PCET's
Pimpri Chinchwad University
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Pimpri Chinchwad Education Trust's

Pimpri Chinchwad University

School of Pharmacy

Sate, Pune – 412106, Maharashtra, India

(Established under Maharashtra Act No V of 2023)

Rules, Structure and Syllabus for First To Final Year (SEM - I to SEM - VIII)

Bachelor of Pharmacy

(2024 Pattern)

[Framed under Revised Regulations 2016-17 for the B. Pharm. Degree Program (CBCS) of the Pharmacy Council of India, New Delhi].

Choice Based Credit System (CBCS) and Grading System

Effective from Academic Year 2024-25

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Preamble

Pimpri Chinchwad University offers Bachelor of Pharmacy (B. Pharm) course. This course is an undergraduate program that aims to provide students with a comprehensive understanding diverse world of Pharmacy as an integral part of healthcare system. The syllabus for Bachelor of Pharmacy at undergraduate level is regulated by Pharmacy Council of India (PCI). Along with this curriculum the students of Pharmacy are offered with audit courses and ability enhancement courses for inculcating the additional abilities and improve proficiency as a pharmacist to serve the society.

The profession of pharmacy is noble in its ideals and pious in its character. Apart from being a career for earning livelihood it has inherent in it the attitude of service and sacrifice in the interests of the suffering humanity. In handling, selling, distributing, compounding and dispensing medical substances including poisons and potent drugs a pharmacist is, in collaboration with medical men and others, charged with the onerous responsibility of safeguarding the health of people. As such he must uphold the interests of his patrons above all things. The lofty ideals set up by Charaka, the ancient Philosopher Physician and Pharmacist in his enunciation: "Even if your own life be in danger, you should not betray or neglect the interests of your patients" should be fondly cherished by all Pharmacist. Government restricts the practice of Pharmacy to those who qualify under regulatory requirements and grant them privileges necessarily denied to others. In return Government expects the Pharmacist to recognize his responsibilities and to fulfill his professional obligations honorably and with due regard for the wellbeing of Society. Standards of professional conduct for pharmacy are necessary in the public interest to ensure an efficient pharmaceutical service. Every pharmacist should not only be willing to play his part in giving such a service but should also avoid any act or omission which would prejudice the giving of the services or impair confidence in any respect for pharmacists as a body. The nature of pharmaceutical practice is such that its demands may be beyond the capacity of the individual to carry out as quickly or as efficiently as the needs of the public require. There should, therefore always, be a readiness to assist colleagues with information or advice. A Pharmacist must, above all be a good citizen and must uphold and defend the laws of the state and the Nation.

The goal of the syllabus is that the students at the end can secure a high ending job. Keeping in mind with the changing nature of the course, passable emphasis has been given on new practices of mapping and understanding of the subject. The syllabus has also been outlined in such a way that the basic skills of course are taught to the students, increasing chances of securing most job opportunities in pharmaceutical industry.

Also, it is recommended that the Project Work and Industrial training is compulsory for all the students as per their respective semester curriculum.

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Vision and Mission of Program:

Vision:

- To emerge as a Centre of Excellence in Pharmaceutical Education, Research and Healthcare Services.

Mission:

- To deliver quality Pharmacy education to cater the evolving needs of the students, industries and the society at large.
- To foster and disseminate high quality research and creative work which enhances learning and contributes to the advancement of knowledge.
- To produce highly productive professionals and leaders to serve the healthcare needs of the society.

Program Educational Objectives:

Program Educational Objectives (PEOs) for a B. Pharm program are as follows:

- **PEO 1:** To generate excellent trained undergraduates with state of art knowledge in pharmaceutical technology and allied subjects in an ambience of motivation that could stimulate growth and excellence.
- **PEO 2:** To create professional undergraduates who are trained in sync with the requirements of the pharmaceutical industry spread across the country and the globe and adapt readily to education, research, industry and healthcare programs.
- **PEO 3**: To mold students to emerge as future leaders of the pharmaceutical industry and as entrepreneurs.
- **PEO 4:** To sensitize students to local and global needs of environment protection and sustainability.
- **PEO 5:** To promote the development of trained human resource in Pharmaceutical Sciences for dissemination of quality education with highly professional and ethical attitude, strong communication skills, effective skills to work in a team with a multidisciplinary approach.

Program Outcome

PO	PO Statement
PO1:	**Pharmacy Knowledge:** Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; 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.
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:** Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and well- being.
PO6:	**Professional Identity:** Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).
PO7:	**Pharmaceutical Ethics:** Apply ethical principles in professional and social contexts, honour personal values.
PO8:	**Communication:** Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.
PO9:	**The Pharmacist and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.
PO10:	**Environment and sustainability:** Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO11:	**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.

Program Specific Objectives

PSO1:	Apply fundamental principles of pharmacy in developing entrepreneurial expertise and solving community-based problems.
PSO2:	Work competently in various areas of pharmaceutical industry and inter-disciplinary research.
PSO3:	Work effectively and ethically in their professional environment.
PSO4:	Seek constant improvement and develop new skills to enhance the state of their pharmaceutical practice.

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Curriculum Structure:

Sr. No.	Type of course	Abbreviations
1	Major	**MAJ**
2	Elective (Minor Stream/Vocational/Program Specific)	**MIN**
3	Open Electives	**OE**
4	Ability Enhancement Courses	**AEC**
5	Skill Enhancement Courses	**SEC**
6	Vocational Skill Course	**VSC**
7	Summer Internship/ On Job Training	**OJT**
8	Project	**PROJ**
9	Field Project	**FP**
10	Indian Knowledge System	**IKS**
11	Community Engagement Program	**CEP**
12	Value Education Course	**VEC**

Sr. No.	Type of course	No. of Courses	Total Credits	
			No	%
1	Major	**64***	**197***	**92.92**
2	Electives	**09**	**08**	**3.77**
3	Ability Enhancement Courses (AEC)	**04**	---	---
4	Summer Internship/On Job Training	**01**	---	---
5	Field Project/Project work	**01**	**06**	**2.83**
6	Indian Knowledge System (IKS)	**01**	---	---
7	Co-curricular & extracurricular activities/Community Engagement Program (CEP)	**01**	**01**	**0.47**
8	Audit course (Value Education Course)	**05**	---	---
	Total	**86**	**212**	**100**

*** Including the students appearing for remedial mathematics (02) credit /remedial biology (03) credit course**

CREDIT DISTRIBUTION: SEMESTER WISE

Sr. No.	Type of course	No. of Credits/Semester								Total
		1	2	3	4	5	6	7	8	
1	Major	30	29	26	28	26	26	24	14	**203**
2	Elective (Minor Stream/Vocational/Program Specific)	--	--	--	--	--	--	--	08	**08**
3	Ability Enhancement Courses (AEC)	--	--	AEC	AEC	AEC	AEC	--	--	--
4	Summer Internship/On Job Training	--	--	--	--	--	--	SI	--	--
5	Field Project	--	FP	--	--	--	--	--	FP	--
6	Indian Knowledge System (IKS)	--	AC	--	--	--	--	--	--	--
7	Co-curricular extracurricular activities / Community Engagement Program (CEP) *	CEP	CEP	CEP	CEP	CEP	CEP	CEP	CEP	**01***
8	Audit course (Value Education Course)	--	AC	AC	AC	AC	AC	--	--	--
Total		30	29	26	28	26	26	24	22	**211/ 212***

***The credit point (01) assigned for extracurricular and co-curricular activities**

Curriculum Structure

PROGRAM STRUCTURE SCHOOL PHARMACY
BACHELOR OF PHARMACY (B.PHARM) 2024 PATTERN
Effective from the Academic Year 2024 - 2025
TABLE I- COURSE OF STUDY FOR SEMESTER I

Course code	Course Type	Name of the course	No. of hours	Tutorial	Credit points	Continuous Internal Assessment (CIA)				End Semester Assessment Scheme		Total Marks
						Continuous Mode	Sessional Exams		Total	Marks	Duration Hrs	
							Marks	Duration Hrs				
BP101T	Core	Human Anatomy and Physiology I– Theory	3	1	4	10	15	1	25	75	3	100
BP102T	Core	Pharmaceutical Analysis I – Theory	3	1	4	10	15	1	25	75	3	100
BP103T	Core	Pharmaceutics I – Theory	3	1	4	10	15	1	25	75	3	100
BP104T	Core	Pharmaceutical Inorganic Chemistry – Theory	3	1	4	10	15	1	25	75	3	100
BP105T	Core	Communication skills – Theory *	2	-	2	5	10	1	15	35	1.5	50
BP106RBT BP106RMT	Core	Remedial Biology/ Mathematics – Theory*	2	-	2	5	10	1	15	35	1.5	50
BP107P	Core	Human Anatomy and Physiology – Practical	4	-	2	5	10	4	15	35	4	50
BP108P	Core	Pharmaceutical Analysis I – Practical	4	-	2	5	10	4	15	35	4	50
BP109P	Core	Pharmaceutics I – Practical	4	-	2	5	1	4	1	35	4	50
BP110P	Core	Pharmaceutical Inorganic Chemistry – Practical	4	-	2	5	10	4	15	35	4	50
BP111P	Core	Communication skills – Practical*	2	-	1	5	5	2	10	15	2	25
BP112RBP	Core	Remedial Biology – Practical*	2	-	1	5	5	2	10	15	2	25
ACUHV101	AC*	Universal Human Values-I (UHV-I)	2	-	-	50				NA		
ACUSPVEC101	VEC*	Value Education Courses	Approx 3	-	-	--				--		
Total			**34/ 36$/ 38#**	**4**	**27/29$ /30#**	**70/75$/80#**	**115/ 125$/ 130#**	**23/24$/26#**	**185/ 200$/ 210#**	**490/ 525$/ 540#**	**31.5/ 33$/35#**	**675/ 725$/ 750#**

Abbreviations: Course Abbreviation; Th = Theory , Tut = Tutorial, Pr = Practical , Hrs = Hours , Cr = Credits ; CIA = Continuous Internal Assessment , ESA = End Semester Assessment , PR = Practical Exam , OR= Oral Exam, *VEC: As per guidelines given with the course.*

TABLE II: COURSE OF STUDY FOR SEMESTER II

Course code	Course Type	Name of the course	No. of hours	Tutorial	Credit points	Continuous Internal Assessment (CIA)				End Semester Assessment Scheme		Total Marks
						Continuous Mode	Sessional Exams		Total	Marks	Duration Hrs	
							Marks	Duration Hrs				
BP201T	Core	Human Anatomy and PhysiologyII – Theory	3	1	4	10	15	1	25	75	3	100
BP202T	Core	Pharmaceutical Organic Chemistry-I Theory	3	1	4	10	15	1	25	75	3	100
BP203T	Core	Biochemistry – Theory	3	1	4	10	15	1	25	75	3	100
BP204T	Core	Pathophysiology – Theory	3	1	4	10	15	1	25	75	3	100
BP205T	Core	Computer Applications inPharmacy – Theory*	3	-	3	10	15	1	25	50	2	75
BP206T	Core	Environmental Sciences – Theory*	3	-	3	10	15	1	25	50	2	75
BP207P	Core	Human Anatomy and PhysiologyII –Practical	4	-	2	5	10	4	15	35	4	50
BP208P	Core	Pharmaceutical Organic Chemistry I– Practical	4	-	2	5	10	4	15	35	4	50
BP209P	Core	Biochemistry – Practical	4	-	2	5	10	4	15	35	4	50
BP210P	Core	Computer Applications in Pharmacy – Practical*	2	-	1	5	5	2	10	15	2	25
ACIKSSP101	AC*	Indian Knowledge System (IKS) – Indian Health Science	2	-	-	50			NA			
ACUSPVEC 102	VEC	Value Education Courses	Approx 3	-	-	--			--			
		Total	**34**	**4**	**29**	**80**	**125**	**20**	**205**	**520**	**30**	**725**

** VEC- As per guidelines given with the course.*
**Audit Course*

TABLE III: COURSE OF STUDY FOR SEMESTER III

Course code	Course Type	Name of the course	No. of hours	Tutorial	Credit points	Continuous Internal Assessment (CIA)				End Semester Assessment Scheme		Total Marks
						Continuous Mode	Sessional Exams		Total	Marks	Duration Hrs	
							Marks	Duration Hrs				
BP301T	Core	Pharmaceutical Organic Chemistry II – Theory	3	1	4	10	15	1	25	75	3	100
BP302T	Core	Physical Pharmaceutics-I –Theory	3	1	4	10	15	1	25	75	3	100
BP303T	Core	Pharmaceutical Microbiology – Theory	3	1	4	10	15	1	25	75	3	100
BP304T	Core	Pharmaceutical Engineering –Theory	3	1	4	10	15	1	25	75	3	100
BP305P	Core	Pharmaceutical Organic Chemistry II – Practical	4	-	2	5	10	4	15	35	4	50
BP306P	Core	Physical Pharmaceutics I –Practical	4	-	2	5	10	4	15	35	4	50
BP307P	Core	Pharmaceutical Microbiology Practical	4	-	2	5	10	4	15	35	4	50
BP308P	Core	Pharmaceutical Engineering Practical	4	-	2	5	10	4	15	35	4	50
ACUHV201	AC	Universal Human Values-II (UHV-II)	2	-	-	50				NA		
UFL201	AEC#	German A1.1/Japanese B1.1*	2	-	-	50				NA		
ACUSPVEC203	VEC	Value Education Courses	Approx 3	-	-	--				--		
		Total	**30**	**4**	**24**	**60**	**100**	**20**	**160**	**440**	**28**	**600**

* **UFL201A- GERMAN, * UFL201B- JAPANESE,** # Ability Enhancement Course, *VEC: As per guidelines given with the course.*

Foreign Language

Course Code	Course Type	Subject name
UFLI 201A	AEC	German
UFLI 201 B	AEC	Japanese

TABLE IV: COURSE OF STUDY FOR SEMESTER IV

Course code	Course Type	Name of the course	No. of hours	Tutorial	Credit points	Continuous Internal Assessment (CIA)				End Semester Assessment Scheme		Total Marks
						Continuous Mode	Sessional Exams		Total	Marks	Duration (Hrs)	
							Marks	Duration (Hrs)				
BP401T	Core	Pharmaceutical Organic Chemistry III– Theory	3	1	4	10	15	1	25	75	3	100
BP402T	Core	Medicinal Chemistry I – Theory	3	1	4	10	15	1	25	75	3	100
BP403T	Core	Physical Pharmaceutics II – Theory	3	1	4	10	15	1	25	75	3	100
BP404T	Core	Pharmacology I – Theory	3	1	4	10	15	1	25	75	3	100
BP405T	Core	Pharmacognosy & Phytochemistry I – Theory	3	1	4	10	15	1	25	75	3	100
BP406P	Core	Medicinal Chemistry I – Practical	4	-	2	5	10	4	15	35	4	50
BP407P	Core	Physical Pharmaceutics II – Practical	4		2	5	10	4	15	35	4	50
BP408P	Core	Pharmacology I – Practical	4	-	2	5	10	4	15	35	4	50
BP409P	Core	Pharmacognosy and Phytochemistry I – Practical	4	-	2	5	10	4	15	35	4	50
ACCOI201	AC	Constitution of India (COI)	2	-	-	50			NA			
UFL202	AEC#	German A1.2/Japanese B1.2*	2	-	-	50			NA			
ACUSPVEC204	VEC	Value Education Courses	Approx 3	-	-	--			--			
Total			**33**	**5**	**28**	**70**	**115**	**21**	**185**	**515**	**31**	**700**

* **UFL202A- GERMAN, * UFL202B- JAPANESE,** # Ability Enhancement Course *VEC: As per guidelines given with the course.*

Foreign Language

Course Code	Course Type	Subject name
UFLI 202A	AEC	German
UFLI 202 B	AEC	Japanese

TABLE V: COURSE OF STUDY FOR SEMESTER V

Course code	Course Type	Name of the course	No. of hours	Tutorial	Credit points	Continuous Internal Assessment (CIA)				End Semester Assessment Scheme		Total Marks
						Continuous Mode	Sessional Exams		Total	Marks	Duration Hrs	
							Marks	Duration Hrs				
BP501T	Core	Medicinal Chemistry II – Theory	3	1	4	10	15	1	25	75	3	100
BP502T	Core	Industrial Pharmacy–I Theory	3	1	4	10	15	1	25	75	3	100
BP503T	Core	Pharmacology II – Theory	3	1	4	10	15	1	25	75	3	100
BP504T	Core	Pharmacognosy and Phytochemistry II – Theory	3	1	4	10	15	1	25	75	3	100
BP505T	Core	Pharmaceutical Jurisprudence – Theory	3	1	4	10	15	1	25	75	3	100
BP506P	Core	Industrial Pharmacy-I– Practical	4	-	2	5	10	4	15	35	4	50
BP507P	Core	Pharmacology II – Practical	4	-	2	5	10	4	15	35	4	50
BP508P	Core	Pharmacognosy & Phytochemistry II – Practical	4	-	2	5	10	4	15	35	4	50
ACALR301	AC	Aptitude and Logical Reasoning	2	-	-	50				NA		
UFL301	AEC	German A2.1/Japanese B2.1*	2	-	-	50				NA		
ACUSPVEC305	VEC	Value Education Courses	Approx 3	-	-	-				-		
Total			**29**	**5**	**26**	**65**	**105**	**17**	**170**	**480**	**27**	**650**

* **UFL301A- GERMAN, * UFL301B- JAPANESE,** # Ability Enhancement Course, *VEC: As per guidelines given with the course.*

Foreign Language

Course Code	Course Type	Subject name
UFLI 301A	AEC	German
UFLI 301 B	AEC	Japanese

TABLE VI: COURSE OF STUDY FOR SEMESTER VI

Course code	Course Type	Name of the course	No. of hours	Tutorial	Credit points	Continuous Internal Assessment (CIA)				End Semester Assessment Scheme		Total Marks
						Continuous Mode	Sessional Exams		Total	Marks	Duration Hrs	
							Marks	Duration Hrs				
BP601T	Core	Medicinal Chemistry III – Theory	3	1	4	10	15	1	25	75	3	100
BP602T	Core	Pharmacology III – Theory	3	1	4	10	15	1	25	75	3	100
BP603T	Core	Herbal Drug Technology – Theory	3	1	4	10	15	1	25	75	3	100
BP604T	Core	Biopharmaceutics and Pharmacokinetics – Theory	3	1	4	10	15	1	25	75	3	100
BP605T	Core	Pharmaceutical Biotechnology–Theory	3	1	4	10	15	1	25	75	3	100
BP606T	Core	Quality Assurance– Theory	3	1	4	10	15	1	25	75	3	100
BP607P	Core	Medicinal chemistry III – Practical	4	-	2	5	10	4	15	35	4	50
BP608P	Core	Pharmacology III – Practical	4	-	2	5	10	4	15	35	4	50
BP609P	Core	Herbal Drug Technology – Practical	4	-	2	5	10	4	15	35	4	50
ACAIP301	AC	Artificial Intelligence in Pharmaceuticals	2	-	-	50				NA		
UFL302	AEC	German A2.2/Japanese B2.2*#	2	-	-	50				NA		
ACUSPVEC306	VEC	Value Education Courses	Approx 3	-	-	-				-		
Total			**32**	**6**	**30**	**75**	**120**	**18**	**195**	**555**	**30**	**750**

* **UFL302A- GERMAN, * UFL302B- JAPANESE,** # Ability Enhancement Course, *VEC: As per guidelines given with the course.*

Foreign Language

Course Code	Course Type	Subject name
UFLI 302A	AEC	German
UFLI 302 B	AEC	Japanese

TABLE VII: COURSE OF STUDY FOR SEMESTER VII

Course code	Course Type	Name of the course	No. of hours	Tutorial	Credit points	Continuous Internal Assessment (CIA)				End Semester Assessment Scheme		Total Marks
						Continuous Mode	Sessional Exams		Total	Marks	Duration Hrs	
							Marks	Duration Hrs				
BP701T	Core	Instrumental Methods of Analysis– Theory	3	1	4	10	15	1	25	75	3	100
BP702T	Core	Industrial Pharmacy II–Theory	3	1	4	10	15	1	25	75	3	100
BP703T	Core	Pharmacy Practice – Theory	3	1	4	10	15	1	25	75	3	100
BP704T	Core	Novel Drug Delivery System –Theory	3	1	4	10	15	1	25	75	3	100
BP705 P	Core	Instrumental Methods of Analysis– Practical	4	-	2	5	10	4	15	35	4	50
BP706 PS	Core	Practice School*	12	-	6	25	-	-	25	125	5	150
ACUSPVEC407	VEC	Value Education Courses	Approx 3	-	-	-	-					
Total			**28**	**5**	**24**	**70**	**70**	**8**	**140**	**460**	**21**	**600**

* ***Non-university examination (NUE)***

TABLE VIII: COURSE OF STUDY FOR SEMESTER VIII

Course code	Course Type	Name of the course	No. of hours	Tutorial	Credit points	Continuous Internal Assessment (CIA)				End Semester Assessment Scheme		Total Marks
						Continuous Mode	Sessional Exams		Total	Marks	Duration Hrs	
							Marks	Duration Hr				
BP801T	Core	Biostatistics and Research Methodology – Theory	3	1	4	10	15	1	25	75	3	100
BP802T	Core	Social and Preventive Pharmacy– Theory	3	1	4	10	15	1	25	75	3	100
BP803ET	Core	Pharma marketing managemnt – Theory	3 + 3 = 6	1 + 1 = 2	4 + 4 = 8	10 + 10 = 20	15 + 15 = 30	1 + 1 = 2	25 + 25 = 50	75 + 75 = 150	3 + 3 = 6	100 + 100 = 200
BP804ET	Core	Pharmaceutical Regulatory Science – Theory										
BP805ET	Core	Pharmacovigilance – Theory										
BP806ET	Core	Quality Control and Standardization of Herbals –Theory										
BP807ET	Core	Computer Aided Drug Design – Theory										
BP808ET	Core	Cell and Molecular Biology – Theory										
BP809ET	Core	Cosmetic Science – Theory										
BP810ET	Core	Pharmacological Screening Methods –Theory										
BP811ET	Core	Advanced Instrumentation Techniques – Theory										
BP812PW	Core	Project Work	12	-	6	-	-	-	-	150	4	150
ACUSPVEC408	VEC	Value Education Courses	Approx 3	-	-	-	-					
Total			**24**	**4**	**22**	**40**	**60**	**4**	**100**	**450**	**16**	**550**

Minor course (Open Elective) offered: “Drugs and Healthcare”

