical cosmetics: BIS specification and analytical methods for shampoo, skincream and toothpaste	8
4	Principles of Cosmetic Evaluation:Principles of sebumeter, corneometer. Measurement of TEWL, Skin Color, Hair tensile strength, Hair combing properties Soaps,and syndet bars. Evolution and skin benfits.	7
5	Oily and dry skin, causes leading to dry skin, skin moisturisation. Basic understanding of the terms Comedogenic, dermatitis. Cosmetic problems associated with Hair and scalp: Dandruff, Hair fall causes Cosmetic problems associated with skin: blemishes, wrinkles, acne, prickly heat and body odor. Antiperspirants and Deodorants- Actives and mechanism of action	8
	Total	45

Recommended Books (latest edition):

1. Harry's Cosmeticology, Wilkinson, Moore, Seventh Edition, George Godwin.
2. Cosmetics – Formulations, Manufacturing and Quality Control, P.P. Sharma, 4thEdition, Vandana Publications Pvt. Ltd., Delhi.
3. Drugs and Cosmetic act/rules by govt. of India Publication
4. European Union regulation for cosmetics.
5. Poucher's Perfumes, Cosmetics and Soaps, Hilda Butler, 10th Edition, Kluwer Academic Publishers
6. Handbook of Cosmetic Science and Technology, 3rd Edition, André O. Barel, Marc Paye, Howard
7. Pulok K.Mukherjee. Quality Control Herbal Drugs Business Horizons; Reprint 2012 edition 8) Trease, G.E. and Evans, W.C. "Trease and Evans' Pharmacognosy" WB Saunders Co.

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Bachelor of Pharmacy
Sub Code: BP808ET
SEMESTER**: VIII**
Subject Name: Advanced Instrumentation Techniques

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

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: understand the advance instrument used and it's application in drug analysis
CO 2: understand the chromatographic separation and analysis of drug
CO 3: understand the calibration of various analytical instruments
CO4**:** understand the analysis of drug by various analytical method

Teaching Scheme and Examination Scheme

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	**Nuclear Magnetic Resonance spectroscopy Principles** of H-NMR and C-NMR, chemical shift, factors affecting chemicalshift, coupling constant, Spin - spin coupling, relaxation, instrumentation andapplications **Mass Spectrometry-** Principles, Fragmentation, Ionization techniques Electron impact, chemical ionization, MALDI, FAB, Analyzers-Time of flight and Quadrupole, instrumentation, applications	12
2	**Thermal Methods of Analysis:** Principles, instrumentation and applications of ThermogravimetricAnalysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC) **X-Ray Diffraction Methods:** Origin of X-rays, basic aspects of crystals, Xray Crystallography, rotating crystal technique, single crystal diffraction, powder diffraction, structural elucidation and applications.	10

3	**Calibration and validation**-as per ICH and USFDA guidelines Calibration of following Instruments Electronic balance, UV-Visible spectrophotometer, IR spectrophotometer, Fluorimeter, Flame Photometer, HPLC and GC	10
4	**Radio immune assay:**Importance, various components, Principle, different methods, Limitation and Applications of Radio immuno assay **Extraction techniques:** General principle and procedure involved in the solid phase extraction and liquid-liquid extraction	8
5	**Hyphenated techniques**-LC-MS/MS, GC-MS/MS, HPTLC-MS.	5
	Total	45

Recommended Texts/Reference books/web resources:

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy byWilliam Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein

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Bachelor of Pharmacy
Sub Code: BP809ET
SEMESTER**:** VIII
Subject Name: Experimental Pharmacology

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

Course Outcomes: Upon successful completion of this course, the student should be able to:
CO 1: Appreciate the applications of various commonly used laboratory animals.
CO 2: Appreciate and demonstrate the various screening methods used in preclinical research
CO:3 Appreciate and demonstrate the importance of biostatistics and research methodology
CO4: Design and execute a research hypothesis independently