List of Minors

Course Code	Name of Course	Teaching Scheme			Evaluation Scheme	
		SEM	Credits	Hours	CIA	ESA
USPDH101	DH Minor 1: Health and hygiene	II	2	2	20	30
USPDH102	DH Minor 2: Know your drugs	III	2	2	20	30
USPDH103	DH Minor 3: Complementary and alternative medicine	IV	2	2	20	30
USPDH104	DH Minor 4: Drug discovery	V	2	2	20	30
USPDH105	DH Minor 5: Forensic science	VI	2	2	20	30

ADD ON COURSES FOR B. PHARM EFFECTIVE FROM A. Y. 2024-25

For First Year B. Pharm Semester-I

Sr. No.	Name of Course	Number of hours/week
1	Pharmacy Technician Fundamentals Specialization **(Mandatory)**	10
2	Vital Signs: Understanding What the Body Is Telling Us **(Mandatory)**	13
3	Introduction to Artificial Intelligence (AI) (mandatory)	13
4	Health Care IT: Challenges and Opportunities	13
5	Pre-Formulation	13
	Total hours	**62**

****Extra credit points are not allotted for the completion of courses. Grades will be given that are reflected in Mark's statement***

For First Year B. Pharm Semester-II

Sr. No.	Name of Course	Number of hours/week
1	Introduction to Chemistry: Reactions and Ratios **(Mandatory)**	18
2	Computer Software Assurance **(Mandatory)**	15
3	Healthcare Marketplace	4
4	AI in Healthcare Specialization (mandatory)	12
5	Pharmacy Syringes, Compounding Medications, & Communication	11
	Total hours	**60**

****Extra credit points are not allotted for the completion of courses. Grades will be given that are reflected in Mark's statement***

For Second Year B. Pharm Semester-III

Sr. No.	Name of Course	Number of hours/week
1	Introduction to Cosmetic Science and Ingredients Specialization **(Mandatory)**	10
2	The Addicted Brain **(Mandatory)**	Approx. 21
3	Herbal Medicines **(Mandatory)**	Approx. 17
4	Pharmacokinetics	Approx. 10
5	Work Smarter with Microsoft Excel	Approx. 20
	Total hours	**78**

****Extra credit points are not allotted for the completion of courses. Grades will be given that are reflected in Mark's statement***

For Second Year B. Pharm Semester-IV

Sr. No.	Name of Course	Number of hours/week
1	People and Soft Skills for Professional and Personal Success Specialization **(Mandatory)**	10
2	Medical Emergencies: CPR, Toxicology, and Wilderness **(Mandatory)**	Approx. 12
3	AI for Medicine Specialization **(Mandatory)**	10
4	Cosmetic Product Development	12
5	Introduction to Drug Hunting	10
	Total hours	**54**

****Extra credit points are not allotted for the completion of courses. Grades will be given that are reflected in Mark's statement***

For Third Year B. Pharm Semester-V

Sr. No.	Name of the Course	Number of hours/week
1	Quality Control and Regulatory in Cosmetic Science	10
2	Preclinical Safety	21*
3	Evaluations of AI Applications in Healthcare	17*
4	Targets, Assays & Screening	10*
5	Industrial Biotechnology	10*
Total	**Total Hours**	**68***

****Extra credit points are not allotted for the completion of courses. Grades will be given that are reflected in Mark's statement***

For Third Year B. Pharm Semester-VI

Sr. No.	Name of the Course	Number of hours/week
1	Intellectual Property in Healthcare Industry	18
2	Computer-Aided Drug Design (CADD)	15
3	Drug Discovery and Development with AI	4
4	Making Data Science Work for Clinical Reporting	12
5	Regulated Competition in Healthcare Systems: Theory & Practice	11
Total	**Total Hours**	**60**

****Extra credit points are not allotted for the completion of courses. Grades will be given that are reflected in Mark's statement***

For Final Year B. Pharm Semester-VII

Sr. No.	Name of the Course	Number of hours/week
1	Medical Billing and Coding Fundamentals Specialization	10
2	Clinical Research or Clinical trial	19*
3	Quality Assurance/Quality Control (QA/QC)	17*
4	Introduction to Medical Software	10*
5	Regulatory Affairs	19*
Total	**Total Hours**	**75 ***

****Extra credit points are not allotted for the completion of courses. Grades will be given that are reflected in Mark's statement***

For Final Year B. Pharm Semester-VIII

Sr. No.	Name of the Course	Number of hours/week
1	Nanotechnology Nanomedicine	09
2	Good with Words: Speaking and Presenting Specialization	10*
3	The social and technical context of health informatics	09*
4	Your Future Job in Medicine and Healthcare	12 *
5	Health Concepts in Chinese Medicine	10*
Total	**Total Hours**	**79***

****Extra credit points are not allotted for the completion of courses. Grades will be given that are reflected in Mark's statement***

1. Short Title and Commencement

These regulations shall be called as "The Revised Regulations for the B. Pharm. Degree Program CBCS) of the Pharmacy Council of India, New Delhi". They shall come into effect from the Academic Year 2016-17. The regulations framed are subject to modifications from time to time by Pharmacy Council of India.

2. Minimum qualification for admission

2.1 First year B. Pharm:

Candidate shall have passed 10+2 examination conducted by the respective state/central government authorities recognized as equivalent to 10+2 examination by the Association of Indian Universities (AIU) with English as one of the subjects and Physics, Chemistry, Mathematics (P.C.M) and or Biology (P.C.B / P.C.M.B.) as optional subjects individually. Any other qualification approved by the Pharmacy Council of India as equivalent to any of the above examinations.

2.2. B. Pharm lateral entry (to third semester):

A pass in D. Pharm. course from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act.

3. Duration of the program

The course of study for B. Pharm shall extend over a period of eight semesters (four academic years) and six semesters (three academic years) for lateral entry students. The curricula and syllabi for the program shall be prescribed from time to time by Pharmacy Council of India, New Delhi.

4. Medium of instruction and examinations

Medium of instruction and examination shall be in English.

5. Working days in each semester

Each semester shall consist of not less than 100 working days. The odd semesters shall be conducted from the month of June/July to November/December and the even semesters shall be conducted from December/January to May/June in every calendar year

6. Attendance and progress

A candidate is required to put in at least 80% attendance in individual courses considering theory and practical separately. The candidate shall complete the prescribed course satisfactorily to be eligible to appear for the respective examinations.

7.1. Credit assignment

7.1.1. Theory and Laboratory courses

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

hours, and a multiplier of half (1/2) for practical (laboratory) hours. Thus, for example, a theory course having three lectures and one tutorial per week throughout the semester carries a credit of 4. Similarly, a practical having four laboratory hours per week throughout semester carries a credit of 2.

7.2. Minimum credit requirements

The minimum credit points required for award of a B. Pharm. degree is 208. These credits are divided into Theory courses, Tutorials, Practical, Practice School and Project over the duration of eight semesters. The credits are distributed semester-wise as shown in Table IX. Courses generally progress in sequences, building competencies and their positioning indicates certain academic maturity on the part of the learners. Learners are expected to follow the semester-wise schedule of courses given in the syllabus. The lateral entry students shall get 52 credit points transferred from their D. Pharm program. Such students shall take up additional remedial courses of 'Communication Skills' (Theory and Practical) and 'Computer Applications in Pharmacy' (Theory and Practical) equivalent to 3 and 4 credit points respectively, a total of 7 credit points to attain 59 credit points, the maximum of I and II semesters.

8. Academic work

A regular record of attendance both in Theory and Practical shall be maintained by the teaching staff of respective courses.

9. Course of study

The course of study for B. Pharm shall include Semester Wise Theory & Practical as given in Table – I to VIII. The number of hours to be devoted to each theory, tutorial and practical course in any semester shall not be less than that shown in Table – I to VIII.

Table – X Semester wise credits distribution

Semester	Credit Points
I	**27/29$^{\$}$/30$^{\#}$**
II	29
III	26
IV	28
V	26
VI	26
VII	24
VIII	22
Extracurricular/ Co-curricular activities	01*
Total credit points for the program	**209/211$^{\$}$/212$^{\#}$**

* The credit points assigned for extracurricular and or co-curricular activities shall be given by the Principals of the colleges and the same shall be submitted to the University. The criteria to acquire this credit point shall be defined by the colleges from time to time.

$^{\$}$Applicable ONLY for the students studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics course.

$^{\#}$Applicable ONLY for the students studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology course.

10. Program Committee

1. The B. Pharm. program shall have a Program Committee constituted by the Head of the institution in consultation with all the Heads of the departments.
2. The composition of the Program Committee shall be as follows:

A senior teacher shall be the Chairperson; One Teacher from each department handling B. Pharm courses; and four student representatives of the program (one from each academic year), nominated by the Head of the institution.

3. Duties of the Program Committee:

i. Periodically reviewing the progress of the classes.
ii. Discussing the problems concerning curriculum, syllabus and the conduct of classes.
iii. Discussing with the course teachers on the nature and scope of assessment for the course and the same shall be announced to the students at the beginning of respective semesters.
iv. Communicating its recommendation to the Head of the institution on academic matters.
v. The Program Committee shall meet at least thrice in a semester preferably at the end of each Sessional exam (Internal Assessment) and before the end semester exam.

11. Examinations/Assessments

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

11.1. End semester examinations

The End Semester Examinations for each theory and practical course through semesters I to VIII shall be conducted by the university except for the subjects with asterix symbol (*) in table I and II for which examinations shall be conducted by the subject experts at college level and the marks/grades shall be submitted to the university.

11.2. Internal assessment: Continuous mode

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

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

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

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

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

11.3. Sessional exams

- Two Sessional exams shall be conducted for each theory / practical course as per the schedule fixed by the college(s). The scheme of question paper for theory and practical Sessional examinations is given below. The average marks of two Sessional exams shall be computed for internal assessment as per the requirements given in tables – X.
- Sessional exam shall be conducted for 30 marks for theory and shall be computed for 15 marks. Similarly Sessional exam for practical shall be conducted for 40 marks and shall be computed for 10 marks.

Question paper pattern for theory Sessional examinations

For subjects having University examination

I. Multiple Choice Questions (MCQs) OR	=	10 x 1 = 10 OR
Objective Type Questions (5 x 2) (Answer all the questions)	=	05 x 2 = 10
II. Long Answers (Answer 1 out of 2)	=	1 x 10 = 10
III. Short Answers (Answer 2 out of 3)	=	2 x 5 = 10
Total	=	30 marks

For subjects having Non-University examination

I. Long Answers (Answer 1 out of 2)	=	1 x 10 = 10
II. Short Answers (Answer 4 out of 6)	=	4 x 5 = 20
Total	=	30 marks

Question paper pattern for practical Sessional examinations

I. Synopsis	=	10
II. Experiments	=	25
III. Viva-voce	=	05
Total	=	40 marks

11.4. 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.

11.5. Carry forward of marks

In case a student fails to secure the minimum 50% in any Theory or Practical course as specified in above, 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.

11.6. Improvement of internal assessment

A student shall have the opportunity to improve his/her performance only once in the Sessional exam component of the internal assessment. The re-conduct of the Sessional exam shall be completed before the commencement of next end semester theory examinations.

11.7. Re-examination of end semester examinations

Reexamination of end semester examination shall be conducted as per the schedule given in table XIII. The exact dates of examinations shall be notified from time to time.

Table-XIII: Tentative schedule of end semester examinations

Semester	For Regular Candidates	For Failed Candidates
I, III, V and VII	November / December	May / June
II, IV, VI and VIII	May / June	November / December

Question paper pattern for end semester theory examinations

For 75 marks paper

I. Multiple Choice Questions (MCQs) OR	20 x 1 = 20 OR
Objective Type Questions (10 x 2) (Answer all the questions)	10 x 2 = 20
II. Long Answers (Answer 2 out of 3)	2 x 10 = 20
III. Short Answers (Answer 7 out of 9)	7 x 5 = 35
Total	75 marks

For 50 marks paper

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

For 35 marks paper

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

Question paper pattern for end semester practical Sessional examinations

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

12. Academic progression

No student shall be admitted to any examination unless he/she fulfills the norms given in 6. Academic progression rules are applicable as follows:

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

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

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

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

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

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

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

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

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

13. Grading of performances

Letter grades and grade points allocations:

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

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

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

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

14. The Semester grade point average (SGPA)

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

$$\mathbf{SGPA} = (\mathbf{C1G1 + C2G2 + C3G3 + C4G4 + C5G5}) / (C_1 + C_2 + C_3 + C_4 + C_5)$$

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

$$\mathbf{SGPA} = (\mathbf{C1G1 + C2G2 + C3G3 + C4Zero + C5G5}) / (C_1 + C_2 + C_3 + C_4 + C_5)$$

15. 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:

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

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,…. .

16. Declaration of results

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,

17. Project work

All the students shall undertake a project under the supervision of a teacher and submit a report. The area of the project shall directly relate any one of the elective subject opted by the student in semester VIII. The project shall be carried out in group not exceeding 5 in number. The project report shall be submitted in triplicate (typed & bound copy not less than 25 pages). The internal and external examiner appointed by the University shall evaluate the project at the time of the Practical examinations of other semester(s). Students shall be evaluated in groups for four hours (i.e., about half an hour for a group of five students). The projects shall be evaluated as per the criteria given below.

Evaluation of Dissertation books

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.

18. 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.

19. Practice School

In the VII semester, every candidate shall undergo practice school for a period of 150 hours evenly distributed throughout the semester. The student shall opt any one of the domains for practice school declared by the program committee from time to time.
At the end of the practice school, every student shall submit a printed report (in triplicate) on the practice school he/she attended (not more than 25 pages). Along with the exams of semester VII, the report submitted by the student, knowledge and skills acquired by the student through practice school shall be evaluated by the subject experts at college level and grade point shall be awarded.

20. 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.

21. Award of Degree

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

22. 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.

23. Re-admission after break of study

Candidate who seeks re-admission to the program after break of study has to get the approval from the university by paying a condemnation fee.
No condemnation is allowed for the candidate who has more than 2 years of break up period and he/she has to rejoin the program by paying the required fees.

24. Tutorial (15 hours, 01 Credit)

*The tutorials are to be conducted as an Academic Activity from any of the options given here like

(a) Quiz (b) Assignment
(c) Open book test (d) Fieldwork
(e) Group discussion (f) Seminar
(g) Viva (h) Small projects
(i) Presentation (j) Scientific model

Sr. No.	Tutorial	CLO	Hours
1	Tutorial Number 1 (UNIT-I)	CLO1	01
2	Tutorial Number 2 (UNIT-I)	CLO1	01
3	Tutorial Number 3 (UNIT-I)	CLO1	01
4	Tutorial Number 4 (UNIT-II)	CLO2	01
5	Tutorial Number 5 (UNIT-II)	CLO2	01
6	Tutorial Number 6 (UNIT-II)	CLO2	01
7	Tutorial Number 7 (UNIT-III)	CLO3	01
8	Tutorial Number 8 (UNIT-III)	CLO3	01
9	Tutorial Number 9 (UNIT-III)	CLO3	01
10	Tutorial Number 10 (UNIT-IV)	CLO4	01
11	Tutorial Number 11 (UNIT-IV)	CLO4	01
12	Tutorial Number 12 (UNIT-IV)	CLO4	01
13	Tutorial Number 13 (UNIT-V)	CLO5	01
14	Tutorial Number 14 (UNIT-V)	CLO5	01
15	Tutorial Number 15 (UNIT-V)	CLO5	01
	Total		**15**

SEMESTER –I
F. Y. B. PHARM

COURSE CURRICULUM

<table>
<tr><td colspan="2">Name of the Program:</td><td colspan="2">B. PHARM</td><td colspan="2">Semester : I</td><td colspan="2">Level: UG</td></tr>
<tr><td colspan="2">Course Name</td><td colspan="2">Human Anatomy And Physiology-I (Theory)</td><td colspan="2">Course Code/ Course Type</td><td colspan="2">BP101T /Core</td></tr>
<tr><td colspan="2">Course Pattern</td><td colspan="2">2024</td><td colspan="2">Version</td><td colspan="2">1.0</td></tr>
<tr><td colspan="4">Teaching Scheme</td><td colspan="4">Assessment Scheme</td></tr>
<tr><td>Theory</td><td>Practical</td><td>Tutorial</td><td>Total Credits</td><td>Hours</td><td>CIA (Continuous Internal Assessment)</td><td>ESA (End Semester Assessment)</td><td>Practical/Oral</td></tr>
<tr><td>3</td><td>-</td><td>1</td><td>4</td><td>45</td><td>25</td><td>75</td><td>--</td></tr>
<tr><td colspan="8">Pre-Requisite: Nil</td></tr>
<tr><td colspan="3">Course Objectives (CO):</td><td colspan="5">The objectives of Human Anatomy And Physiology-I are:
1. To recall the gross morphology, structure and functions of various organs of the human body.
2. To recognize the various homeostatic mechanisms and their imbalances.
3. To identify the various tissues and organs of different systems of human body.
4. To perform the various experiments related to special senses and nervous system.
5. To study coordinated working pattern of different organs of each system.</td></tr>
<tr><td colspan="3">Course Learning Outcomes (CLO):</td><td colspan="5">Students would be able to:
1. Apply knowledge of identification of the various cells/tissues of different systems of human body and study the various homeostatic mechanisms and their imbalances.
2. Identify the gross morphology, structure and functions of various systems of the human body.
3. Explain the roles and importance of various body fluids and lymphatic system.
4. Perform the various experiments related to special senses and nervous system.
5. Evaluate and study coordinated working pattern of different organs of each system</td></tr>
</table>

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
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, intracellular signaling pathway activation by extracellular signal molecule, 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.	**CLO 1**	**10**
UNIT II		
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	**CLO 2**	**10**
UNIT III		
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	**CLO 3**	**10**
UNIT IV		
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.	**CLO 4**	**08**
UNIT V		
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 heartbeat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.	**CLO 5**	**07**
Total Hours		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning resources

Textbooks:

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee Brother's medical publishers, New Delhi.
2. Textbook of Human Histology by Inderbir Singh, Jaypee brothers medical publishers, New Delhi.
3. Textbook of Practical Physiology by C.L. Ghai, Jaypee brothers medical publishers, New Delhi.
4. Text book of Medical Physiology- Arthur C, Guyton and John.E. Hall. Miamisburg, OH.

Reference Books:

1. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York.
2. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje, Academic Publishers Kolkata.

Online Resources/E-Learning Resources

1.	Nervous system:	**i.**	https://en.wikipedia.org/wiki/Nervous_system
		ii.	https://training.seer.cancer.gov/anatomy/nervous/tissue.html
2	Digestive system:	i.	https://www.niddk.nih.gov/health-information/digestive-diseases/digestive-system-how-it-works
		ii.	https://www.britannica.com/science/human-digestive-system
3	Respiratory System:	i.	https://www.nhlbi.nih.gov/health/lungs/respiratory-system
		ii.	https://www.lung.org/lung-health-diseases/how-lungs-work
4	Urinary System :	i.	https://www.niddk.nih.gov/health-information/urologic-diseases/urinary-tract-how-it-works
		ii.	https://www.stanfordchildrens.org/en/topic/default?id=anatomy-of-the-urinary-system-85-P01468
5	Endocrine System:	i.	https://www.healthline.com/health/the-endocrine-system
		ii.	https://www.medicalnewstoday.com/articles/endocrine-system-function#organs-and-glands
6	Reproductive System:	i.	https://www.cancer.gov/publications/dictionaries/cancer-terms/def/reproductive-system
7	Introduction to Genetics	i.	https://www.ncbi.nlm.nih.gov/books/NBK115568/
		ii.	https://www.cliffsnotes.com/study-guides/biology/biology/classical-mendelian-genetics/introduction-to-genetics

COURSE CURRICULUM

Name of the Program:	B. PHARM	Semester: I	Level: UG
Course Name	Pharmaceutical Analysis (Theory)	Course Code/ Course Type	BP102T/Core
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	1	4	45	25	75	--

Pre-Requisite: Nil

Course Objectives (CO):	The objectives of Pharmaceutical Analysis-I are: 1. To recall definitions and scope of analytical techniques. 2. To recognize need of various titrations methods like acid-base titration, non-aqueous titration, Precipitation titration, complexometric titrations, redox titration. 3. To identify sources of errors, sources of impurities and methods to minimize errors and impurities. 4. To perform volumetric and electrochemical titrations 5. To study and develop analytical skills in conductometry, potentiometry, polarography.
Course Learning Outcomes (CLO):	Students would be able to: 1. Identify sources of impurities, errors and methods to determine the impurities, minimizing errors in pharmacopoeia. 2. Explain theory involved in titrations of acids and bases by various titration methods 3. Apply different methods for the estimation of various salts like sodium chloride, magnesium sulphate, calcium gluconate, barium sulphate 4. Perform various types of redox titrations 5. Evaluate the samples using electrochemical methods of analysis.