Teaching Scheme and Examination Scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	-	4	75	25	-	-

Unit	Course Content	Hours
1	**Laboratory Animals:** Study of CPCSEA and OECD guidelines for maintenance, breeding and conduct of experiments on laboratory animals Common lab animals: Description and applications of different species and strains of animals. Popular transgenic and mutant animals.Techniques for collection of blood and common routes of drug administration in laboratory animals, Techniques of blood collection and euthanasia.	7
2	**Introduction to preclinical studies:** Dose selection, calculation and conversions, preparation of drug solution/suspensions, grouping of animals and importance of sham negative and positive control groups. Rationale for selection of animal species and sex for the study	3
3	**Preclinical screening models** Preclinical screening models for drugs acting on CNS :- analgesic, antipyretic, anti-inflammatory, general anesthetics, sedative and hypnotics, antipsychotic, antidepressant, antiepileptic, nootropics anti	12

	Parkinsonism drugs, anti-Alzheimer drug,Preclinical screening models for drugs acting on eye and local aesthetics	
4.	**Preclinical screening models for drugs acting on ANS** : sympathomimetics, sympatholytics, parasympathomimetics, parasympatholytics, skeletal muscle relaxants	5
5.	**Preclinical screening models for drugs acting on CVS :-** antihypertensives, diuretics, antiarrhythmic, antidyslepidemic, anti aggregatory, coagulants, and anticoagulants, Preclinical screening models for antiulcer, antidiabetic, anticancer and antiasthmatic activities	13
6.	**Research methodology and Bio-statistics** Selection of research topic, review of literature, research hypothesis and study design Pre-clinical data analysis and interpretation using Students't' test and One-way ANOVA. Graphical representation of data	5
	Total	45

Recommended Texts/Reference books/web resources:

1. Fundamentals of experimental Pharmacology-byM.N.Ghosh
2. Hand book of Experimental Pharmacology-S.K.Kulakarni
3. CPCSEA guidelines for laboratory animal facility.
4. Drug discovery and Evaluation by Vogel H.G.
5. Drug Screening Methods by Suresh Kumar Gupta and S. K. Gupta
6. Introduction to biostatistics and research methods by PSS Sundar Rao and J Richard

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Bachelor of Pharmacy
Sub Code: BP-AC
SEMESTER**:** VI and VII
Subject Name: Audit Course

SEMESTER 6

(**BP609AC4**) Integrated Personality Development Course (IPDC)
https://www.baps.org/IPDC/IPDC.aspx

(**BP610AC4**) English Research Paper Writing
https://www.coursera.org/learn/academic-writing-capstone

(**BP611AC4**) Industrial Waste Management Course
https://www.cseindia.org/online-certificate-course-sustainable-waste-management-organic-and-inorganic--11523

(**BP612AC4**) Drug Abuse: Problem Prevention and Management
https://tapas.dosje.gov.in/courses_drug.php

SEMESTER 7

(**BP708AC1**) Constitution of India
https://opportunitycell.com/online-course-on-the-indian-constitution-by-ministry-of-law-justice/

(**BP709AC1**) Yoga and Stress Control
https://www.classcentral.com/course/swayam-yoga-for-stress-management-204718

Annexure I

Program Name: Bachelor of Pharmacy (B. Pharm)

Course Code, Course Number and other details:

Course Code 90 represent B.Pharm

BP101T/P

- Alphabet shown in Red Color Code represent the name of program; BP for Bachelor of Pharmacy
- First Numerical shown in green represent the semester number i.e. from 1 to 8 semester
- The Numerical shown in purple represent the subject sequence in the semester
- The Capital letter T stands for the Theory of course
- The Capital letter P stands for Practical of the course

Other Codes

- CC: Core Course/ Compulsory Course
- AECC: Ability Enhancement Compulsory Course
- SEC: Skill Enhancement Course
- DSE: Discipline Specific Elective
- GE: General Elective
- # Audit Course