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
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 **Errors** Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures (c) Pharmacopoeia, Sources of impurities in medicinal agents, limit tests.	**CLO1**	**10**
UNIT II		
Acid base titration Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves **Non aqueous titration** Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl	**CLO2**	**10**
UNIT III		
Precipitation titrations Mohr's method, Volhard's, Modified Volhard's, Fajans 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 diazotisation titration.	**CLO3**	**10**
UNIT IV		
Redox titrations Concepts of oxidation and reduction, Types of redox titrations (Principles and applications) Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate	**CLO4**	**08**
UNIT V		
Electrochemical methods of analysis Conductometry-Introduction, Conductivity cell, Conductometric titrations, applications. Potentiometry - Electrochemical cell, construction and working of reference (Standard hydrogen, silver chloride electrode and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications. Polarography - Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum electrode, applications	**CLO5**	**07**
Total Hours		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning resources:

Textbooks:

1. Bentley and Driver's Textbook of Pharmaceutical Chemistry
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
3. Handbook of Modern Pharmaceutical Analysis, edited by Satinder Ahuja, Stephen Scypinski, 1st Edition, Volume July 26, 2001, Elesevier Publication

Reference Books:

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London
2. John H. Kennedy, Analytical chemistry principles
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry

Online Resources/E-Learning Resources

1. Acid Base Titration-Working Principle, Process, Types And Indicators (themasterchemistry.com)
2. Acid–base titration - Wikipedia
3. Complexometric Titration: Definition, Examples, and Applications (chemistrylearner.com)
4. Electrochemical method of analysis - [PDF Document] (vdocument.in)

COURSE CURRICULUM

Name of the Program:		**B. PHARM**		**Semester : I**		**Level: UG**	
Course Name		**Pharmaceutics-I (Theory)**		**Course Code/ Course Type**		**BP102T/Core**	
Course Pattern		**2024**		**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
3	-	1	4	45	25	75	---
Pre-Requisite: Nil							
Course Objectives (CO):				The objectives of Pharmaceutics-I are: 1. To Know the history of profession of pharmacy 2. To learn the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations 3. To study the professional way of handling the prescription. 4. To study the Preparation of various conventional dosage forms 5. To acquire basic knowledge of semisolid dosage form			
Course Learning Outcomes (CLO):				Students would be able to: 1. Outline the history of profession of pharmacy and know the professional way of handling the prescription. 2. Recognize the basic knowledge of powders and liquid formulation dosage forms with pharmaceutical calculations concept. 3. Know the basic knowledge of dosage forms namely monophasic and biphasic dosage form. 4. Identify the basic knowledge of dosage forms viz suppositories dosage form and pharmaceutical incompatibilities 5. Comprehend the basic knowledge of semisolid dosage form			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
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. **Dosage forms:** Introduction to dosage forms, classification and definitions **Prescription:** Definition, Parts of prescription, handling of Prescription and Errors in prescription. **Posology:** Definition, Factors affecting posology. Paediatric dose calculations based on age, body weight and body surface area.	**CLO 1**	**10**
UNIT II		
Pharmaceutical calculations: Weights and measures – Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point and molecular weight. **Powders:** Definition, classification, advantages and disadvantages, Simple & compound powders – official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions. **Liquid dosage forms** Advantages and disadvantages of liquid dosage forms. Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques.	**CLO 2**	**10**
UNIT III		
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.	**CLO 3**	**10**
UNIT IV		
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	**CLO 4**	**08**
UNIT V		
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	**CLO 5**	**07**
Total Hours		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning resources

Textbooks:

1. A textbook of pharmaceutics-I by Dr. B.S. Venkateswarlu mr. j. Jayaprakash)
2. A textbook of pharmaceutics-I by Dr Atamaram .P. Pawar)

Reference Books:

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

Online Resources/E-Learning Resources

1. https://www.carewellpharma.in/bpharmacy/notes/1st-sem/pharmaceutics-1/unit-
2. https://rxpharma-edu.com/unit-1-notes-pharmaceutics-1/
3. https://imperfectpharmacy.shop/b-pharmacy-all-semester-notes/
4. https://pharmdbm.com/pharmaceutics-1-notes-free-download/

COURSE CURRICULUM

Name of the Program:		B. Pharm		Semester : I		Level: UG	
Course Name		Pharmaceutical Inorganic Chemistry (Theory)		Course Code/ Course Type		BP104T/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	1	4	45	25	75	-
Pre-Requisite: Nil							
Course Objectives (CO):				The objectives of Pharmaceutical Inorganic Chemistry are: 1.To know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals. 2.To understand the medicinal and pharmaceutical importance of inorganic compounds. 3.To know the preparation and analysis of inorganic medicinal compounds. 4.To know their diagnostic applications. 5.To apply the knowledge to prepare various inorganic pharmaceuticals.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Develop knowledge about the sources and types of impurities, principles involved in the limit test; to apply various methods for the determination of impurities in inorganic drugs and pharmaceuticals. 2.Analyze various inorganic pharmaceutical compounds 3.Demonstrate the general methods of preparation of inorganic pharmaceuticals. 4.Assess the quality of inorganic pharmaceutical compounds. 5.Apply various inorganic compounds as medicinal and pharmaceutical agents.			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
Impurities in pharmaceutical substances History of Pharmacopoeia, Sources and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate General methods of preparation, assay for the compounds superscripted with asterisk (*), properties and medicinal uses of inorganic compounds belonging to the following classes.	**CLO 1**	**10**
UNIT II		
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. **Major extra and intracellular electrolytes** Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride*, Potassium chloride, Calcium gluconate* and Oral Rehydration Salt (ORS), Physiological acid base balance. **Dental products** Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement.	**CLO 2**	**10**
UNIT III		
Gastrointestinal agents **Acidifiers** Ammonium chloride* and Dil. HCl Antacid: Ideal properties of antacids, combinations of antacids, Sodium40Bicarbonate*, Aluminium hydroxide gel, Magnesium hydroxide mixture **Cathartics** Magnesium sulphate, Sodium orthophosphate, Kaolin and Bentonite **Antimicrobials** Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*, Iodine and its preparations	**CLO 3**	**10**
UNIT IV		
Miscellaneous compounds **Expectorants:** Potassium iodide, Ammonium chloride*. **Emetics:** Copper sulphate*, Sodium potassium tartarate **Haematinics:** Ferrous sulphate*, Ferrous gluconate **Poison Antidote:** Sodium thiosulphate*, Activated charcoal, Sodium nitrite333 **Astringents:** Zinc Sulphate, Potash Alum	**CLO 4**	**08**
UNIT V		
Radiopharmaceuticals Radio activity, Measurement of radioactivity, Properties of α, β, γ radiations, Half-life, radio isotopes and study of radio isotopes - Sodium iodide I131, Storage conditions, precautions & pharmaceutical application of radioactive substances.	**CLO 5**	**07**
Total Hours		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning resources:

Textbooks:

1. A Textbook of Pharmaceutical Inorganic Chemistry by Mayuresh K. Raut, Everest Publishing House Pune.
2. Textbook of Pharmaceutical Inorganic Chemistry-Theory & Practical by V.N. Rajasekaran, CBS Publishers & Distributors, Second Edition.

Reference Books:

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, CBS Publishers & Distributors Pvt Ltd, 4th edition.
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis, Longman Sc & Tech; 4th edition
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry,Vallabh Prakashan
4. Bentley and Driver's Textbook of Pharmaceutical Chemistry, Oxford University Press; Eighth edition
5. John H. Kennedy, Analytical Chemistry Principles
6. Indian Pharmacopoeia.

Online Resources/E-Learning Resources

1. https://www.youtube.com/watch?v=cA0fGIfALxI
2. https://www.youtube.com/watch?v=ruKyDMKqsXc
3. https://www.youtube.com/watch?v=yrvV85H737o

COURSE CURRICULUM

Name of the Program:	B. Pharm			Semester : I		Level: UG	
Course Name	Communication Skills			Course Code/ Course Type		BP105T	
Course Pattern	2024			Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	2	30	15	35	-
Pre-Requisite: Nil							
Course Objectives (CO):				The objectives of Communication Skills are: 1. To Understand the behavioural needs for a Pharmacist to function effectively in the areas of pharmaceutical Operation. 2. To communicate effectively (Verbal and Non Verbal). 3. To effectively manage the team as a team player. 4. To develop interview skills. 5. To develop Leadership qualities and essentials.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Define & interpret Importance of Communication in life and its process. 2. Learn how to write Business Correspondence. 3. Know Importance of Listening. 4. Understand how to speak, and how to face Interviews and Group Discussion. 5. Learn Pronunciation of English.			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
• **Communication Skills:** Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context • **Barriers to communication:** Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers • **Perspectives in Communication:** Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment	**CLO 1**	**07**
UNIT II		
• **Elements of Communication:** Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication	**CLO 2**	**07**

• **Communication Styles:** Introduction, The Communication Styles Matrix with example for each -Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style		
UNIT III		
• **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	**CLO 3**	**07**
UNIT IV		
• **Interview Skills:** Purpose of an interview, Do's and Dont's of an interview • **Giving Presentations:** Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery	**CLO 4**	**05**
UNIT V		
• **Group Discussion:** Introduction, Communication skills in group discussion, Do's and Dont's of group discussion	**CLO 5**	**04**
Total Hours		**30**

Learning resources:

Textbooks:

1. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011
2. Communication skills, Sanjay Kumar, Pushpalata, 1st Edition, Oxford Press, 2011
3. Organizational Behaviour, Stephen .P. Robbins, 1stEdition, Pearson, 2013
4. Brilliant- Communication skills, Gill Hasson, 1stEdition, Pearson Life, 2011

Reference Books:

1. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5th Edition, Pearson, 2013.
2. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010
3. Communication skills for professionals, Konar nira, 2ndEdition, New arrivals PHI, 2011
4. Personality development and soft skills, Barun K Mitra, 1stEdition, Oxford Press, 2011
5. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning india pvt. ltd, 2011
6. Soft skills and professional communication, Francis Peters SJ, 1stEdition, Mc Graw Hill Education, 2011
7. Effective communication, John Adair, 4thEdition, Pan Mac Millan, 2009
8. Bringing out the best in people, Aubrey Daniels, 2ndEdition, Mc Graw Hill, 1999

Online Resources/E-Learning Resources

1. https://ncert.nic.in/vocational/pdf/kees101.pdf
2. https://sgc.edu.in/assets/docs/e-resources/communication-skills.pdf
3. https://nou.edu.ng/coursewarecontent/LIS%20211%20LEARNING%20AND%20COMMUNICATION%20SKILLS.pdf

COURSE CURRICULUM

Name of the Program:	B. PHARM			Semester : I		Level: UG	
Course Name	Remedial Biology (Theory)			Course Code/ Course Type		BP106RBT/Core	
Course Pattern	2024			Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	2	30	15	35	--
Pre-Requisite: Nil							
Course Objectives (CO):				The objectives of Remedial Biology are: 1. To recall the classification and salient features of five kingdoms of life 2. To understand the biology of body fluids, process of digestion and respiration by plants. 3. To study the basic components of anatomy & physiology animal with special reference to human. 4. To study the process of plant photosynthesis and nutrition intake. 5. To study the basic components of anatomy & physiology of plant			
Course Learning Outcomes (CLO):				Students would be able to: 1. Recall the classification and salient features of five kingdoms of life 2. Understand the biology of body fluids, process of digestion and respiration by plants. 3. Study the basic components of anatomy & physiology animal with special reference to human. 4. Study the process of plant photosynthesis and nutrition intake. 5. Understand the basic components of anatomy & physiology of plant with respect to cells and tissue development.			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
Living world : Definition and characters of living organisms, Diversity in the living world, Binomial nomenclature, Five kingdoms of life and basis of classification. Salient features of Monera, Potista, Fungi, Animalia and Plantae, Virus **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.	**CLO 1**	**07**
UNIT II		
Body fluids and circulation : Composition of blood, blood groups, coagulation of blood, Composition and functions of lymph, Human circulatory system, Structure of human heart and blood vessels, Cardiac cycle, cardiac output and ECG **Digestion and Absorption:** Human alimentary canal and digestive glands, Role of digestive enzymes, Digestion, absorption and assimilation of digested food **Breathing and respiration :**Human respiratory system, Mechanism of breathing and its regulation, Exchange of gases, transport of gases and regulation of respiration, Respiratory volumes	**CLO 2**	**07**
UNIT III		
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	**CLO 3**	**07**
UNIT IV		
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.	**CLO 4**	**05**
UNIT V		
Plant respiration: Respiration, glycolysis, fermentation (anaerobic). **Plant growth and development:** Phases and rate of plant growth, Condition of growth, Introduction to plant growth regulators **Cell - The unit of life** Structure and functions of cell and cell organelles, Cell division **Tissues** Definition, types of tissues, location and functions.	**CLO 5**	**04**
Total Hours		**30**

Learning resources:

Textbooks:

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

Reference Books:

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

Online Resources/E-Learning Resources:

1. https://www.toppr.com/guides/biology/diversity-in-living-organisms/five-kingdom-classification/
2. https://www.khanacademy.org/science/in-in-class-11-biology-india/x9d1157914247c627:body-fluids-and-circulation

Name of the Program:		B. PHARM		Semester : 1		Level: UG	
Course Name		Remedial Mathematics – (Theory*)		Course Code/ Course Type		BP106RMT/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	2	30	15	35	---
Pre-Requisite: Nil							
Course Objectives (CO):				Upon completion of the course the student shall be able to:- 1. To Know the theory and their application in Pharmacy 2. To Solve the different types of problems by applying theory 3. To Appreciate the important application of mathematics in Pharmacy 4. To understand analytical geometry. 5. To explore the Laplace transformation.			
Course Learning Outcomes (CLO):				Upon completion of the course the student shall be able to:- 1. Identify the theory and their application in Pharmacy 2. Explain the different types of problems by applying theory 3. Appreciate the important application of mathematics in Pharmacy 4. Understand analytical geometry. 5. Explore the Laplace transformation.			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
Partial fraction Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction , Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics **Logarithms** Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems. **Function** Real Valued function, Classification of real valued functions, **Limits and continuity** Introduction , Limit of a function, Definition of limit of a function ($\in$ - δ n n definition) , $\lim x - a = nan-1$, $\lim \sin\theta = 1$,	**CLO 1**	**06**
UNIT II		
Matrices and Determinant: Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants , Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix , Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method, Cramer's rule, Characteristic equation and roots of a square matrix, Cayley–Hamilton theorem,Applicationof Matrices in solving Pharmacokinetic equations	**CLO 2**	**06**
UNIT III		
Calculus **Differentiation** Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function , Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula), Derivative of the quotient of two functions (Quotient formula) – Without Proof, Derivative of xn $w.r.t$x,where n is any rational number, Derivative of ex,, Derivative of loge x , Derivative of ax ,Derivative of trigonometric functions from first principles (without Proof), Successive Differentiation, Conditions for a function to be a maximum or a minimum at a point. Application	**CLO 3**	**06**
UNIT IV		
Analytical Geometry **Introduction** Signs of the Coordinates, Distance formula, **Straight Line** Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines, Slope of a line joining two points, Slope – intercept form of a straight line **Integration** Introduction, Definition, Standard formulae, Rules of integration , Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application	**CLO 4**	**06**
UNIT V		
Differential Equations Some basic definitions, Order and degree, Equations in separable form, Homogeneous equations, Linear Differential equations, Exact equations,	**CLO 5**	**06**

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		
Total Hours		**30**

Learning resources:

Textbooks:
1. Differential Calculus by Shanthinarayan
2. Pharmaceutical Mathematics with application to Pharmacy by Panchaksharappa Gowda D.H.

Reference Books:
1. Integral Calculus by Shanthinarayan
2. Higher Engineering Mathematics by Dr.B.S.Grewal

Online Resources/E-Learning Resources
1. https://www.youtube.com/results?search_query=remedial+mathematics+for+pharmacy+1st+year+pdf
2. https://www.youtube.com/watch?v=cMzEapXkCLE&list=PLdhH6lJ5Nz1ek73kxDpBnOmXPaQGlt54t
3. https://www.youtube.com/watch?v=yCpAhHukJA0&list=PLfdcY3cg_NfbdanWnqwqRuybQizA1zJUK

COURSE CURRICULUM

Course Contents/Syllabus
(All the Practical's carry equal weightage in Summative Assessment and equal engagement)

Practical Plan

Name of the Program:	**B. Pharm**	**Semester : I**	**Level: UG**
Course Name	**Human Anatomy And Physiology-I (Practical)**	**Course Code/ Course Type**	**BP107P/Core**
Course Pattern	**2024**	**Version**	1.0

Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
-	4	-	2	60	15	35	-

Pre-Requisite: Nil

Course Objectives (CO):	The objectives of Tools for Human Anatomy And Physiology-I are: 1. To understand the working of microscope. 2. To study the gross morphology, structure and functions of various organs of human body. 3. To identify the various organs of skeletal system of human body. 4. To perform the various experiments related to the blood. 5. To determine the physiological parameters related to cardiovascular system.
Course Learning Outcomes (CLO):	Students would be able to: 1. Understand the working of microscope. 2. Understand the gross morphology, structure and functions of various organs of the human body. 3. Identify the various organs of skeletal system of human body. 4. Perform the various experiments related to the blood. 5. Determine the physiological parameters related to cardiovascular system.

Assignment/Practical/Activity Number	**Assignment/Practical/ Activity Title**	**Week Number/Turn**	**Details**	**CLO**	**Hours**
1	Practical 1: Compound microscope.	Week1/ Turn 1	1.1 Study of compound microscope.	CLO1	04
2.	Practical 2: Microscopic study	Week 2/ Turn 1	2.1 Microscopic study of epithelial and connective tissue	CLO 2	04
3	Practical 3: Microscopic study	Week 3/ Turn 1	3.1 Microscopic study of muscular and nervous tissue	CLO 2	04
4	Practical 4: Identification of bones	Week 4 / Turn 1	4.1 Identification of axial bones	CLO 3	04
5	Practical 5: Identification of bones	Week 5/ Turn 1	5.1 Identification of appendicular bones	CLO 3	04
6	Practical 6: Introduction to haemocytometer	Week 6 / Turn 1	6.1 Introduction to haemocytometer	CLO 4	04
7	Practical 7: Enumeration of white blood cell (WBC) count	Week 7 / Turn 1	7.1 Enumeration of white blood cell (WBC) count	CLO 4	04
8	Practical 8: Total RBC count	Week 8 / Turn 1	8.1 Enumeration of total red blood corpuscles (RBC) count	CLO 4	04

9	Practical 9: Bleeding time	Week 9 / Turn 1	9.1 Determination of bleeding time	CLO 4	04
10	Practical 10: Clotting time	Week 10 / Turn 1	10.1 Determination of clotting time	CLO 4	04
11	Practical 11: Haemoglobin content	Week 11 / Turn 1	11.1 Estimation of haemoglobin content	CLO 4	04
12	Practical 12: Heart rate and pulse rate	Week 12 / Turn 1	12.1 Determination of heart rate and pulse rate	CLO 5	04
13	Practical 13: Recording of blood pressure	Week 13 / Turn 1	13.1 Recording of blood pressure	CLO 5	04
14	Practical 14: Determination of blood groups	Week 14 / Turn 1	14.1 Determination of blood groups	CLO 5	04
15	Practical 15: Determination of (ESR)	Week 15 / Turn 1	15.1 Determination of erythrocyte sedimentation rate (ESR)	CLO 5	04

Learning resources:

Textbooks:

1. Practical Anatomy and Physiology by R. K. Goyal and N. M. Patel, B. S. Shah Prakashan Ahemedabad.
2. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
3. Textbook of Practical Physiology by C.L. Ghai, Jaypee brothers medical publishers, New Delhi.
4. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

Reference Books:

1. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York.
2. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje, Academic Publishers Kolkata.

Online Resources/E-Learning Resources:

1. https://www.slideshare.net/slideshow/hap-i-p-lab-manual/178802701
2. https://courseware.cutm.ac.in/wp-content/uploads/2020/06/Microscopic-study-of-epithelial-and-connective-tissue.pdf
3. https://www.youtube.com/watch?v=aGz-p4u6FU8

COURSE CURRICULUM

Name of the Program:	B. PHARM	Semester: I	Level: UG
Course Name	Pharmaceutical Analysis-I (Practical)	Course Code/ Course Type	BP108P/Core
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	4	-	2	60	15	35	-

Pre-Requisite: Nil

Course Objectives (CO):	The objectives of Tools for Pharmaceutical Analysis-I are: 1. To impart a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry. 2. To conduct preparations of different concentration of solutions and standardize them. 3. To study different analytical techniques for determination of percentage purity 4. To perform various titrimetric methods for evaluation. 5. To perform acid-base titrations by using different principles.
Course Learning Outcomes (CLO):	Students would be able to: 1. To understand the fundamentals and assess the presence of particular contaminants in the specified inorganic compounds using various limit tests 2. To perform how different concentrations are expressed and be able to develop and standardize solutions 3. To study utilization of titrimetric analysis to ascertain the pharmaceutical drug's percentage purity. 4. To evaluate and perform a variety of volumetric and electrochemical titrations, gain analytical skills, and comprehend the fundamentals of volumetric and electrochemical analysis. 5. To apply conductometric, potentiometric titration methods for acid-base type.

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)
Practical Plan: (Conduct any 15 Practical)

Assignment/Practical/Activity Number	Assignment/Practical/Activity Title	Week Number/ Turn	Details	CLO	Hours
1	Practical 1: Limit test of Chloride	Week 01/ Turn 1	To perform the limit test of Chloride	CLO1	04
2	Practical 2: Limit test of Sulphate	Week 02/ Turn 1	To perform the limit test of sulphate	CLO1	
3	Practical 3: Limit test of Iron	Week 03/ Turn 1	To perform the limit test of Iron	CLO1	
4	Practical 4: Limit test of Arsenic	Week 04/ Turn 1	To perform the limit test of Arsenic	CLO2	

5	Practical 5: Preparation and standardization	Week 05/ Turn 1	To prepare and standardize sodium hydroxide	CLO2	04
6	Practical 6: Preparation and standardization	Week 06/ Turn 1	To prepare and standardize sulphuric acid	CLO2	
7	Practical 7: Preparation and standardization	Week 07/ Turn 1	To prepare and standardize sodium thiosulphate	CLO3	
8	Practical 8: Preparation and standardization	Week 08/ Turn 1	To prepare and standardize Potassium permanganate	CLO3	
9	Practical 9: Preparation and standardization	Week 09/ Turn 1	To prepare and standardize Cerric ammonium sulphate.	CLO3	
10	Practical 10: Assay by acid base titration	Week 10/ Turn 1	To perform assay of ammonium chloride	CLO4	04
11	Practical 11: Assay by Cerimetry	Week 11/ Turn 1	To perform assay of Ferrous sulphate	CLO4	
12	Practical 12: Assay by Iodometry	Week 12/ Turn 1	To perform assay of Copper sulphate	CLO4	
13	Practical13: Assay by complexometry	Week 13/ Turn 1	To perform assay of Calcium gluconate	CLO4	
14	Practical 14: Assay by Permanganometry	Week 14/ Turn 1	To perform assay of Hydrogen peroxide	CLO5	
15	Practical 15: Assay by non-aqueous titration	Week 15/ Turn 1	To perform assay of Sodium benzoate	CLO5	
16	Practical 16: Assay by precipitation titration	Week 16/ Turn 1	To perform assay of Sodium chloride	CLO5	
17	Practical 17: Conductometric titration of strong acid against strong base	Week 17/ Turn 1	Determination of Normality by electro-analytical methods	CLO4	04
18	Practical 18: Conductometric titration of strong acid and weak acid against strong base	Week 18/ Turn 1	Determination of Normality by electro-analytical methods	CLO4	
19	Practical 19: Potentiometric titration of strong acid against strong base	Week 19/ Turn 1	Determination of Normality by electro-analytical methods	CLO4	

Learning resources:

Practical Text Book:

1. A.I. Vogel, Text Book of Quantitative Inorganic analysis Text book of practical organic chemistry- A.I.Vogel.
2. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London

Reference Books:

1. Martindale's extra pharmacopoeia.
2. Indian Pharmacopoeia.

Online Resources/E-Learning Resources:

1. https://www.youtube.com/watch?v=FbRLLdbbjFQ
2. https://www.youtube.com/watch?v=FAkbYY9Y_vQ
3. https://www.youtube.com/watch?v=0cKRCNO0c9M
4. https://www.youtube.com/watch?v=4RNYDSJrFXo
5. https://www.youtube.com/watch?v=FfWTBV5lE4c
6. https://www.youtube.com/watch?v=9vPqVDPfJ7k
7. https://www.youtube.com/watch?v=amFOhvc6p74

COURSE CURRICULUM

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Practical Plan

Name of the Program:		**B. PHARM**		**Semester: 1**		**Level: UG**	
Course Name		**Pharmaceutics-I (Practical)**		**Course Code/ Course Type**		**BP109P/Core**	
Course Pattern		**2024**		**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
-	4	-	2	60	15	35	-
Pre-Requisite: Nil							
Course Objectives (CO):				The objectives of Pharmaceutics-I Practical are: 1. To impart fundamental knowledge on the preparatory pharmacy 2. To know arts and science of preparing the different conventional dosage forms. 3. To evaluate different dosage forms.			
Course Learning Outcomes (CLO):				The Students shall be able to: 1.Prepare and evaluate monophasic liquid dosage forms 2.Prepare and evaluate Biphasic liquid dosage forms 3. Prepare and evaluate Solid dosage forms 4. Prepare and evaluate unit dosage forms 5.Prepare and evaluate Semisolid dosage forms and suppositories.		

Assignment/ Practical/ Activity Number	**Assignment/ Practical/ Activity Title**	**Week Number/Turn**	**Details**	**CLO**	**Hours**
1	Practical 1: Syrup	Week 1/ Turn 1	1.1 Syrup IP'66 1.2 Compound syrup of Ferrous Phosphate BPC'68	CLO1	04
2.	Practical 2: Elixir	Week 2/ Turn 1	2.1 Piperazine citrate elixir 2.2 Paracetamol pediatric elixir	CLO1	04
3.	Practical 3: Linctus	Week 3/ Turn 1/ Turn 1	3.1 Terpin Hydrate Linctus IP'66 3.2 Iodine Throat Paint (Mandles Paint)	CLO1	04
4	Practical 4: Solutions	Week 4/ Turn 1	4.1 Strong solution of ammonium acetate 4.2 Cresol with soap solution 4.3 Lugol's solution	CLO1	04
5	Practical 5: Lotions	Week 5/ Turn 1	5.1 Calamine lotion 5.2Magnesium Hydroxide mixture 5.3Aluminium Hydroxide gel	CLO2	04
6	Practical 6: Emulsion	Week 6/ Turn 1	6.1 Turpentine Liniment 6.2 Liquid paraffin emulsion	CLO2	04
7	Practical 7: Granules	Week 7/ Turn 1	7.1 ORS powder (WHO) 7.2 Effervescent granules	CLO3	04
8	Practical 8:	Week 8/	8.1 Dusting powder	CLO4	04

	Powders	Turn 1	8.2 Divided powders		
9	Practical 9: Suppository	Week 9/ Turn 1	9.1 Glycero gelatin suppository 9.2Coca butter suppository	CLO5	04
10	Practical 10: Suppository	Week 10/ Turn 1	Zinc Oxide suppository	CLO5	04
11	Practical 11: Ointment	Week 11/ Turn 1	Sulphur ointment	CLO5	04
12	Practical 12: Ointment	Week 12/ Turn 1	Non staining-iodine ointment with methyl salicylate	CLO5	04
13	Practical 13: Carbopol gel	Week 13/ Turn 1	Carbopol gel	CLO5	04
14	Practical 14: Iodine gargle	Week 14/ Turn 1	Iodine gargle	CLO5	04
15	Practical 15: Mouthwash	Week 15/ Turn 1	Chlorhexidine mouthwash	CLO5	04

Learning resources

Textbook:

1. Practical handbook of Pharmaceutics Dr Atamaram Pawar
2. Practical handbook of Pharmaceutics Dr P.D .Choudhari

Reference Books:

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

Online Resources/E-Learning Resources:

1. https://jru.edu.in/studentcorner/lab-manual/dpharm/1st-year/Pharmaceutics.p
2. https://pharmacyinfoline.com/bp109p-pharmaceutics-i-practical/
3. https://drive.google.com/file/d/1azhRS42lMfbot8HYqCHT5Dq6Cu0vOMOD/view

COURSE CURRICULUM

Name of the Program:	B. Pharm	Semester : I	Level: UG
Course Name	Pharmaceutical Inorganic Chemistry (Practical)	Course Code/ Course Type	BP110P/Core
Course Pattern	2024	Version	1.0

Teaching Scheme — **Assessment Scheme**

Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	4	-	2	60	15	35	-

Pre-Requisite: Nil

Course Objectives (CO):	The objectives of Pharmaceutical Inorganic Chemistry are: 1. To perform limit test/modified limit test for chlorides and sulphate, iron, heavy metals, lead, and arsenic. 2. To recognize identification test for magnesium hydroxide, ferrous sulphate, sodium bicarbonate, calcium gluconate and copper sulphate. 3. To analyze test of purity for swelling powder of bentonite, neutralizing capacity of aluminum hydroxide gel and potassium iodate and iodine in potassium iodide. 4. To prepare various inorganic pharmaceuticals.
Course Learning Outcomes (CLO):	Students would be able to: 1. Explain the limit test/modified limit tests. 2. Apply knowledge of identification test for various compounds. 3. Evaluate the data of test of purity. 4. Apply the knowledge to prepare various inorganic pharmaceuticals

Course Contents/Syllabus:
(All the Practical's carry equal weightage in Summative Assessment and equal engagement)
Practical Plan

Assignment/ Practical/ Activity Number	Assignment/Practical/ Activity Title	Week Number/Turn	Details	CLO	Hours
1	Practical 1: Limit test for Chloride	Week 1/Turn 1	perform Limit test for Chloride on given sample	CLO1	04
2	Practical 2: Limit test for Sulphate	Week 2/Turn 1	To perform Limit test for Sulphate on given sample	CLO1	04
3	Practical 3: Limit test for Iron	Week 3/Turn 1	To perform Limit test for Iron on given sample	CLO1	04
4	Practical 4: Limit test for Heavy Metals	Week 4/Turn 1	To perform Limit test for Heavy Metals on given sample	CLO1	04
5	Practical 5: Limit test for Arsenic	Week 5/Turn 1	To perform Limit test for Arsenic on given sample	CLO1	04
6	Practical 6: Identification test Ferrous sulphate	Week 6/Turn 1	To perform Identification test for Ferrous sulphate	CLO2	04

7	Practical 7: Identification test for sodium bicarbonate	Week 7/Turn 1	To perform Identification test for sodium bicarbonate	CLO2	04
8	Practical 8: Identification test for calcium gluconate	Week 8/Turn 1	To perform Identification test for calcium gluconate	CLO2	04
9	Practical 9: Identification test for copper sulphate	Week 9/Turn 1	To perform Identification test for copper sulphate	CLO2	04
10	Practical 10: Test for purity of Bentonite	Week10/Turn1	To perform Swelling power of Bentonite	CLO3	04
11	Practical 11: Test for purity aluminum hydroxide gel	Week11/Turn1	To perform Neutralizing capacity of aluminum hydroxide gel	CLO3	04
12	Practical 12: Determination of potassium iodate and iodine in potassium Iodide	Week12/Turn1	To Determine potassium iodate and iodine in potassium Iodide	CLO3	04
13	Practical 13: Preparation of inorganic pharmaceutical	Week13/Turn1	To prepare Boric acid	CLO4	04
14	Practical 14: Preparation of inorganic pharmaceutical	Week14/Turn1	To prepare Potash alum	CLO4	04
15	Practical 15: Preparation of inorganic pharmaceutical	Week15/Turn1	To prepare Ferrous sulphate	CLO4	04

Learning resources

Textbooks:

1. Laboratory Manual of Pharmaceutical Inorganic Chemistry by Dr. Vidhya K. Bhusari, Dr. Rajesh B. Patil, Dr. Sanjay D. Sawant Pritam Publications.
2. Inorganic Pharmaceutical Chemistry (Practical) by D.P. Belsare, A.S. Dhake Career Publication.

Reference Books:

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

Online Resources/E-Learning Resources

1. Limit test for Chlorides: https://www.youtube.com/watch?v=WcVH1wD3HiE
2. Swelling Power of Bentonite: https://www.youtube.com/watch?v=sNXuRCd1KRw
3. Neutralization of Antacid: https://www.youtube.com/watch?v=dgQloQvMGfE
4. Preparation of Boric acid: https://www.youtube.com/watch?v=W7sL2Sbu0EQ
5. Preparation of Ferrous Sulphate: https://www.youtube.com/watch?v=34vKBF4VryU
6. Preparation of Ferrous Sulphate: https://www.youtube.com/watch?v=hQ3YwDnYdYk
7. Preparation of Alum: https://www.youtube.com/watch?v=bhoMvPJKc24

COURSE CURRICULUM

Name of the Program:	**B. Pharm**	**Semester : I**	**Level: UG**
Course Name	**Communication Skills**	**Course Code/ Course Type**	**BP111P**
Course Pattern	**2024**	**Version**	1.0

Teaching Scheme				**Assessment Scheme**			
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
-	2	-	1	30	10	15	-

Pre-Requisite:	**Nil**
Course Objectives (CO):	The objectives of Communication Skills are: 1. To develop basic communication skills using English language lab software. 2. To learn and practice different types of pronunciations. 3. To improve advanced learning using English language lab software. 4. To develop writing skills, interview handling skills, presentation skills and group discussion skills using English language lab software.
Course Learning Outcomes (CLO):	Students would be able to: 1. Understand the behavioural needs for a Pharmacist to function effectively in the areas of pharmaceutical Operation. 2. Communicate effectively (Verbal and Non Verbal). 3. Effectively manage the team as a team player. 4. Develop interview skills. 5. Develop Leadership qualities.

Course Contents/Syllabus:
(All the Practical's carry equal weightage in Summative Assessment and equal engagement)

Practical Plan

Assignment/ Practical /Activity Number	**Assignment/Practical/ Activity Title**	**Week Number/Turn**	**Details**	**CLO**	**Hours**
1	Practical 1: Basic communication	Week 1/Turn 1	sic communication while Meeting People	CLO1	02
2	Practical 2: Basic communication	Week 2/Turn 1	Basic communication regarding asking Questions	CLO1	02
3	Practical 3: Basic communication	Week 3/Turn 1	Basic Communication for Making Friends	CLO1	02
4	Practical 4: Basic communication	Week 4/Turn 1	Basic communication: What did you do?	CLO1	02
5	Practical 5: Basic communication	Week 5/Turn 1	Do's and Dont's of Basic communication	CLO1	02
6	Practical 6: Pronunciations	Week 6/Turn 1	Pronunciation (Consonant Sounds)	CLO2	02

7	Practical 7: Pronunciations	Week 7/Turn 1	Pronunciation and Nouns	CLO2	02
8	Practical 8: Pronunciations	Week 8/Turn 1	Pronunciation (Vowel Sounds)	CLO2	02
9	Practical 9: Advanced Learning	Week 9/Turn 1	Listening Comprehension / Direct and Indirect Speech	CLO3	02
10	Practical 10: Advanced Learning	Week10/Turn1	Figures of Speech	CLO3	02
11	Practical 11: Advanced Learning	Week11/Turn1	Effective Communication	CLO3	02
12	Practical 12: Advanced Learning	Week12/Turn1	Writing Skills, Effective Writing	CLO4	02
13	Practical 13: Advanced Learning	Week13/Turn1	Interview Handling Skills	CLO4	02
14	Practical 14: Advanced Learning	Week14/Turn1	E-Mail etiquette	CLO5	02
15	Practical 15: Advanced Learning	Week15/Turn1	Presentation Skills	CLO5	02

Learning resources

Textbooks:

4. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011
5. Communication skills, Sanjay Kumar, Pushpalata, 1st Edition, Oxford Press, 2011
6. Organizational Behaviour, Stephen .P. Robbins, 1stEdition, Pearson, 2013
4. Brilliant- Communication skills, Gill Hasson, 1stEdition, Pearson Life, 2011

Reference Books:

1. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5th Edition, Pearson, 2013.
2. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010
3. Communication skills for professionals, Konar nira, 2ndEdition, New arrivals PHI, 2011
4. Personality development and soft skills, Barun K Mitra, 1stEdition, Oxford Press, 2011
5. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning india pvt. ltd, 2011
6. Soft skills and professional communication, Francis Peters SJ, 1stEdition, Mc Graw Hill Education, 2011
7. Effective communication, John Adair, 4thEdition, Pan Mac Millan, 2009
8. Bringing out the best in people, Aubrey Daniels, 2ndEdition, Mc Graw Hill, 1999

Online Resources/E-Learning Resources:

1. https://www.manage.gov.in/studymaterial/EC.pdf
2. https://www.fip.org/files/ypg/Project%20Documents/career%20development/CareerDevelopment-Interviews.pdf
3. https://www.icsi.edu/media/webmodules/CSEET/BUSINESS_COMMUNICATION_printable.pdf

COURSE CURRICULUM

Name of the Program:	B. Pharm	Semester : I	Level: UG

Course Name	Remedial Biology (Practical)	Course Code/ Course Type	BP112RBP/Core
Course Pattern	2024	Version	1.0

Teaching Scheme **Assessment Scheme**

Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	2	-	1	30	10	15	-

Pre-Requisite: **Nil**

Course Objectives (CO):	The objectives of Tools for Remedial Biology are: 1. To understand the experiments in biology. 2. To study the gross morphology, structure and functions of cells and study the system of frog 3. To identify the gross morphology, structure and functions of Stem, Root, Leaf, seed, fruit, flower. 4. To perform the various experiments related to the bones and blood. 5. To determine the tidal volume.
Course Learning Outcomes (CLO):	Students would be able to: 1. Understand the experiments in biology. 2. Understand the gross morphology, structure and functions of cells and study the system of frog 3. Identify the gross morphology, structure and functions of Stem, Root, Leaf, seed, fruit, flower 4. Perform the various experiments related to the bones and blood 5. Determine the tidal volumes.

Course Contents/Syllabus
(All the Practical's carry equal weightage in Summative Assessment and equal engagement)

Practical Plan

Assignment/ Practical/ Activity Number	Assignment/Practical/ Activity Title	Week Number/Turn	Details	CLO	Hours
1	Practical 1: Introduction to experiments in biology	Week1/ Turn 1	1.1 Study of microscope.	CLO1	02
2.	Practical 2: Introduction to experiments in biology	Week 2/ Turn 1	2.1 To study Section cutting techniques	CLO1	02
3	Practical 3: Introduction to experiments in biology	Week 3/ Turn 1	3.1 To study Mounting and staining	CLO1	02
4	Practical 4: Introduction to experiments in biology	Week 4 / Turn 1	4.1 To study Permanent slide preparation	CLO1	02
5	Practical 5: Study of cell and its inclusions	Week 5/ Turn 1	5.1 To study cell and its inclusions	CLO2	02
6	Practical 6: Study of Stem, Root, Leaf	Week 6 / Turn 1	6.1 To study Stem, Root, Leaf	CLO3	02
7	Practical 7: Study of seed, fruit, flower and their modifications	Week 7 / Turn 1	7.1 To study seed, fruit, flower and their modifications	CLO3	02
8	Practical 8: Detailed study of frog by using computer models	Week 8 / Turn 1	8.1 To study frog by using computer models	CLO2	02
9	Practical 9: Microscopic study and identification of tissues pertinent to Stem, Root	Week 9 / Turn 1	9.1 To study microscopy and identification of tissues pertinent to Stem, Root	CLO3	02

10	Practical 10: Microscopic study and identification of tissues pertinent to leaf and seed	Week 10 / Turn 1	10.1 To study microscopy and identification of tissues pertinent to leaf and seed	CLO3	02
11	Practical 11: Microscopic study and identification of tissues pertinent to flower and fruit	Week 11 / Turn 1	11.1 To study microscopy and identification of tissues pertinent to flower and fruit	CLO3	02
12	Practical 12: Identification of bones	Week 12 / Turn 1	12.1 To study identification of bones	CLO4	02
13	Practical 13: Determination of blood group	Week 13 / Turn 1	13.1 Determination of blood group	CLO4	02
14	Practical 14: Determination of blood pressure	Week 14 / Turn 1	14.1 To study determination of blood pressure	CLO4	02
15	Practical 15 Determination of tidal volume	Week 15 / Turn 1	15.1 Determination of tidal volume	CLO5	02

Learning resources:

Textbooks:

1. Text book of Biology by S. B.Gokhale
2. A Text book of Biology by Dr. Thulajappa and Dr.Seetaram
3. Practical Anatomy and Physiology by R. K. Goyal and N. M. Patel, B. S. Shah Prakashan Ahemedabad.
4. Practical human anatomy and physiology. by S.R.Kale and R.R.Kale.

Reference Books:

1. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York.
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

Online Resources/E-Learning Resources

1. https://www.scribd.com/document/442114456/To-understand-the-method-of-Section-Cutting-Technique-Staining-Mounting-and-Observation-of-pdf
2. https://courseware.cutm.ac.in/wp-content/uploads/2020/06/Microscopic-study-of-epithelial-and-connective-tissue.pdf
3. https://www.slideshare.net/BikashAdhikari26/parts-of-plant-plant-tissues-microscopy-and-morphology

COURSE CURRICULUM

<table>
<tr><td colspan="2">Name of the Program:</td><td colspan="2">B. Pharm</td><td colspan="2">Semester : I</td><td colspan="2">Level: UG</td></tr>
<tr><td colspan="2">Course Name</td><td colspan="2">Universal Human Values-I (UHV-I): Professional Ethics</td><td colspan="2">Course Code/ Course Type</td><td colspan="2">ACUHV101/AC</td></tr>
<tr><td colspan="2">Course Pattern</td><td colspan="2">2024</td><td colspan="2">Version</td><td colspan="2">1.0</td></tr>
<tr><td colspan="5">Teaching Scheme</td><td colspan="3">Assessment Scheme</td></tr>
<tr><td>Theory</td><td>Practical</td><td>Tutorial</td><td>Total Credits</td><td>Hours</td><td>CIA (Continuous Internal Assessment)</td><td>ESA (End Semester Assessment)</td><td>Practical/ Oral</td></tr>
<tr><td>2</td><td>-</td><td>-</td><td>-</td><td>30</td><td>50</td><td>-</td><td>-</td></tr>
<tr><td colspan="8">Pre-Requisite: Nil</td></tr>
<tr><td colspan="3">Course Objectives (CO):</td><td colspan="5">The objectives of Universal Human Values-I: Professional Ethics are:
1. To make the students understand the importance of ethical behavior
2. To expose the students to the ethical practices to be followed in profession
3. To sensitize the students to become responsible persons who will uphold ethics in profession when they pursue their career
4. To make students understand Psychological and Philosophical approaches
5. To make students understand social responsibility and corporate Sustainability</td></tr>
<tr><td colspan="3">Course Learning Outcomes (CLO):</td><td colspan="5">Students would be able to:
1. Equip themselves with an understanding of moral, professional and personal values.
2. Understand the need of ethics in shaping their profession The learners will hone their decision-making skills.
3. Refine their business ethics based on psychological and philosophical perspective.
4. Assess the need for a balance between ecology, and economy.
5. Equip themselves with a better understanding of themselves and the society they live in and the responsibilities they shoulder in creating a sustainable world.</td></tr>
</table>

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
Individual and Professional Ethics Introduction to Professional Ethics, Morals, Values and Ethics – Personal and Professional- Sensé of Professional Ethics – Code of Ethics by NSPE-Making decisions with ethical dimensions–definition–roadmap to ethical decision making–common standards– internal obstacles – bias – empathy	**CLO 1**	**08**
UNIT II		
Business Ethics Philosophical approaches to Business Ethics – ethical reasoning – ethical issues in business - Social Responsibility of Business- conflict of interest–cultural relativism-Ethical Leadership-Resisting un-ethical authority and domination-Global Business Ethics	**CLO 2**	**05**
UNIT III		
Psychological Approaches Ethical Theories-Psychological and Philosophical Approaches-Myths about Morality-conflict of interest in psychological perspective - Courage-Integrity – ethical dilemma – Emotional Intelligence (Mahabharata- Iskcon Publications)	**CLO 3**	**05**
UNIT IV		
Workplace Ethics Ethics in changing domains of Research–academic integrity–intellectual honesty-Role of Engineers and Managers-Ethical issues in Diverse workplace – competition – free will- Confidentiality – employee rights – Intellectual property rights – discrimination	**CLO 4**	**05**
UNIT V		
Safety, Responsibilities and Rights Ecology, and Economy-Risk benefit analysis and reducing risk SDGs–Corporate social responsibility and Corporate Sustainability - CSR in India - Sustainability Case Studies	**CLO 5**	**07**
Total Hours		**30**

Learning resources:

Textbooks:

1. Subramanian. R. *Professional Ethics*, Oxford Publication, 2013.
2. Nagarasan. R. S. *Professional Ethics and Human Values*. New Age International Publications, 2006.

Reference Book:

1. Mike W Martin and Roland Schinzinger, *Ethics in Engineering*,4th edition, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi,2014

Online Resources/E-Learning Resources:

1. https://www.nspe.org/resources/ethics/code-ethics
2. https://www.toolshero.com/tag/ethical-decision-making/
3. https://pagecentertraining.psu.edu/public-relations-ethics/introduction-to-public-relations-ethics/lesson-1/ethical-theories/https://peer.asee.org/case-studies-in-engineering-ethics.pdf.

CIA Guidelines

Online Quiz (Based on MCQ)- 20 marks

Activity (with short Report Submission) - 20 Marks

Academic Sincerity - 10 marks

Few of the suggested activities are Assignments, Debates, and poster presentations, Model making, Group presentation, Field visits and Group Discussions.

Few of suggested topics related to **UHV1- Professional Ethics** are:

Debate Topics

- Ethical Approach versus Realistic Approach
- Individual and Social Approach
- Dilemma between heart and Mind

Activity

- Analyze the wastage (Electricity or any other) at work place? How you managed.

Assignment

- Analyze the code of ethics at work place
- If you fulfill the duties, rights will automatically fall in place. Justify the statement

SEMESTER-II
F. Y. B. PHARM

COURSE CURRICULUM

Name of the Program:		B. PHARM		Semester : II		Level: UG	
Course Name		Human Anatomy And Physiology-II (Theory)		Course Code/ Course Type		BP201T/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	1	4	45	25	75	--
Pre-Requisite: Nil							
Course Objectives (CO):				The objectives of Human Anatomy And Physiology-I are: 1. To recall the gross morphology, structure, and functions of various organs of the human body. 2. To recognize the various homeostatic mechanisms and their imbalances. 3. To identify the various tissues and organs of different systems of the human body. 4. To perform various hematological experiments and also record blood pressure, heart rate, pulse, and respiratory volume. 5. To study the coordinated working pattern of different organs of each system.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Identify the gross morphology, structure and functions of various organs of the human body. 2. Explain the various homeostatic mechanisms and their imbalances. 3. Apply knowledge of identification of the various tissues and organs of different systems of human body. 4. Perform the various hematological experiments and also record also record blood pressure, heart rate, pulse and respiratory volume. 5. Evaluate and study coordinated working pattern of different organs of each system			

Course Contents/Syllabus:

(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	CLO	Hours
UNIT I		
Nervous system Organization of nervous system, neuron, neuroglia, classification and properties of nerve fiber, electrophysiology, action potential, Nerve impulse, receptors, synapse, neurotransmitters. Central nervous system: Meninges, ventricles of brain, and Cerebrospinal fluid. structure and functions of brain (cerebrum, brain stem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity)	**CLO 1**	**10**
UNIT II		
Digestive system Anatomy of GI Tract with special reference to anatomy and functions of stomach, (Acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsin role in protein digestion) small intestine. and large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT. **Energetics** Formation and role of ATP, Creatinine Phosphate and BMR.	**CLO 2**	**06**
UNIT III		
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, artificial respiration and resuscitation methods. **Urinary system** Anatomy of urinary tract with special reference to anatomy of kidney and nephrons, functions of kidney and urinary tract, physiology of urine formation, micturition reflex and role of kidneys in acid base balance, role of RAS in kidney and disorders of kidney.	**CLO 1, CLO 2**	**10**
UNIT IV		
Endocrine system Classification of hormones, mechanism of hormone action, structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland, thymus and their disorders.	**CLO2**	**10**
UNIT V		
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 of inheritance	**CLO5**	**09**
Total Hours		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning resources:

Textbooks:

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee Brothers Medical Publishers, New Delhi.
2. Textbook of Human Histology by Inderbir Singh, Jaypee brothers medical publishers, New Delhi.
3. Textbook of Medical Physiology- Arthur C, Guyton, and John. E. Hall. Miamisburg, OH,U.S.A.

Reference Books:

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
2. Textbook 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

Online Resources/E-Learning Resources:

1. https://training.seer.cancer.gov/anatomy/nervous/
2. https://www.ncbi.nlm.nih.gov/books/NBK542179/
3. https://www.youtube.com/watch?v=44B0ms3XPKU
4. https://www.betterhealth.vic.gov.au/health/conditionsandtreatments/nervous-system

COURSE CURRICULUM

Name of the Program:		B. Pharm		Semester : II		Level: UG	
Course Name		Pharmaceutical Organic Chemistry-I (Theory)		Course Code/ Course Type		BP202T/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	1	4	45	25	75	-
Pre-Requisite:							
Course Objectives (CO):				The objectives of Pharmaceutical Organic Chemistry-I are: 1. To write the structure, name and type of isomerism of the organic compound. 2. To state the name of reaction and orientation of reaction. 3. To account for reactivity/stability of compounds. 4. To identify/confirm the identification of organic compound. 5. To know medicinal and pharmaceutical applications.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Solve the nomenclature of simple organic compounds by analyzing chemical structure and vice versa; and classify structural Isomerism 2. Find the mechanism and orientation of important name reactions of organic compounds 3. Interpret reactivity/stability of organic compounds 4. Synthesize organic compounds by different methods; and to relate the structure of organic compounds with their physical Properties. 5. Apply the knowledge for the identification of organic compounds; and to appraise their medicinal and pharmaceutical applications.			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
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's in organic compounds	**CLO 1**	**07**
UNIT II		
Alkanes*, Alkenes* and Conjugated dienes* SP3 hybridization in alkanes, Halogenation of alkanes, uses of paraffins. Stabilities of alkenes, SP2 hybridization in alkenes E1 and E2 reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeffs orientation and evidences. E1 verses E2 reactions, Factors affecting E1 and E2 reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation. Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement	**CLO 2**	**10**
UNIT III		
Alkyl halides* SN1 and SN2 reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations. SN1 versus SN2 reactions, Factors affecting SN1 and SN2 reactions Structure and uses of ethyl chloride, Chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform. **Alcohols***- Qualitative tests, Structure and uses of Ethyl alcohol, Methyl alcohol, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol	**CLO 3**	**10**
UNIT IV		
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, Vanillin, Cinnamaldehyde.	**CLO 4**	**10**
UNIT V		
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 Acetyl salicylic acid. **Aliphatic amines*** - Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylene diamine, Amphetamine	**CLO 5**	**08**
Total Hours		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning resources:

Textbooks:

1. Pharmaceutical Organic Chemistry-I Theory and Practical by Anees Ahmad Siddiqui, Seemi Siddiqui, CBS Publishers & Distributors Pvt Ltd.
2. Pharmaceutical Organic Chemistry-I by P. S. Kalsi, New Age International Publishers, Second Edition.

Reference Books:

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar, Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P.L.Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. Vogel's text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K.Vishnoi.
8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.
9. Reaction and reaction mechanism by Ahluwaliah/Chatwal.

Online Resources/E-Learning Resources:

1. https://www.youtube.com/watch?v=cA0fGIfALxI
2. https://www.youtube.com/watch?v=ruKyDMKqsXc
3. https://www.youtube.com/watch?v=yrvV85H737o

COURSE CURRICULUM

Name of the Program:		**B. PHARM**		**Semester : II**		**Level: UG**	
Course Name		**Biochemistry (Theory)**		**Course Code/ Course Type**		**BP203T/Core**	
Course Pattern		**2024**		**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
3	-	1	4	45	25	75	_
Pre-Requisite:		**Nil**					
Course Objectives (CO):				The objectives of Biochemistry are: 1. To understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes. 2. To understand the metabolism of nutrient molecules in physiological and pathological conditions. 3. To understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins. 4. To understand diagnostic applications of enzyme and importance of enzyme inhibitors in the design of new drugs. 5. To study Lipid and amino acid metabolism.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Describe the biomolecules and bioenergetics involved in chemical process associated with living cells. 2. Illustrate metabolism of Carbohydrate molecules in physiological and pathological conditions. 3. Illustrate metabolism of Lipid and amino acid molecules in physiological and pathological conditions. 4. Explain the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins. 5. Outline the catalytic role, therapeutic and diagnostic applications of enzyme and importance of enzyme inhibitors in the design of new drugs.			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
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	**CLO1**	**08**
UNIT II		
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, Hormonal regulation of blood glucose level and Diabetes mellitus **Biological oxidation** Electron transport chain (ETC) and its mechanism. Oxidative phosphorylation & its mechanism and substrate phosphorylation Inhibitors ETC and oxidative phosphorylation/Uncouplers	**CLO2**	**10**
UNIT III		
Lipid metabolism β-Oxidation of saturated fatty acid (Palmitic acid) Formation and utilization of ketone bodies; ketoacidosis De novo synthesis of fatty acids (Palmitic acid), Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity. **Amino acid metabolism** General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders, Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenyketonuria, Albinism, alkeptonuria, tyrosinemia) Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline Catabolism of heme; hyperbilirubinemia and jaundice	**CLO3**	**10**
UNIT IV		
Nucleic acid metabolism and genetic information transfer Biosynthesis of purine and pyrimidine nucleotides, Catabolism of purine nucleotides and Hyperuricemia and Gout disease Organization of mammalian genome Structure of DNA and RNA and their functions DNA replication (semi conservative model) Transcription or RNA synthesis Genetic code, Translation or Protein synthesis and inhibitors	**CLO4**	**10**
UNIT V		
Enzymes Introduction, properties, nomenclature and IUB classification of enzymes Enzyme kinetics (Michaelis plot, Line Weaver Burke plot), Enzyme inhibitors with examples Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation, Therapeutic and diagnostic applications of enzymes and isoenzymes, Coenzymes –Structure and biochemical functions	**CLO5**	**07**
Total Hours		**45**

***The total 15 tutorials should be conducted as per the format mentioned above**

Learning resources

Textbooks:

1. Essential of Pharmaceutical Biochemistry (B.PHARM 1ST SEM by Harbans lal)
2. Pharmaceutical Biochemistry – A Comprehensive Approach G. Saravanan, V. Alagarsamy

Reference Books:

1. Principles of Biochemistry by Lehninger.
2. Harper's Biochemistry by Robert K. Murry, Daryl K. Granner and Victor W. Rodwell.
3. Biochemistry by Stryer.
4. Biochemistry by D. Satyanarayan and U.Chakrapani
5. Textbook of Biochemistry by Rama Rao.
6. Textbook of Biochemistry by Deb.
7. Outlines of Biochemistry by Conn and Stumpf
8. Practical Biochemistry by R.C. Gupta and S. Bhargavan.
9. Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition)
10. Practical Biochemistry for Medical students by Rajagopal and Ramakrishna.
11. Practical Biochemistry by Harold Varley

Online Resources/E-Learning Resources:

1. https://www.carewellpharma.in/bpharmacy/notes/2nd-sem/biochemistr
2. https://www.brightmedico.com/free-best-handwritten-notes/b-pharmacy-notes-pdf-free-download/2nd-semester-biochemistry-notes/
3. https://rxpharma-edu.com/unit-1-notes-biochemistry/
4. https://www.lastbenchpharmacist.in/post/b-pharm-biochemistry-unit-1-pdf-notes

COURSE CURRICULUM

Name of the Program:		B. PHARM		Semester : II		Level: UG	
Course Name		Pathophysiology (Theory)		Course Code/ Course Type		BP204T/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	1	4	45	25	75	--
Pre-Requisite: Nil							
Course Objectives (CO):				The objectives of Pathophysiology are: 1. To recall the basic principles of cell injury and inflammation. 2. To describe the etiology and pathogenesis of the selected disease states. 3. To study the pathogenesis of hematological, endocrine, nervous and gastrointestinal system. 4. To identify and study the signs and symptoms of the diseases related to bones/joints and cancer. 5. To study the pathophysiology of infectious and sexually transmitted diseases.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Understand the basic principles of cell injury and inflammation. 2. Identify the etiology and pathogenesis of the selected disease states. 3. Explain the pathogenesis of hematological, endocrine, nervous and gastrointestinal system. 4. Study the signs and symptoms of the diseases related to bones/joints and cancer. 5. Study the pathophysiology of infectious and sexually transmitted diseases.			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
Basic principles of Cell injury and Adaptation Introduction, definitions, Homeostasis, Components and Types of Feedback systems, Causes of cellular injury, Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage), Morphology of cell injury – Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia), Cell swelling, Intra cellular accumulation, Calcification, Enzyme leakage and Cell Death Acidosis & Alkalosis, Electrolyte imbalance. **Basic 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 blood flow, migration of WBC's, Mediators of inflammation, Basic principles of wound healing in the skin, Pathophysiology of Atherosclerosis.	**CLO 1**	**10**
UNIT II		
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	**CLO 2**	**10**
UNIT III		
Hematological Diseases Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cell anemia, thalassemia, hereditary acquired anemia, hemophilia. **Endocrine system** Diabetes, thyroid diseases, disorders of sex hormones **Nervous system** Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease. **Gastrointestinal system** Peptic Ulcer	**CLO 3**	**10**
UNIT IV		
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.	**CLO 4**	**08**
UNIT V		
Infectious diseases: Meningitis, Typhoid, Leprosy, Tuberculosis Urinary tract infections. **Sexually transmitted diseases:** AIDS, Syphilis, Gonorrhea.	**CLO 5**	**07**
Total Hours		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning resources:

Textbooks:

1. Text book of Pathology by Harsh Mohan; 10th edition; India; Jaypee Publications.
2. Textbook of Medical Physiology; by Guyton A, John .E Hall 12th edition; WB Saunders Company; 2010.

Reference Books:

1. Vinay Kumar, Abul K. Abas, Jon C. Aster; Robbins & Cotran Pathologic Basis of Disease; South Asia edition; India; Elsevier; 2014.
2. Laurence B, Bruce C, Bjorn K. ; Goodman Gilman's The Pharmacological Basis of Therapeutics; 12th edition; New York; McGraw-Hill; 2011.
3. 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;
4. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston; Davidson's Principles and Practice of Medicine; 21st edition; London; ELBS/Churchill Livingstone; 2010.
5. Joseph DiPiro, Robert L. Talbert, Gary Yee, Barbara Wells, L. Michael Posey; Pharmacotherapy: A Pathophysiological Approach; 9th edition; London; McGraw-Hill Medical; 2014.
6. V. Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6th edition; Philadelphia; WB Saunders Company; 1997.
7. Roger Walker, Clive Edwards; Clinical Pharmacy and Therapeutics; 3rd edition; London; Churchill Livingstone publication; 2003.

Online Resources/E-Learning Resources

1. https://medicine.nus.edu.sg/pathweb/wp-content/uploads/2022/07/Study-notes_Inflammation-and-repair.pdf
2. https://www.urmc.rochester.edu/encyclopedia/content.aspx?ContentTypeID=85&ContentID=P00799
3. https://www.intechopen.com/chapters/84638
4. https://www.physio-pedia.com/Respiratory_Disorders
5. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9405799/

COURSE CURRICULUM

Name of the Program:		B. PHARM		Semester: II		Level: UG	
Course Name		Computer Applications in Pharmacy (Theory)		Course Code/ Course Type		BP205T/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
3	-	-	3	30	25	50	--
Pre-Requisite: Nil							
Course Objectives (CO):				The objectives of Computer Applications in Pharmacy are: 1. To demonstrate and make use of MS Office, MS Word, MS Excel, MS Access, and MS Power point 2. To understand the paradigms of program language from each model C and SQL. 3. To summarize the report and printing the report from patient database. 4. To design questionnaire using a word processing package to gather information about a particular disease. 5. To create HTML web page to show personal information and to create mailing labels using label wizard, generating label in MS Word			
Course Learning Outcomes (CLO):				Students would be able to: 1. Identify use of MS Office, MS Word, MS Excel, MS Access and MS PowerPoint. 2. Explain paradigms of program language from each model C and SQL 3. Apply questionnaire designed to obtain the patient database 4. Perform word processing charges to create questionnaire, for collection of patient database. 5. Evaluate web pages created and personal information filled			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
Number system Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One's complement, Two's complement method, binary multiplication, binary division. **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	**CLO1**	**06**
UNIT II		
Web technologies Introduction to HTML, XML, CSS and Programming languages, introduction to web servers and Server Products Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database	**CLO2**	**06**
UNIT III		
Application of computers in Pharmacy Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System	**CLO3**	**06**
UNIT IV		
Bioinformatics Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery	**CLO4**	**06**
UNIT V		
Computers as data analysis in Preclinical development Chromatographic data analysis(CDS), Laboratory Information management System (LIMS), and Text Information Management System(TIMS)	**CLO5**	**06**
Total Hours		**30**

Learning resources

Textbooks:

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

Reference Books:

1. Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA)
2. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi – 110002

Online Resources/E-Learning Resources:

1. BP205T.pdf (sathyabama.ac.in)
2. https://pharmacyinfoline.com/computer-applications-in-pharmacy/
3. PowerPoint Presentation (teachntest.org)

COURSE CURRICULUM

Name of the Program:		B. Pharm		Semester: II		Level: UG	
Course Name		Environmental Sciences (Theory)		Course Code/ Course Type		BP206T/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	-	3	30	25	50	-
Pre-Requisite: Nil							

Course Objectives (CO):	The objectives of Environmental Sciences are: 1.Understand the importance of Environmental education and conservation of natural resources. 2.Understand the importance of ecosystems and biodiversity. 3.Apply the environmental science knowledge on solid waste management, disaster management and EIA process. 4.Create awareness about environmental problems among learners. 5.Motivate learners to participate in environment protection.
Course Learning Outcomes (CLO):	Students would be able to: 1.Define & interpret their knowledge about different Natural Resources. 2.Expand their knowledge regarding problems associated with different Natural Resources. 3.Describe problems associated with ecosystem and their depletion. 4.Ascertain the Classification of ecosystem and their composition. 5.Judge causes and solution of pollution.

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
The Multidisciplinary nature of environmental studies • Natural Resources • Renewable and non-renewable resources: • Natural resources and associated problems a) Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources.	**CLO1, CLO2**	**10**
UNIT II		
Ecosystems: • Concept of an ecosystem. • Structure and function of an ecosystem. • Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	**CLO3, CLO4**	**10**
UNIT III		
Environmental Pollution: Air pollution; Water pollution; Soil pollution	**CLO 5**	**10**
Total Hours		**30**

Learning resources:

Textbooks:

1. Anubha Kaushik, C.P.Kaushik, "Environmental Studies", New Age International, (2007).
2. Benny Joseph, "Environmental Studies", Tata McGraw-Hill companies, New Delhi, (2009).

Reference Books:

1. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers, Bangalore
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Bharucha Erach, The Biodiversity of India, Mapin Pu blishing Pvt. Ltd., Ahmedabad – 380 013, India, 4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
5. Clark R.S., Marine Pollution, Clanderson Press Oxford
6. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p
7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
8. Down of Earth, Centre for Science and Environment

Online Resources/E-Learning Resources

1. https://www.youtube.com/watch?v=LE9KTG9PFho

COURSE CURRICULUM

Name of the Program:	B. Pharm	Semester : II	Level: UG
Course Name	Human Anatomy And Physiology-II (Practical)	Course Code/ Course Type	BP207P/Core
Course Pattern	2024	Version	1.0

Teaching Scheme **Assessment Scheme**

Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
-	4	-	2	60	15	35	-

Pre-Requisite: Nil

Course Objectives (CO):	The objectives of Tools for Human Anatomy And Physiology-II are: 1. To recall the gross morphology, structure and functions of various organs of human body. 2. To recognize the various tissues and organs of different systems of human body. 3. To analyze the different diagnostic tools of different systems of human body 4. To estimate the various experimental data related to the blood/its components. 5. To identify the permanent slides of vital organs and gonads.
Course Learning Outcomes (CLO):	Students would be able to: 1. Explain the gross morphology, structure and functions of various organs of human body. 2. Identify the various tissues and organs of different systems of human body. 3. Evaluate the different diagnostic tools/vital physiological parameters of different systems of human body. 4. Estimate the various experimental data related to the blood/its components. 5. Observe and identify the permanent slides of vital organs and gonads.

Course Contents/Syllabus
(All the Practical's carry equal weightage in Summative Assessment and equal engagement)

Practical Plan

Assignment /Practical/ Activity Number	Assignment/Practical/ Activity Title	Week Number/ Turn	Details	CLO	Hours
1	Practical 1: Integumentary and special senses using specimen, models.	Week1/ Turn 1	To study the integumentary and special senses using specimen, models etc	CLO1	04

2.	Practical 2: Nervous system	Week 2/ Turn 1	2.1 To study the nervous system using specimen, models, etc.	CLO1	04
3	Practical 3: Endocrine system	Week 3/ Turn 1	3.1 To study the endocrine system using specimen, models, etc	CLO1	04
4	Practical 4: Digestive, respiratory, cardiovascular, urinary and reproductive systems	Week 4 / Turn 1	4.1 To study digestive, respiratory, cardiovascular, urinary and reproductive systems with help of models, charts and specimens	CLO1 / CLO2	04
5	Practical 5: Body temperature	Week 5/ Turn 1	5.1 To record the body temperature	CLO3	04
6	Practical 6: Basal mass index	Week 6/ Turn 1	6.1 To record the basal mass index	CLO3	04
7	Practical 7: General neurological examination	Week 7/ Turn 1	7.1 To demonstrate the general neurological examination	CLO3	04
8	Practical 8: Function of olfactory nerve	Week 8/ Turn 1	8.1 To demonstrate the function of olfactory nerve	CLO3	04
9	Practical 9: Different types of taste.	Week 9/ Turn 1	9.1 To examine the different types of taste.	CLO3	04
10	Practical 10: Visual and reflex acuity.	Week10/ Turn 1	10.1 To demonstrate the visual and reflex acuity.	CLO3	04
11	Practical 11: Positive and negative feedback mechanism.	Week 11 / Turn 1	11.1 To demonstrate positive and negative feedback mechanism.	CLO3	04
12	Practical 12: Tidal volume and vital capacity.	Week12 / Turn 1	12.1 To determine the tidal volume and vital capacity.	CLO3	04
13	Practical 13: Family planning devices and pregnancy diagnosis test.	Week13 / Turn 1	13.1 To study family planning devices and pregnancy diagnosis test.	CLO3	04
14	Practical 14: Total blood count / differential Leucocyte count.	Week14/ Turn 1	14.1 To determine the total blood count / differential Leucocyte count.	CLO4	04
15	Practical 15: Permanent slides of vital organs and gonads	Week15 / Turn 1	15.1 To study permanent slides of vital organs and gonads.	CLO5	04

Learning resources:

Textbooks:

1. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
2. Textbook of Practical Physiology by C.L. Ghai, Jaypee brothers' medical publishers, New Delhi.
3. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

Reference Books:

1. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York.
2. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje, Academic Publishers Kolkata.

Online Resources/E-Learning Resources:

1. https://nurseslabs.com/special-senses-anatomy-physiology/
2. https://bio.libretexts.org/Learning_Objects/Laboratory_Experiments/General_Biology_Labs/BIOL_1108%3A_Principles_of_Biology_II_Lab_Manual_(Burran_and_DesRochers)/Lab_04%3A_Nervous_System
3. https://www.youtube.com/watch?v=aGz-p4u6FU8

COURSE CURRICULUM

Course Contents/Syllabus:
(All the Practical's carry equal weightage in Summative Assessment and equal engagement)

Name of the Program:	**B. Pharm**		**Semester: II**		**Level: UG**	
Course Name	**Pharmaceutical Organic Chemistry-I (Practical)**		**Course Code/ Course Type**		**BP208P/Core**	
Course Pattern	2024		**Version**		1.0	
Teaching Scheme				**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
-	4	-	2	60	15	35	-
Pre-Requisite:							
Course Objectives (CO):			The objectives of Pharmaceutical Organic Chemistry-I are: 1. Systematic qualitative analysis of unknown organic compounds. 2. Preparation of suitable solid derivatives from organic compounds. 3. Construction of molecular models.			
Course Learning Outcomes (CLO):			Students would be able to: 1. Understand steps involved in identification of unknown organic compound. 2. Able to prepare suitable solid derivatives from organic compounds. 3. Develop skills to prepare stereo models containing various functional groups			

Practical Plan

Assignment/ Practical/ Activity Number	**Assignment/Practical/Activity Title**	**Week Number /Turn**	**Details**	**CLO**	**Hours**
1	Practical 1: Systematic qualitative analysis of unknown organic compounds	Week 1/ Turn 1	perform qualitative analysis of given unknown sample	CLO1	04
2	Practical 2: Systematic qualitative analysis of unknown organic compounds	Week 2/ Turn 1	To perform qualitative analysis of given unknown sample	CLO1	04
3	Practical 3: Systematic qualitative analysis of unknown organic compounds	Week 3/ Turn 1	To perform qualitative analysis of given unknown sample	CLO1	04
4	Practical 4: Systematic qualitative analysis of unknown organic compounds	Week 4/ Turn 1	To perform qualitative analysis of given unknown sample	CLO1	04
5	Practical 5: Systematic qualitative analysis of unknown organic compounds	Week 5/ Turn 1	To perform qualitative analysis of given unknown sample	CLO1	04
6	Practical 6: Systematic qualitative analysis of unknown organic compounds	Week 6/ Turn 1	To perform qualitative analysis of given unknown sample	CLO1	04
7	Practical 7:	Week 7/	To perform qualitative analysis of	CLO1	04

	Systematic qualitative analysis of unknown organic compounds	Turn 1	given unknown sample		
8	Practical 8: Preparation of suitable solid derivatives from organic compounds	Week 8/ Turn 1	To prepare suitable solid derivatives of given organic compounds	CLO2	04
9	Practical 9: Preparation of suitable solid derivatives from organic compounds	Week 9/ Turn 1	To prepare suitable solid derivatives of given organic compounds	CLO2	04
10	Practical 10: Preparation of suitable solid derivatives from organic compounds	Week10/ Turn1	To prepare suitable solid derivatives of given organic compounds	CLO2	04
11	Practical 11: Preparation of suitable solid derivatives from organic compounds	Week11/ Turn 1	To prepare suitable solid derivatives of given organic compounds	CLO2	04
12	Practical 12: Preparation of suitable solid derivatives from organic compounds	Week12/ Turn1	To prepare suitable solid derivatives of given organic compounds	CLO2	04
13	Practical 13: Construction of molecular models	Week13/ Turn 1	To construct molecular models of ethane	CLO3	04
14	Practical 14: Construction of molecular models	Week14/ Turn 1	To construct molecular models of butane	CLO3	04
15	Practical 15: Construction of molecular models	Week15/ Turn 1	To construct molecular models of cyclohexane	CLO3	04

Learning resources

Textbooks:

1. Vogel's text book of Practical Organic Chemistry
2. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.

Reference Books:

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar, Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P.L.Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. Advanced Practical organic chemistry by N.K.Vishnoi.
8. Reaction and reaction mechanism by Ahluwaliah/Chatwal.

Online Resources/E-Learning Resources

1. https://vlab.amrita.edu/index.php?brch=63&cnt=1&sim=1094&sub=3
2. https://vlab.amrita.edu/?sub=3&brch=63&sim=631&cnt=2
3. https://www.youtube.com/watch?v=OsdhNtNNNds

COURSE CURRICULUM

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)
Practical Plan

Name of the Program:		**B. PHARM**		**Semester: II**		**Level: UG**	
Course Name		**Biochemistry (Practical)**		**Course Code/ Course Type**		**BP209P/Core**	
Course Pattern		**2024**		**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
-	4	-	2	60	15	35	-
Pre-Requisite:							
Course Objectives (CO):				The objectives of Biochemistry Practical is 1. To design and impart a fundamental practical knowledge on qualitative and quantitative analysis of bioconstituents present in blood, urine and saliva. 2. To identify different samples of carbohydrates and proteins. 3. To know Quantitative analysis of reducing sugars and Proteins 4. To study blood constituents. 5. To understand preparation of buffer, enzymatic hydrolysis of starch and the salivary amylase activity.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Identify the different samples of carbohydrates. 2. Identify the different samples of Proteins. 3. Perform the Quantitative analysis of reducing sugars and Proteins 4. Determine different blood constituents. 5. Study the preparation of buffer, enzymatic hydrolysis of starch and the salivary amylase activity.			

Assignment /Practical/ Activity Number	**Assignment/Practical/Activity Title**	**Week Number/ Turn**	**Details**	**CLO**	**Hours**
1	Practical 1: Qualitative analysis of carbohydrates	Week1/ Turn 1	Qualitative analysis of carbohydrates (Glucose, Fructose)	CLO1	04
2	Practical 2: Qualitative analysis of carbohydrates	Week 2/ Turn 1	Qualitative analysis of carbohydrates (Lactose, Maltose)	CLO1	04
3	Practical 3: Qualitative analysis of carbohydrates	Week 3/ Turn 1	Qualitative analysis of carbohydrates (Sucrose and starch)	CLO1	04
4	Practical 4: Identification tests for Proteins	Week 4/ Turn 1	Identification tests for Proteins (albumin and Casein)	CLO2	04
5	Practical 5: Quantitative analysis of reducing sugars	Week 5/ Turn 1	Quantitative analysis of reducing sugars (DNSA method)	CLO2	04
6	Practical 6: Quantitative analysis of Proteins	Week 6/ Turn 1	Quantitative analysis of Proteins (Biuret method)	CLO2	04

7	Practical 7: Qualitative analysis of urine	Week 7/ Turn 1	Qualitative analysis of urine for abnormal constituents	CLO3	04
8	Practical 8: Determination of blood creatinine	Week 8/ Turn 1	Determination of blood creatinine	CLO3	04
9	Practical 9: Determination of blood sugar	Week 9/ Turn 1	Determination of blood sugar	CLO3	04
10	Practical 10: Determination of serum total cholesterol	Week 10/ Turn 1	Determination of serum total cholesterol	CLO4	04
11	Practical 11: Preparation of buffer solution	Week 11/ Turn 1	Preparation of buffer solution and measurement of pH	CLO4	04
12	Practical 12: Study of enzymatic hydrolysis of starch	Week 12/ Turn 1	Study of enzymatic hydrolysis of starch	CLO4	04
13	Practical 13: Determination of Salivary amylase activity	Week 13/ Turn 1	Determination of Salivary amylase activity	CLO5	04
14	Practical 14: Study the effect of Temperature on Salivary amylase activity.	Week 14/ Turn 1	Study the effect of Temperature on Salivary amylase activity.	CLO5	04
15	Practical 15: Study the effect of substrate concentration on salivary amylase activity.	Week 15/ Turn 1	Study the effect of substrate concentration on salivary amylase activity.	CLO5	04

Learning resources

Text Book

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.

Reference Books:

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

Online Resources/E-Learning Resources

1. https://www.youtube.com/watch?v=uFahV8HBKr4&list=PLcVgXSU9gf3s-a7s7QKvbvACTquUkH_7N
2. https://www.youtube.com/watch?v=Adxcntdwsb8
3. https://www.youtube.com/watch?v=YcywZjzOxlo

COURSE CURRICULUM

Practical Plan: (Conduct any 10 Practical)

Name of the Program:	B. PHARM	Semester: II	Level: UG
Course Name	Computer Application in Pharmacy-Practical	Course Code/ Course Type	BP210P/Core
Course Pattern	2024	Version	1.0

Teaching Scheme				Assessment Scheme			
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	02	-	01	30	10	15	-

Pre-Requisite:	
Course Objectives (CO):	The objectives of the Computer application in pharmacy subject is to make the students deal with the introduction database, database management system, computer application in clinical studies and use of databases.
Course Learning Outcomes (CLO):	Students would able to 1. To define & interpret their own knowledge upon number system as well as information system. 2. To give brief idea about web Technology & data base and its application of pharmacy field. 3. To quote and illustrate the technologies being applied within the platform of pharmacy in addition to some label of software. 4. To recite the utilization of computer in the field of bioinformatics in addition to database, scope, application, vacancies development and its limitations 5. To describe the process of separation technique to be utilized in the field of preclinical studies and to summarize the information related to laboratories as well as text.

Assignment/Practical/Activity Number	Assignment/Practical/Activity Title	Week Number/Turn	Details	CLO	Hours
1	Practical 1: Design a questionnaire using a word processing package to gather information about a particular disease.	Week 01/Turn1	Preparation of questionnaire using word file format	CLO1	02
2	Practical 2: Create a HTML web page to show personal information	Week 02/Turn1	Creating a HTML web page for information display	CLO1	02
3	Practical 3: Retrieve the information of a drug and its adverse effects using online tools	Week 03/Turn1	To gather the information of drugs using online tools	CLO1	02
4	Practical 4: Creating mailing labels Using Label Wizard ,	Week 04/Turn1	To create mailing tab	CLO2	02
5	Practical 5: generating label in MS WORD	Week 05/Turn1	To create mailing tab	CLO2	02
6	Create a database in MS Access to store the patient information with the required fields Using acces	Week 06/Turn1	To create database in MS Access	CLO3	02

7	Practical 6: Design a form in MS Access to view, add, delete and modify the patient record in the database	Week 07/Turn1	To design the form in MS Access	CLO3	02
8	Practical 7: Generating report and printing the report from the patient database	Week 08/Turn1	To generate report and printing from patient database.	CLO4	02
9	Practical 8: Creating invoice table using – MS Accesss	Week 09/Turn1	To create invoice using MS Access	CLO4	02
10	Practical 9: Drug information storage using MS Access	Week 10/Turn1	To study drug information storage	CLO3	02
11	Drug information retrieval using MS Access	Week 11/Turn1	To study drug information storage	CLO3	02
12	Practical 10: Creating and working with queries in MS Access	Week 12/Turn1	To analyze the queries and obtain the solution	CLO5	02
13	Practical 11: Exporting Tables, Queries and Forms	Week 13/Turn1	To export the queries forms, reports of web page	CLO5	02
14	Exporting Tables, Queries, Forms and Reports to web pages	Week 14/Turn1	To export the queries forms, reports of web page	CLO5	02
15	Practical 12: Exporting Tables, Queries, Forms and Reports to XML pages	Week 15/Turn1	To export tables, queries and report to XML pages	CLO5	02

Learning resources:

Textbooks:

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

Reference Books:

1. Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA)
2. 4. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi – 110002

Online Resources/E-Learning Resources

1. BP205T.pdf (sathyabama.ac.in)
2. https://pharmacyinfoline.com/computer-applications-in-pharmacy/
3. PowerPoint Presentation (teachntest.org)

COURSE CURRICULUM

Name of the Program:		B. Pharm		Semester : 1		Level: UG	
Course Name		IKS: Indian Health Science		Course Code/ Course Type		ACIKSSP101	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	-	30	50	-	-
Pre-Requisite:		Nil					
Course Objectives (CO):				The objectives of IKS: Indian Health Science are: 1. To know the historical development of Indian health systems. 2. To make students aware about the traditional way of maintaining the internal balance to prevent diseases. 3. Familiarize our unique mind body constitution and choosing the right lifestyle 4. To understand mind and its dynamics through knowledge of Ayurveda and Yoga. 5. To enable students for implementation of Indian Knowledge system in their life style.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Understand the fundamental principles of Indian health systems and its core values. 2. Examine the significance of traditional way of maintaining the physical and mental balance. 3. Access our unique mind and body constitution for incorporating the healthy lifestyle. 4. Evaluate the various parameters of Ayurveda and Yoga for wellbeing of mind and its dynamics. 5. Enable for using the knowledge to maintain harmony between body and mind to achieve absolute mental health.			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLOs	Hrs
Unit I		
Understanding human body Introduction to Ayurveda, health and treatment aspects in ayurveda, influence of Pancha maha bhuta on internal environment of human body, understanding composition of human body through the concept of *dosha, dhatu mala*. Understanding *Prakruthi*, the Mind – Body Constitution.	CLO 1	06
Unit II		
Basic concepts of Ayurveda The three *gunas* and three *doshas*, *Pancha-mahabhuta* and *Sapta-dhatu*. The importance of *Agni* (digestion). Six *Rasas* and their relation to *Doshas*. Ayurvedic view of the cause of diseases.	CLO 2	06

Unit III		
Literatures in Ayurveda Study of selected extracts from *Astāngahrdaya* (selections from *Sūtrasthāna*) and *Suśruta-Samhitā* (sections on plastic surgery, cataract surgery and anal fistula), pharmacopeia of Ayurveda, Charaka's description of a hospital, hospitals in ancient and medieval India. Ayurveda in 18/19th centuries, surgical practices, inoculation. Current revival of Ayurveda and Yoga.	CLO 3	06
Unit IV		
Introduction to Yoga Definition, meaning and objectives of Yoga, relevance of yoga in modern age. Brief introduction of Hatha yoga, Raja yoga, Karma yoga, Gyana Yoga, Bhakti yoga. Understanding eight steps of Ashtanga yoga, Understanding Shatkriyas , the six cleansing procedures of Yoga	CLO 4	06
Unit V		
Importance of IKS in life science: Ethnic Studies, Life science in plants, Āyurveda, integrated approach to healthcare, medicine and yoga, etc	CLO 5	06
Total		30

Learning Resource:

Text Reading:

1. Introduction to Indian Knowledge System Concepts and applications by B. Mahadevan, Vinayak Bhat, Nagendra Pavana R. N.; 2022 (Prentice Hall of India).
2. Indian Knowledge Systems: Vol I and II, Kapil Kapoor and A. K. Singh; 2005 (D. K. Print World Ltd.).

Reference books:

1. The Charaka Samhita
2. The Susruta Samhita
3. Teh Ashtanga Hridaya
4. Dr Deepak Chopra, Perfect Health--Revised and Updated: The Complete Mind Body Guide, Harmony publication, 2001
5. Vasant lad, Ayurveda, the Science of Self-healing: A Practical Guide: Science of Self-healing, lotus press, 1984. The Hatha yoga pradipika
7. The Patanjali yoga sutras
8. The Gheranda samhita
9. BKS Iyengar, Light on Yoga: The Classic Guide to Yoga by the World's Foremost Authority, thronson publication, 2006
10. Swamy Satyananda Saraswati, Asana, Pranayama, Mudra and Bandha, Bihar School of Yoga, 2002.

Online resource/ E-learning resource:

1. https://swayam.gov.in/explorer?searchText=iks
2. https://iksindia.org/book-list.php
3. Indian Knowledge Systems Vol 1 https://iks.iitgn.ac.in/wp-content/uploads/2016/01/Indian-Knowledge-Systems-Kapil-Kapoor.pdf

CIA Guidelines

- Online Quiz (Based on MCQ)- 20 marks
- Activity (with short Report Submission) - 20 Marks

- Academic Sincerity - 10 marks

Few of the suggested activities are Assignments, Debates, Group presentation, and Group discussions.

Few of suggested topics related to IKS-Indian Health System:

- Debate

Activity

- Assignment

SEMESTER-III
S.Y.B. PHARM

COURSE CURRICULUM

Name of the Program:	**B. Pharm**	**Semester: III**	**Level: UG**
Course Name	**Pharmaceutical Organic**	**Course Code/ Course Type**	**BP301T/Core**

		Chemistry-II (Theory)					
Course Pattern		**2024**		**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
3	--	1	4	45	25	75	-
Pre-Requisite:		**Nil**					
Course Objectives (CO):		The objectives of Pharmaceutical Organic Chemistry-II are: 1. Explain the mechanism of reactions of benzene; describe effect and orientation of substituents on benzene ring. 2. To account for reactivity/stability of compounds, 3. Demonstrate understanding of the composition of fats and oils, chemistry and reactions of fatty acids. 4. To explain the stability, reactivity and mechanism involved in synthesis and reactions of Polynuclear hydrocarbons and their derivatives. 5. Understand the theory of cycloalkanes.					
Course Learning Outcomes (CLO):		Students would be able to: 1. Describe stability of benzene by resonance and explain aromaticity of benzene by Huckel's rule, Write Structure and uses of DDT, Saccharin, BHC and Chloramine. 2. Synthesize aromatic compounds by different methods and to interpret reactivity/stability of organic compounds. 3. Explain the chemistry of fats and oils and to evaluate the analytical constants of fats and oils. 4. Apply the knowledge for the identification of aromatic compounds and to appraise their medicinal and pharmaceutical applications. 5. Explain reactions of cyclopropane and cyclobutane.					

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
Benzene and its derivatives a. Analytical, synthetic and other evidences in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's rule b. Reactions of benzene - nitration, sulphonation, halogenation reactivity, Friedel crafts alkylation- reactivity, limitations, Friedel crafts acylation. c. Substituents, effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction d. Structure and uses of DDT, Saccharin, BHC and Chloramine	**CLO 1**	**10**
UNIT II		
Phenols* - Acidity of phenols, effect of substituents on acidity, qualitative tests, Structure and uses of phenol, cresols, resorcinol, naphthol's **Aromatic Amines*** - Basicity of amines, effect of substituents on basicity and synthetic uses of aryl diazonium salts **Aromatic Acids*** -Acidity, effect of substituents on acidity and important reactions of benzoic acid.	**CLO 2**	**10**
UNIT III		
Fats and Oils a. Fatty acids - reactions.	**CLO 3**	**10**

b. Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils. c. Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination.		
UNIT IV		
Polynuclear hydrocarbons: Synthesis, reactions, Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives	**CLO 4**	**08**
UNIT V		
Cycloalkanes* Stabilities – Baeyer's strain theory, limitation of Baeyer's strain theory, Coulson and Moffitt's modification, Sachse Mohr's theory (Theory of strainless rings), reactions of cyclopropane and cyclobutane only	**CLO 5**	**07**
Total Hours		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning resources:

Textbooks:

1. A textbook of Organic Chemistry by Arun Bahl, B.S. Bahl.
2. A Textbook of Pharmaceutical Organic Chemistry-II by Prashik B Dudhe, Mayuresh K. Raut, Everest Publishing House, Pune.
3. Pharmaceutical Organic Chemistry-III by Mayuresh Raut, Everest Publishing House, Pune.
4. Pharmaceutical Organic Chemistry-IV by Mayuresh Raut, Everest Publishing House, Pune.

Reference Books:

1. Organic Chemistry by I.L. Finar, Volume-I.
2. Organic Chemistry by Morrison and Boyd
3. Organic Chemistry by P.L.Soni
5. Practical Organic Chemistry byMann and Saunders.
6. Vogel's text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K.Vishnoi.

Online Resources/E-Learning Resources:

1. Fats & Oils: https://youtu.be/C1pJJSsk06g
2. Naphthalene: https://youtu.be/Lknf986JC5M
3. Anthracene: https://youtu.be/MlsZIotkpvk
4. Phenanthrene: https://youtu.be/THPjP0xofao
5. Diphenylmethane: https://youtu.be/qeRHMCzyFuY
6. Triphenylmethane: https://youtu.be/HWIiYKFh0ZY
7. R & S configuration: https://youtu.be/BPys76MC2tw
8. E & Z configuration: https://youtu.be/mGtiBZy7XG4
9. Cis/Trans isomerism: https://youtu.be/Zg-EV3zgQbg

COURSE CURRICULUM

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Name of the Program:		**B. PHARM**		**Semester : III**		**Level: UG**	
Course Name		**Physical Pharmaceutics I – (Theory)**		**Course Code/ Course Type**		**BP302T/Core**	
Course Pattern		**2024**		**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
3	--	1	4	45	25	75	---
Pre-Requisite: **Nil**							
Course Objectives (CO):		Upon the completion of the course student shall be able 1. To Understand various physicochemical properties of drug molecules in designing the dosage forms 2. To Know the principles of chemical kinetics & to use them for stability testing 3. To determine expiry date of formulations 4. To demonstrate use of physicochemical properties in the formulation development. 5. To evaluate dosage forms.					
Course Learning Outcomes (CLO):		Upon the completion of the course student shall be able to 1. Acquire the knowledge on different types of solubility of drug. 2. Describe various physicochemical properties of drug molecules in the designing the dosage form. 3. Demonstrate the underlying principles of adsorption solubilisation and types of interfaces. 4. Evaluate and differentiate the types of complexes and corelate the drug action and protein binding. 5. Appreciate the methods to determine pH and able to prepare pharmaceutical buffers.					

Descriptors/Topics	**CLO**	**Hours**
UNIT I		
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.	**CLO 1**	**10**
UNIT II		
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,	**CLO 2**	**10**

determinations and applications		
UNIT III		
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	**CLO 3**	**10**
UNIT IV		
Complexation and protein binding Introduction, Classification of Complexation, Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants	**CLO 4**	**08**
UNIT V		
pH, buffers and Isotonic solutions Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions	**CLO 5**	**07**
Total Hours		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning resources

Textbooks:

1. Test book of Physical Phramacy, by Gaurav Jain & Roop K. Khar
2. Physical Pharmaceutics by C.V.S. Subramanyam

Reference Books:

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

Online Resources/E-Learning Resources

1. https://www.iptsalipur.org/wp-content/uploads/2020/08/BP302T_PYP_UNIT_IV.pdf
2. https://www.iptsalipur.org/wp-content/uploads/2020/08/BP302T_PYP_UNIT_II.pdf
3. https://www.carewellpharma.in/bpharmacy/notes/3rd-sem/physical-pharmaceutics-1#google_vignette

COURSE CURRICULUM

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Name of the Program:		**B. PHARM**		**Semester : III**		**Level: UG**	
Course Name		**Pharmaceutical Microbiology (Theory)**		**Course Code/ Course Type**		**BP303T/Core**	
Course Pattern		**2024**		**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
3	--	1	4	45	25	75	--
Pre-Requisite:		**Nil**					
Course Objectives (CO):				The objectives of Pharmaceutical Microbiology are: 1. To understand methods of identification, cultivation and preservation of various microorganisms 2. To understand the importance and implementation of sterilization in pharmaceutical processing and industry 3. To learn sterility testing of pharmaceutical products. 4. To perform the microbiological standardization of Pharmaceuticals. 5. To understand the cell culture technology and its applications in pharmaceutical industries.		
Course Learning Outcomes (CLO):				Students would be able to: 1. Understand methods of identification, cultivation and preservation of various microorganisms 2. Understand the importance and implementation of sterilization in pharmaceutical processing and industry 3. Learn sterility testing of pharmaceutical products. 4. Perform the microbiological standardization of Pharmaceuticals. 5. Understand the cell culture technology and its applications in pharmaceutical industries.		

Descriptors/Topics	**CLO**	**Hours**
UNIT I		
Introduction History of microbiology, its branches, scope and its importance. Introduction to Prokaryotes and Eukaryotes. Study of ultra-structure and morphological classification of bacteria, nutritional requirements, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total & viable count). Study of different types of phase contrast microscopy, dark field microscopy and electron microscopy.	**CLO 1**	**10**
UNIT II		
Identification of bacteria using staining techniques simple, Gram's & Acid fast staining) and biochemical tests (IMViC). 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. Equipment employed in large scale sterilization. Sterility indicators.	**CLO 2**	**10**
UNIT III		

Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses. Classification and mode of action of disinfectants. Factors influencing disinfection, antiseptics and their evaluation for bacteriostatic and bactericidal actions. Evaluation of bactericidal & Bacteriostatic. Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.	**CLO 3**	**10**
UNIT IV		
Designing of aseptic area, laminar flow equipment; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification. Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids. Assessment of a new antibiotic.	**CLO 4**	**08**
UNIT V		
Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage. Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations. Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures. Application of cell cultures in pharmaceutical industry and research.	**CLO 5**	**07**
Total Hours		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning resources

Textbooks:

1. Text Book of Microbiology, by Ananthnarayan Orient-Longman, Chennai
2. Edward: Fundamentals of Microbiology.
3. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi

Reference Books:

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
5. Rose: Industrial Microbiology.
6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
8. Peppler: Microbial Technology.
9. I.P., B.P., U.S.P.- latest editions.

Online Resources/E-Learning Resources:

1. https://www.slideshare.net/JagrutiMarathe2/introduction-to-microbiology-252918158

2. https://www.pharmaguideline.com/2007/02/identification-of-bacteria-using-staining-techniques.html
3. https://www.slideshare.net/DRxPoojaBhandare/classification-and-mode-of-action-of-disinfectants-pharmaceutical-microbiology-bp303t-unitiii-part3
4. https://www.slideshare.net/DRxPoojaBhandare/designing-of-aseptic-area-laminar-flow-equipment-study-of-different-source-of-contamination-in-aseptic-area-and-methods-of-prevention-clean-area-classification-pharmaceutical-microbiology-bp303tunitiv-part1
5. https://www.slideshare.net/DRxPoojaBhandare/types-of-spoilage-factors-affecting-the-microbial-spoilage-of-pharmaceutical-products-source-and-type-of-contaminants-pharmaceutical-microbiology-bp303tunitv-part1

COURSE CURRICULUM

Name of the Program:		B. PHARM		Semester : III		Level: UG	
Course Name		Pharmaceutical Engineering (Theory)		Course Code/ Course Type		BP304T/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	--	1	4	45	25	75	--
Pre-Requisite:		Nil					
Course Objectives (CO):				The objectives of Pharmaceutical Engineering are: 1. To recall various unit operations used in Pharmaceutical industries and material handling techniques. 2. To recognize and carry out various test to prevent environmental pollution. 3. To identify and perform various processes involved in pharmaceutical manufacturing process. 4. To perform and appreciate and comprehend significance of plant lay out design for optimum use of resources. 5. To study and appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Identify various unit operations like size reduction, size separation used in Pharmaceutical industries and material handling techniques. 2. Explain principle behind heat transfer, evaporation and distillation. 3. Apply various processes involved in pharmaceutical manufacturing process like mixing and drying 4. Perform appreciate and comprehend significance of plant lay out design and processes like filtration and centrifugation 5. Evaluate the material for plant construction and to prevent its corrosion.			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	CLO	Hours
UNIT I		
Flow of fluids Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter, Pitot tube and Rotometer. **Size Reduction:** Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill. **Size Separation** Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank.	**CLO 1**	**10**
UNIT II		
Heat Transfer Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers. **Evaporation** Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator& Economy of multiple effect evaporator. **Distillation** Basic Principles and methodology of simple distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation	**CLO 2**	**10**
UNIT III		
Drying Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer. **Mixing** Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier,	**CLO3**	**08**
UNIT IV		
Filtration Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Cartridge filter, membrane filters and Seidtz filter. **Centrifugation** Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge.	**CLO4**	**08**
UNIT V		
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.	**CLO5**	**07**

Total Hours		45

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning resources

Textbooks:

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-Latest edition.
3. Unit operation of chemical engineering – Mcabe Smith, Latest edition.
4. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition.

Reference Books:

1. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition.
2. Remington practice of pharmacy- Martin, Latest edition.
3. Theory and practice of industrial pharmacy by Lachmann., Latest edition.
4. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition.

Online Resources/E-Learning Resources:

1. https://www.sips.org.in/wp-content/uploads/2020/03/Size-reduction-SIze-separation.pdf
2. https://www.iptsalipur.org/wp-content/uploads/2020/08/BP304T_PE_UNIT_II.pdf
3. https://www.chips.ac.in/pages/downloads/PPTs/Pceutics/EVAPORATION.pdf
4. https://www.sips.org.in/wp-content/uploads/2020/03/Distillation.pdf
5. https://www.iptsalipur.org/wp-content/uploads/2020/08/BP304T_PE_UNIT_III.pdf
6. https://www.iptsalipur.org/wp-content/uploads/2020/08/BP304T_PE_UNIT_IV.pdf
7. https://www.iptsalipur.org/wp-content/uploads/2020/08/BP304T_PE_UNIT_V.pdf
8. http://103.47.12.35/bitstream/handle/1/6573/77.pdf?sequence=1&isAllowed=y

COURSE CURRICULUM

Name of the Program:		B. Pharm		Semester: III		Level: UG	
Course Name		Pharmaceutical Organic Chemistry-II (Practical)		Course Code/ Course Type		BP305P/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme				Assessment Scheme			
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	4	-	2	60	15	35	-
Pre-Requisite:		Nil					
Course Objectives (CO):				The objectives of Pharmaceutical Organic Chemistry-II are: 1. To demonstrate recrystallization and Steam distillation. 2. To determine the oil values of given sample. 3. To synthesize the different organic compounds and understand the reaction mechanisms.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Perform recrystallization and steam distillation. 2. Determine the iodine value, acid value, saponification value and perform standardization of NaOH/ KOH. 3. Synthesize of various organic compounds 4. Explain the mechanism involved in the synthesis. 5. Evaluate the physical constant of the synthesized compounds			

Course Contents/Syllabus:
(All the Practical's carry equal weightage in Summative Assessment and equal engagement)

Practical Plan

Assignment/ Practical/ Activity Number	Assignment/Practical /Activity Title	Week Number/Turn	Details	CLO	Hours
1	Practical 1: Laboratory techniques	Week 1/Turn 1	perform recrystallization of given sample.	CLO1	04
2	Practical 2: Laboratory techniques	Week 2/Turn 1	To perform Steam Distillation of given sample.	CLO1	04
3	Practical 3: Estimation of Oils and fats	Week 3/Turn 1	To determine acid value of given oil/fat	CLO2	04
4	Practical 4: Estimation of Oils and fats	Week 4/Turn 1	To determine saponification value of given oil/fat	CLO2	04
5	Practical 5: Estimation of Oils and fats	Week 5/Turn 1	To determine iodine value of given oil/fat	CLO2	04
6	Practical 6: Preparation of organic compounds	Week 6/Turn 1	To synthesize Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol/Aniline by acylation reaction.	CLO3	04
7	Practical 7: Preparation of compounds	Week 7/Turn 1	To synthesize 2,4,6-Tribromo aniline/ p-bromo acetanilide from aniline (bromination reaction)	CLO3	04
8	Practical 8: Preparation of organic compounds	Week 8/Turn 1	To synthesize 5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid /Nitro benzene by nitration reaction.	CLO3	04
9	Practical 9: Preparation of organic compounds	Week 9/Turn 1	To synthesize Benzoic acid from Benzyl chloride by oxidation reaction.	CLO3	04
10	Practical 10: Preparation of organic compounds	Week10/Turn1	To synthesize Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction.	CLO3	04
11	Practical 11: Preparation of organic compounds	Week11/Turn1	To synthesize 1-phenyl-azo-2-naphthol from aniline by diazotization and coupling reaction	CLO3	04
12	Practical 12: Preparation of organic compounds	Week12/Turn1	To synthesize Benzil from Benzoin by oxidation reaction	CLO3	04
13	Practical 13: Preparation of organic compounds	Week13/Turn1	To synthesize Dibenzalacetone from Benzaldehyde by Claisen Schmidt reaction.	CLO3	04
14	Practical 14: Preparation of organic compounds	Week14/Turn1	To synthesize Cinnamic acid from Benzaldehyde by Perkin reaction	CLO3	04
15	Practical 15: Preparation of organic compounds	Week15/Turn1	To synthesize p-iodo benzoic acid from p-amino benzoic acid	CLO3	04

Learning resources:

Textbooks:
1. Vogel's text book of Practical Organic Chemistry
2. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.

Reference Books:
1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar, Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P.L.Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. Advanced Practical organic chemistry by N.K.Vishnoi.
8. Reaction and reaction mechanism by Ahluwaliah/Chatwal.

Online Resources/E-Learning Resources
1. Phenyl benzoate: https://www.youtube.com/watch?v=Rc4CdoqBHDk
2. Cinnamic acid: https://www.youtube.com/watch?v=oqFGNM4ZmJQ
3. Benzanilide: https://www.youtube.com/watch?v=LuA-RP8tgHQ
4. Dibenzalacetone: https://www.youtube.com/watch?v=_BuntAh2Xog
5. 1-phenyl-azo-2-naphthol: https://www.youtube.com/watch?v=gVh6Mn2IAB8
6. Benzoic acid: https://www.youtube.com/watch?v=0rJ7Q_AwNk0

COURSE CURRICULUM

Name of the Program:		B. PHARM		Semester: III		Level: UG	
Course Name		Physical Pharmaceutics – I (Practical)		Course Code/ Course Type		BP306P/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
--	4	--	2	60	15	35	--
Pre-Requisite: Nil							
Course Objectives (CO):				The objectives of Physical Pharmaceutics – I are: 1. To cover experiments to provide fundamental principles of physical pharmacy necessary to design physically and chemically stable dosage forms and ensure their therapeutic safety and efficacy. 2. To Understand the principles and methods for the determination of various physical parameters of drugs and formulations. 3. To carry out various physical tests involved in the characterization of drugs. 4. To demonstrate the testing of various physical parameters involved in pre-formulation and formulation evaluation. 5. To estimate the stability constants of complexes by solubility and pH titration method		
Course Learning Outcomes (CLO):				Students would be able to: 1. Determine the significance of physical properties such as solubility in the design of dosage forms. 2. Apply Henderson – Hasselbalch equation for interpretation of pKa value of drugs 3. Determine the partition coefficient, sodium chloride concentration in solution by CST method 4. Determine the surface tension of sample liquids by drop count and drop weight methods and explain adsorption isotherms and determine Freundlich-Langmuir constant using activated charcoal. 5. Deduce the HLB value and critical micellar concentration of a surfactant and estimate the stability constants of complexes by solubility and pH titration method		

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)
Practical Plan

Assignment/ Practical/ Activity Number	Assignment/Practical/ Activity Title	Week Number/Turn	Details	CLO	Hours
1	Practical 1: solubility of drug	Week 1/ Turn 1	Determination the solubility of drug at room temperature	CLO1	04
2.	Practical 2: solubility of drug	Week 2/ Turn 1	Determination the solubility of drug at room temperature	CLO1	04
3.	Practical 3: solubility of drug	Week 3/ Turn 1	Determination the solubility of drug at room temperature	CLO1	04
4	Practical 4: pKa value	Week 4/ Turn 1	Determination of pKa value by Half Neutralization/ Henderson Hasselbalch equation.	CLO2	04
5	Practical 5: pKa value	Week 5/ Turn 1	Determination of pKa value by Half Neutralization/ Henderson Hasselbalch equation.	CLO2	04
6	Practical 6: pKa value	Week 6/ Turn 1	Determination of pKa value by Half Neutralization/ Henderson Hasselbalch equation.	CLO2	04
7	Practical 7: Partition co- efficient	Week 7/ Turn 1	Determination of Partition co- efficient of benzoic acid in benzene and water	CLO3	04
8	Practical 8: Partition co- efficient	Week 8/ Turn 1	Determination of Partition co- efficient of Iodine in CCl4 and water	CLO3	04
9	Practical 9: % composition	Week 9/ Turn 1	Determination of % composition of NaCl in a solution using phenol-water system by CST method	CLO3	04
10	Practical 10: surface tension	Week 10/ Turn 1	Determination of surface tension of given liquids by drop count and drop weight method	CLO4	04
11	Practical 11: HLB number	Week 11/ Turn 1	Determination of HLB number of a surfactant by saponification method	CLO4	04
12	Practical 12: Freundlich and Langmuir constants	Week 12/ Turn 1	Determination of Freundlich and Langmuir constants using activated charcoal	CLO4	04
13	Practical 13: critical micellar concentration	Week 13/ Turn 1	Determination of critical micellar concentration of surfactants	CLO5	04
14	Practical 14: stability constant	Week 14/ Turn 1	Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubility method	CLO5	04
15	Practical 15: stability constant	Week 15/Turn 1	Determination of stability constant and donor acceptor ratio of Cupric-Glycine complex by pH titration method	CLO5	04

Learning resources

Practical Text Book

1. Laboratory Manual of Physical Pharmaceutics, C.V.S. Subramanyam, J. Thimma settee.

Reference Books:

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

Online Resources/E-Learning Resources:

1. https://www.youtube.com/watch?v=hk2hFaYCHyA&list=PLQnNyE1lxfVI7MOdKtjyJyxotjCwZ5w5y
2. https://www.youtube.com/watch?v=a23kVT6yaW0
3. https://www.studocu.com/in/document/chitkara-university/physical-pharmacy/med-chem-practicals-notes/61190401

COURSE CURRICULUM

Name of the Program:		B. Pharm		Semester : III		Level: UG	
Course Name		Pharmaceutical Microbiology (Practical)		Course Code/ Course Type		BP307P/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
--	4	--	2	60	15	35	--
Pre-Requisite: Nil							
Course Objectives (CO):				The objectives of Pharmaceutical Microbiology are: 1. To study the different equipment and thereby processing. 2. To study the sterilization of glassware, preparations and media. 3. To perform the sub culturing of microbes, stationing methods and isolation of pure culture 4. To carry out the various experiments related to microbial assay and sterility testing. 5. To perform the bacteriological analysis of water and biochemical tests.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Explain the different equipment and thereby processing. 2. Study the sterilization of glassware, preparations and media. 3. Perform the sub culturing of microbes, stationing methods and isolation of pure culture Estimate the various experimental data related to the blood/its components. 4. Carry out the various experiments related to microbial assay and sterility testing. 5. Perform the bacteriological analysis of water and biochemical tests.			

Course Contents/Syllabus
(All the Practical's carry equal weightage in Summative Assessment and equal engagement)

Practical Plan

Assignment/ Practical/ Activity Number	Assignment/Practical/ Activity Title	Week Number/ Turn	Details	CLO	Hours
1	Practical 1: Introduction and study of different equipment and processing, of B.O.D. incubator.	Week1/ Turn 1	1.1To study the different equipment and processing, of B.O.D. incubator.	CLO1	04
2.	Practical 2: Introduction and study of different equipment and processing, of laminar flow, and aseptic hood.	Week 2/ Turn 1	2.1 To study the different equipment and processing, of laminar flow, and aseptic hood.	CLO 1	04
3	Practical 3: Introduction and study of different equipment and processing, of autoclave, and hot air sterilizer.	Week 3/ Turn 1	3.1 To study the different equipment and processing, of autoclave, and hot air sterilizer	CLO 1	04
4	Practical 4: Introduction and study of different equipment and processing, of deep freezer, refrigerator, and microscopes used in experimental microbiology	Week 4 / Turn 1	4.1 To study different equipment and processing, of deep freezer, refrigerator, microscopes used in experimental microbiology	CLO 1	04
5	Practical 5: Sterilization of glassware, preparation and sterilization of media	Week 5/ Turn 1	5.1 To study Sterilization of glassware, preparation and sterilization of media	CLO 2	04
6	Practical 6: Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.	Week 6 / Turn 1	6.1 To study Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.	CLO 3	04
7	Practical 7: Staining methods- Simple, Grams staining and acid fast staining.	Week 7 / Turn 1	7.1 To demonstrate the Staining methods- Simple, Grams staining and acid fast staining.	CLO 3	04
8	Practical 8: Isolation of pure culture of micro-organisms by multiple streak plate technique	Week 8 / Turn 1	8.1 To demonstrate the Isolation of pure culture of micro-organisms by multiple streak plate technique	CLO 3	04
9	Practical 9: Isolation of pure culture of micro-organisms by other techniques	Week 9 / Turn 1	9.1 To demonstrate the Isolation of pure culture of micro-organisms by other techniques	CLO 3	04
10	Practical 10: Microbiological assay of antibiotics by cup plate method and other methods	Week 10 / Turn 1	10.1 To demonstrate the Microbiological assay of antibiotics by cup plate method and other methods	CLO 4	04
11	Practical 11: Microbiological assay of antibiotics by other methods	Week 11 / Turn 1	11.1 To demonstrate the Microbiological assay of antibiotics other methods	CLO 4	04
12	Practical 12: Motility determination by Hanging drop method.	Week 12 / Turn 1	12.1 To demonstrate the motility determination by Hanging drop method.	CLO 4	04
13	Practical 13: Sterility testing of pharmaceuticals	Week 13 / Turn 1	13.1 To study Sterility testing of pharmaceuticals	CLO 4	04
14	Practical 14: Bacteriological analysis of water	Week 14 / Turn 1	14.1 To study Bacteriological analysis of water	CLO 5	04
15	Practical 15: Biochemical test	Week 15 / Turn 1	15.1 To study Biochemical test.	CLO 5	04

Learning resources

Textbooks:

1. Text Book of Microbiology, by Ananthnarayan Orient-Longman, Chennai
2. Edward: Fundamentals of Microbiology.
3. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi

Reference Books:

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn, Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
5. Rose: Industrial Microbiology.
6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
8. Peppler: Microbial Technology.
9. I.P., B.P., U.S.P.- latest editions.

Online Resources/E-Learning Resources:

1. https://www.slideshare.net/EknathAhire/exp-no-01-study-of-apparatus-used-in-experimental-microbiology
2. https://www.slideshare.net/DRxPoojaBhandare/designing-of-aseptic-area-laminar-flow-equipment-study-of-different-source-of-contamination-in-aseptic-area-and-methods-of-prevention-clean-area-classification-pharmaceutical-microbiology-bp303tunitiv-part1
3. https://www.slideshare.net/benazeerfathaima/preparation-of-media-sterilization-technique
4. https://www.rlsycollegebettiah.ac.in/wp-content/uploads/2023/02/file_63ec78c09cd16.pdf
5. https://www.slideshare.net/monnask/microbiological-assay-of-antibiotics
6. https://www.slideshare.net/ARUNGOPALAKRISHNAN18/sterility-testing-of-pharmaceutical-products

COURSE CURRICULUM

Name of the Program:		B. PHARM		Semester: III		Level: UG	
Course Name		Pharmaceutical Engineering (Practical)		Course Code/ Course Type		BP308P/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
--	4	--	2	60	15	35	--
Pre-Requisite: Nil							
Course Objectives (CO):				The objectives for Pharmaceutical Engineering are 1. To impart a fundamental knowledge of science for various unit operations used in pharmaceutical industry. 2. To perform various process in manufacturing process 3. To illustrate the construction material used to build various machineries 4. To explain the principles of size reduction, size separation in unit operations 5. To comprehend the functioning of equipment used in manufacturing process of pharmaceuticals			
Course Learning Outcomes (CLO):				Students would be able to 1. To comprehend the material handling techniques. 2. To perform various process involved in pharmaceutical manufacturing processes 3. To study the construction material of pharmaceutical industry 4. To evaluate size reduction using different of tablet granulation by different techniques. 5. To demonstrate colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and factor affecting pharmaceutical processes			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Practical Plan

Assignment/ Practical/ Activity Number	Assignment/Practical/ Activity Title	Week Number/ Turn	Details	CLO	Hours
1	Practical 1: Radiation constant	Week 1/Turn1	Determination of radiation constant of brass, iron	CLO1	04
2.	Practical 2: Radiation constant	Week 2/Turn1	Determination of radiation constant of unpainted and painted glass.	CLO1	04
3.	Practical 3: Steam distillation	Week 3/Turn1	Steam distillation – To calculate the efficiency of steam distillation	CLO2	04
4	Practical 4: Heat transfer	Week 4/Turn1	To determine the overall heat transfer coefficient by heat exchanger	CLO2	04
5	Practical 5: Drying curves	Week5/ Turn1	Construction of drying curves (for calcium carbonate and starch).	CLO2	04
6	Practical 6: Moisture content	Week 6/ Turn1	Determination of moisture content and loss on drying	CLO2	04
7	Practical 7: Humidity of air	Week 7/ Turn1	Determination of humidity of air – i) From wet and dry bulb temperatures –use of Dew point method.	CLO3	04
8	Practical 8: Construction working	Week8/ Turn1	Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, dehumidifier.	CLO3	04
9	Practical 9: Size analysis	Week 9/ Turn1	Size analysis by sieving – To evaluate size distribution of tablet granulations –Construction of various size frequency curves including arithmetic and logarithmic probability plots	CLO4	04
10	Practical 10: Size reduction	Week10/ Turn1	Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill.	CLO4	04
11	Practical 11: Demonstration	Week11/ Turn1	Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such other major equipment.	CLO4	04
12	Practical 12: Filtration and Evaporation	Week12/ Turn1	Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration and Thickness/ viscosity	CLO4	04
13	Practical 13: Crystallization	Week 13/ Turn1	To study the effect of time on the Rate of Crystallization	CLO5	04
14	Practical 14: Uniformity Index	Week 14/ Turn1	To calculate the uniformity Index for given sample (Paracetamol) by using Double Cone Blender.	CLO5	04
15	Practical 15: Uniformity Index	Week 15/ Turn1	To calculate the uniformity Index for given sample (Aceclofenac) by using Double Cone Blender.	CLO5	04

Learning resources

Practical Text Book:

1. Theory and practice of industrial pharmacy by Lachmann, Latest edition.
2. Dr. Vishwajeet Ghorpade, Dr. Remeth J. Dias, Dr. Kailas K. Mali, Vijay D. Havaldar, Laboratory Manual of Pharmaceutical Engineering, Trinity publishing house, Satara
3. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition.

Reference Books:

1. Remington practice of pharmacy- Martin, Latest edition.
2. Theory and practice of industrial pharmacy by Lachmann., Latest edition.
3. Unit operation of chemical engineering – Mcabe Smith, Latest edition.

Online Resources/E-Learning Resources:

1. https://www.researchgate.net/publication/375000374_Laboratory_Manual_of_Pharmaceutical_Engineering
2. https://www.scribd.com/document/643690149/Pharmacutical-Engineering-Practical-lab-Mannual-kT-docx
3. https://content.kopykitab.com/ebooks/2014/07/3495/sample/sample_3495.pdf

COURSE CURRICULUM

Name of the Program:		B. Pham		Semester: 3/4		Level: UG	
Course Name		UHV-II: Understanding Harmony		Course Code/ Course Type		ACUHV201/AC	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
2	--	--	--	30	50	--	--
Pre-Requisite: Nil							
Course Objectives (CO):				The objectives of Universal Human Value Understanding Harmony are: 1. To train the student for Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence. 2. To comprehend (or develop clarity) the harmony in the human being, family, society and nature/existence 3. To strengthen self-reflection. 4. To infuse a sense of commitment and courage to act 5. To understand Holistic Understanding of Harmony on Professional Ethics			
Course Learning Outcomes (CLO):				Students would be able to: 1. Analyze the most important requirement for any human being 2. Apply correct appraisal of Physical needs, meaning of Prosperity in detail 3. Analyze salient values in relationship, Friends and Foes, Empathy, False Prestige. 4. Develop holistic perception of harmony at all levels of existence 5. Apply the Holistic Understanding of Harmony on Professional Ethics			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours

UNIT I		
Course Introduction - Need, Basic Guidelines, Content and Process for Value Education Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration–what is it? - Its content and process; Personality Traits- Self Excellence, „Natural Acceptance" and Experiential Validation- as the process for self-exploration, Adaptability, Belief and Understanding- Self-discipline, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels.	**CLO 1**	**08**
UNIT II		
Understanding Harmony in the Human Being - Harmony in Myself Understanding human being as a co-existence of the sentient „I" and the material „Body", Understanding the needs of Self („I") and „Body" - happiness and physical facility, Understanding the Body as an instrument of „I" (I being the doer, seer and enjoyer)- Habits and Hobbies, SWOT Analysis (Activity) ,Understanding the characteristics and activities of „I" and harmony in „I" – Dalai Lamas" Tibetan Personality Test – Dr. Menninger"s Psychometric Test., Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail	**CLO 2**	**05**
UNIT III		
Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Friends and Foes, Empathy, False Prestige.	**CLO 3**	**05**
UNIT IV		
Understanding Harmony in the Nature and Existence - Whole existence as Coexistence Understanding the harmony in the Nature and its Equanimity, Respect for all, Nature as Teacher, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all- pervasive space, Holistic perception of harmony at all levels of existence.	**CLO 4**	**05**
UNIT V		
Implications of the above Holistic Understanding of Harmony on Professional Ethics Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Vision for the Holistic alternatives, UHVs for entrepreneurship	**CLO 5**	**07**
Total Hours		**30**

Learning resources:

Textbooks:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

2. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
3. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

Reference Books:

1. The Story of Stuff (Book).
2. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
3. Small is Beautiful - E. F Schumacher
4. Slow is Beautiful - Cecile Andrews

Online Resources/E-Learning Resources:

1. https://www.studocu.com/in/document/jss-science-and-technology-university/human-values/uhv-handout-2- harmony-in-the-human-being/
2. https://vvce.ac.in/wp-content/uploads/2021/04/Realising-Aspirations-of-NEP2020-UHV.pdf
3. https://vemu.org/uploads/lecture_notes/22_12_2022_1850871704.pdf

CIA Guidelines

Online Quiz (Based on MCQ)- 20 marks

Activity (with short Report Submission) - 20 Marks

Academic Sincerity - 10 marks

Few of suggested activities are Assignments, Debates, Poster presentations, Model making, Group presentation, Field visits and Group Discussions.

Few of suggested topics related to UHVII-Understand Harmony are:
Debate Topics

- Materialistic things make you happy
- Happiness in individualism and family
- Spirituality vs Materialistic
- Satisfaction of Body and self (Soul)

Assignment
Students maintain a reflective account of the times they felt happy and prosperous and the causes of that happiness and prosperity for them.

COURSE CURRICULUM

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Name of the Program:		**B. Pharm**		**Semester : III**		**Level: UG/PG**	
Course Name		**Foreign Language -I**		**Course Code/ Course Type**		**UFL201A/AEC**	
Course Pattern		**2024**		**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/ Oral**
2	-	-	-	30	50	--	-
Pre-Requisite:	**Nil**						
Course Objectives (CO):		The objectives of Foreign Language -I (German) are: 1. To remember new words and their spellings. 2. To understand the new concepts. 3. To apply the basic vocab and grammar concepts. 4. To understand the German text. 5. To create basic sentences in German.					
Course Learning Outcomes (CLO):		Students would be able to: 1. Spell simple words in German 2. Can understand everyday expressions. 3. Able to frame simple sentences in German language. 4. Can introduce themselves and others. 5. Can answer questions about themselves.					

Descriptors/Topics	**CLO**	**Hours**
UNIT I		
Guten Tag Speak about yourself and others, Speak about Countries and Languages Grammar – Sentence formation and verbs usage	**CLO 1**	**06**
UNIT II		
Freunde, Kollegen und Ich Speak about your Hobbys, To fix a meeting, Speak about work and Profession, To creat a profile on Internet Grammar – How to use 'The' in german, Singular and plural forms of Nouns	**CLO 2**	**06**
UNIT III		
In der Stadt To get to know about Cities and Places, how to find way and understand directions, learn international words Grammar – Negations (how to use NO in german), Definite articles, indefinite articles	**CLO3**	**06**
UNIT IV		
Guten Appetit To speak about food and food habits, to have a discussion about shopping, Grammar – introduction of cases	**CLO4**	**06**
UNIT V		
Tag für Tag & Zeit mit Freunden	**CLO5**	**06**

Clock timings, To speak about family and friends, Daily routine To speak about free time activity, to understand the specific information from the text, to order and to pay in a restaurant Grammar – Possessivarticle, Modalverbs, use of on,at,from…till, Seprable verbs and past tence		
Total Hours		**30**

Learning resources:

Textbooks:

1. Netzwerk A1, Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd.
2. Studio d A1, Cornelesen Verlag & Goyal Publishers & Distributors Pvt. Ltd.
3. Netzwerk Neu A1, Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd

Reference Books:

1. Hallo Deutsch A1,Ernst Klett Verlag, Goyal Publishers & Distributors Pvt. Ltd
2. Themen Aktuell 1, Hueber verlag
3. Maximal Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd.

Online Resources/E-Learning Resources:

1. https://youtube.com/@LearnGermanwithAnja?si=BkJYDPi7TS0fT4lr
2. https://youtube.com/@deutschlernenmitheidi?si=TkICIabzioaU0roZ
3. instagram.com/learngermanwithanja

COURSE CURRICULUM

Name of the	**B. Pham**	**Semester : III**	**Level: UG/PG**

Program:							
Course Name		Foreign Language -I		Course Code/Course Type		UFL201B/AEC	
Course Pattern		2024		Version			
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
2	--	--	--	30	50	--	--

Pre-Requisite: Desire to get acquainted with the Japanese language.

Course Objectives (CO):	The objectives of Foreign Language -I (Japanese) are: 1. To meet the needs of ever growing industry, with respect to language support. 2. To get introduced to Japanese society and culture through language.
Course Learning Outcomes (CLO):	After learning the course, the students will be able to: 1. Read and Write Hiragana script. 2. Write and Speak basic sentences. 3. Listen and speak about time, hobbies, likes and dislikes. 4. Write basic kanji.

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Japanese Language Introduction of script, culture, History of script ,Speaking : Self introduction, listening short video skit on self-introduction	**CLO 1**	**02**
UNIT II		
Introduction of Hiragana Script Writing : Hiragana script, Speak : Basic sentences, General vocabulary : Months , Days of the week ,Basic numbers, colours	**CLO 2**	**18**
UNIT III		
Basic Sentence formation : Basic sentence structure : Affirmative and Negative , General vocabulary: about family,	**CLO 3**	**04**
UNIT IV		
Time and verbs : Speaking : Talking about routine, Writing: routine using verbs and time, reading : A clock	**CLO 4**	**04**
UNIT V		
Introduction of Katakana and basic kanji Reading : English words, country names Writing : Basic Kanji	**CLO 5**	**02**
Total Hours		**30**

Learning resources

Textbook:

1. Minna no Nihongo , " Japanese for everyone" ,Elementary Main Textbook , Goyal Publishers & Distributors Pvt. Ltd.

Reference books:

1. Shyoho Volume 1.

Online Resources/E-Learning Resources:

1. YouTube links

1. https://www.youtube.com/watch?v=shdlEapDsP4
2. https://youtu.be/K-nw5EUxDz0?feature=shared
3. https://youtu.be/o9sP-vaCEa0?si=l8yOvVKaItBQWXNu
4. https://youtu.be/JnoZE51WZg4?si=9uq68USOz5plBk2n
5. https://youtu.be/shdlEapDsP4?si=tC6RGaMtwDJgVu2d
6. https://youtu.be/9paXgC2U8L0?si=btS1G4mvrkG5C9zi

2. Apps

A) Learn Japanese - Hiragana APP available on Google play.
B) Hiragana Pro

SEMESTER-IV
S.Y.B. PHARM

COURSE CURRICULUM

Name of the	**B. Pharm**	**Semester: IV**	**Level: UG**

Program:							
Course Name		**Pharmaceutical Organic Chemistry-III (Theory)**		**Course Code/ Course Type**		**BP401T/Core**	
Course Pattern		**2024**		**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
3	-	1	4	45	25	75	-
Pre-Requisite:		**Nil**					
Course Objectives (CO):				The objectives of Pharmaceutical Organic Chemistry-III are: 1. To explain the stereochemical aspects of organic compounds and stereochemical reactions. 2. To understand the theory of cycloalkanes and explain the geometrical isomerism of organic compounds. 3. To understand the methods of preparation and properties of heterocyclic compounds. 4. To know the medicinal uses and other applications of heterocyclic compounds. 5. To find the mechanism of important chemical reactions of organic compounds.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Determine stereochemical aspects of organic compounds and to demonstrate stereochemical reactions. 2. Clarify the concept of stereospecific and stereoselective reactions. 3. Solve the nomenclature of heterocyclic compounds by analysing chemical structure and vice versa to classify heterocyclic compounds and to relate physical properties with the structure of heterocyclic compounds. 4. Synthesize heterocyclic compounds by different methods by employing name reactions and appraise the medicinal uses and other applications of heterocyclic compounds. 5. Explain the mechanism of important chemical reactions of organic compounds.			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
Stereo isomerism Optical isomerism-Optical activity, enantiomerism, diastereoisomerism, meso compounds. Elements of symmetry, chiral and achiral molecules, DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers. Reactions of chiral molecules, Racemic modification and resolution of racemic mixture. Asymmetric synthesis: partial and absolute.	**CLO 1**	**10**
UNIT II		
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. Stereoisomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity. Stereospecific and stereoselective reactions	**CLO 2**	**10**
UNIT III		
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	**CLO 3**	**10**
UNIT IV		
Synthesis, reactions and medicinal uses of following compounds/ derivatives Pyrazole, Imidazole, Oxazole and Thiazole, Pyridine, Basicity of pyridine, Quinoline, Isoquinoline, Acridine and Indole. Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives	**CLO 4**	**08**
UNIT V		
Reactions of synthetic importance Metal hydride reduction (NaBH4 and LiAlH4), Clemmensons reduction, Birch reduction, Wolff Kishner reduction, Oppenauer-oxidation and Dakin reaction, Beckmann's rearrangement and Schmidt rearrangement, Claisen-Schmidt condensation	**CLO 5**	**07**
Total Hours		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning resources

Textbooks:

1. A textbook of Organic Chemistry by Arun Bahl, B.S. Bahl.
2. A Textbook of Pharmaceutical Organic Chemistry-III by Mayuresh Raut, Prashik Dudhe, Everest Publishing House, Pune.
3. Pharmaceutical Organic Chemistry-III by Mayuresh Raut, Everest Publishing House, Pune.
4. Pharmaceutical Organic Chemistry-IV by Mayuresh Raut, Everest Publishing House, Pune.

Reference Books:

1. Organic chemistry by I.L. Finar, Volume-I & II.
2. Heterocyclic Chemistry by Raj K. Bansal
3. Organic Chemistry by Morrison and Boyd
4. Heterocyclic Chemistry by T.L. Gilchrist

Online Resources/E-Learning Resources

1. Schmidt rearrangement: https://youtu.be/AeBoyy1X6vU

2. Beckmann rearrangement: https://youtu.be/y2y_gikj3U8
3. Hoffmann rearrangement: https://youtu.be/-02EKjiEdkc
4. Pinacol-pinacolon rearrangement: https://youtu.be/SZXPd2sK9Ms
5. Benzil-Benzilic acid rearrangement: https://youtu.be/ALs8ECOW95k
6. Birch reduction: https://youtu.be/YIdjlN_Z1RQ
7. Claisen condensation: https://youtu.be/2Kkr6pgm3tw
8. Bayer Villiger Oxidation: https://youtu.be/BkMQ8nP8PCc
9. Dakin Oxidation: https://youtu.be/nRpU_e6-sG8
10. Resolution of racemic mixture: https://youtu.be/eM-ZrJwxIDc

COURSE CURRICULUM

Name of the Program:		B. PHARM		Semester : IV		Level: UG	
Course Name		Medicinal Chemistry-I (Theory)		Course Code/ Course Type		BP402T/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
3	-	1	4	45	25	75	--
Pre-Requisite: Nil							
Course Objectives (CO):				The objectives of (Medicinal Chemistry-I) are: 1. To recall the chemistry of drugs with respect to their pharmacological activity. 2. To recognize drug metabolic pathways, adverse effect and therapeutic value of drugs. 3. To identify the Structural Activity Relationship (SAR) of different class of drugs 4. To perform the writing of the chemical synthesis of some drugs 5. To study Structural influences on pharmacologic / toxicological /therapeutic profiles.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Identify physicochemical properties in relation to biological action. 2. Explain drugs acting on Autonomic Nervous System with metabolic pathways, adverse effect and therapeutic value of drugs. 3. Apply SAR of different cholinergic neurotransmitters including parasympathomimetics and cholinolytics. 4. Perform the study of drugs acting on Central Nervous System consisting of sedative-hypnotics, antipsychotics and anticonvulsants. 5. Evaluate general anaesthetics, narcotic and non-narcotic analgesic, and anti-inflammatory agents.			

Course Contents/Syllabus:

(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	CLO	Hours
UNIT I		
Introduction to Medicinal Chemistry History and development of medicinal chemistry **Physicochemical properties in relation to biological action** Ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein binding, Chelation, Bioisosterism, Optical and Geometrical isomerism. **Drug metabolism** Drug metabolism principles- Phase I and Phase II. Factors affecting drug metabolism including stereo chemical aspects.	**CLO1**	**10**
UNIT II		
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, Propyl hexedrine. Agents with mixed mechanism: Ephedrine, Metaraminol. **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.	**CLO2**	**10**
UNIT III		
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, Echothiophate iodide, Parathione, Malathion. **Cholinesterase reactivator:** Pralidoxime chloride. **Cholinergic Blocking agents: SAR of cholinolytic agents** **Solanaceous alkaloids and analogues:** Atropine sulphate, Hyoscyamine sulphate, 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.	**CLO3**	**10**
UNIT IV		
Drugs acting on Central Nervous System **A. Sedatives and Hypnotics:** **Benzodiazepines:** SAR of Benzodiazepines, Chlordiazepoxide, Diazepam*,Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem	**CLO4**	**08**

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. **B. Antipsychotics** **Phenothiazeines** SAR of Phenothiazeines - Promazine hydrochloride, Chlorpromazine hydrochloride*, Trifluprомazine, Thioridazine hydrochloride, Piperacetazine hydrochloride, Prochlorperazine maleate, Trifluoperazine hydrochloride. **Ring Analogues of Phenothiazeines:** Chlorprothixene, Thiothixene, Loxapine succinate, Clozapine. **Fluro buterophenones:** Haloperidol, Droperidol, Risperidone. **Beta amino ketones:** Molindone hydrochloride. **Benzamides:** Sulpieride. **C. Anticonvulsants:** SAR of Anticonvulsants, mechanism of anticonvulsant action **Barbiturates**: Phenobarbitone, Methabarbital. **Hydantoins:** Phenytoin*, Mephenytoin, Ethotoin **Oxazolidine diones:** Trimethadione, Paramethadione **Succinimides:** Phensuximide, Methsuximide, Ethosuximide* **Urea and monoacylureas**: Phenacemide, Carbamazepine* **Benzodiazepines**: Clonazepam **Miscellaneous:** Primidone, Valproic acid , Gabapentin, Felbamate		
UNIT V		
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 anaesthetics:** 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 ydrochloride*, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartarate. **Narcotic antagonists** Nalorphine hydrochloride, Levallorphan tartarate,Naloxone hydrochloride. **Anti-inflammatory agents** Sodium salicylate, Aspirin, Mefenamic acid*, eclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepriac, Diclofenac, Ketorolac, Ibuprofen*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.	**CLO5**	**07**
Total Hours		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning resources

Textbooks:

1. Introduction to principles of drug design- Smith and Williams.
2. Organic Chemistry by I.L. Finar, Vol. II.

3. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
4. Text book of practical organic chemistry- A. I. Vogel

Reference Books:

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. Remington's Pharmaceutical Sciences.
5. Martindale's extra pharmacopoeia.
6. Indian Pharmacopoeia.
7. Thomas L. Lemke, David A. Williams, Victoria F. Roche, S. William Zito, Foye's Principles of Medicinal Chemistry, 7th Ed., Lippincott Williams & Wilkins, 2012 (30 copies in the library).
8. Graham L. Patrick, "An Introduction to Medicinal Chemistry", 5th Ed. Oxford University Press 2013

Online Resources/E-Learning Resources:

1. https://uogqueensmcf.com/wpcontent/uploads/2020/BA%20Modules//Pharmacy/Year%20II%20(semester%202)/Medicinal%20Chemistry%20I/Reference%20books/An%20Introduction%20to%20Medicinal%20Chemistry%205th%20ed%20-%20Graham%20L.%20Patrick%20(OUP,%202013).pdf
2. https://utkaluniversity.ac.in/wp-content/uploads/2023/03/Unit-I_Intro_Med-Chem-Drug-Metabolism.pdf
3. https://basu.org.in/wp-content/uploads/2020/04/Drugs_acting_on_ANS_.pdf
4. https://jiwaji.edu/pdf/ecourse/pharmaceutical/Cholinergic%20neurotransmitters.pdf
5. https://utkaluniversity.ac.in/wp-content/uploads/2023/03/Unit-V_Drugs-acting-on-Central-Nervous-System.pdf
6. https://basu.org.in/wp-content/uploads/2020/07/Unit_III__Drugs_acting_on_CNS_.pdf
7. https://www.jiwaji.edu/pdf/ecourse/pharmaceutical/NON-NARCOTIC%20ANALGESICS.pdf
8. https://www.jiwaji.edu/pdf/ecourse/pharmaceutical/Narcotic%20Agents.pdf

COURSE CURRICULUM

Name of the Program:	B. PHARM	Semester: IV	Level: UG
Course Name	Physical Pharmaceutics II – (Theory)	Course Code/ Course Type	BP403T/Core
Course Pattern	2024	Version	1.0

Teaching Scheme				Assessment Scheme			
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	1	4	45	25	75	-

Pre-Requisite:	Nil
Course Objectives (CO):	Upon the completion of the course student shall be able to 1. Understand various physicochemical properties of drug molecules in the designing the dosage forms 2. Know the principles of chemical kinetics & to use them for stability testing. 3. determine expiry date of formulations 4. Demonstrate use of physicochemical properties in the formulation development. 5. Perform evaluation of dosage forms.
Course Learning Outcomes (CLO):	Upon the completion of the course student shall be able to 1. Categorize the dispersed systems and understand the properties and applications of colloidal dispersions. 2. Interpret the rheological behaviour of fluids and illustrate the physics of tablet compression 3. Formulate and evaluate coarse dispersions making use of rheological and electrokinetic properties. 4. Describe, analyze and distinguish the fundamental properties of particle and develop analytical skills to optimize the flow of powders. 5. Apply the principles of kinetics in the stabilization of dosage forms.

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
Colloidal dispersions Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles, classification of colloids & comparative account of their general properties. Optical, kinetic & electrical properties. Effect of electrolytes, coacervation, peptization& protective action.	**CLO 1**	**05**
UNIT II		
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	**CLO 2**	**10**
UNIT III		
Coarse dispersion Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of flocculated and deflocculated suspensions. Emulsions and theories of emulsification, microemulsion and multiple emulsions; Stability of emulsions, preservation of emulsions, rheological properties of emulsions and emulsion formulation by HLB method	**CLO 3**	**10**
UNIT IV		
Micromeretics Particle size and distribution, mean particle size, number and weight distribution, particle number, methods for determining particle size by different methods, counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties	**CLO 4**	**10**
UNIT V		
Drug stability Reaction kinetics: zero, pseudo-zero, first & second order, units of basic rate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific & general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention	**CLO 5**	**10**
Total Hours		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning resources

Textbooks:

1. Test book of Physical Phramacy, by Gaurav Jain & Roop K. Khar
2. Physical Pharmaceutics by C.V.S. Subramanyam

Reference Books:

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

Online Resources/E-Learning Resources

1. https://www.carewellpharma.in/bpharmacy/notes/4th-sem/physical-pharmaceutics-2
2. https://www.copbela.org/downloads/2020/SELF%20LEARNING%20MATERIAL%20BPHARMA/semester%204/BP403T/MODULE%2002.pdf
3. https://copbela.org/downloads/2020/SELF%20LEARNING%20MATERIAL%20BPHARMA/semester%204/BP403T/MODULE%2004.pdf

COURSE CURRICULUM

Name of the Program:		B. PHARM		Semester : IV		Level: UG	
Course Name		Pharmacology-I (Theory)		Course Code/ Course Type		BP404T	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	--	1	4	45	25	75	--
Pre-Requisite: Nil							
Course Objectives (CO):				The objectives of Pharmacology -I are: 1. To recall the gross knowledge of general pharmacology with respect to drugs and its action. 2. To study the basics of general pharmacology with respect to Pharmacodynamics, ADR, drug interaction and drug discovery. 3. To study the pharmacology of drugs acting on peripheral nervous system, w.r.t. ANS, local anesthetics etc. 4. To study the pharmacology of drugs acting on peripheral nervous system, w.r.t. neurotransmitters agents, general anesthetics, sedatives, anti-epileptics, alcohols etc. 5. To study the pharmacology of drugs acting on peripheral nervous system, w.r.t. psychopharmacological agents, CNS stimulants, analgesics, drug addiction.		
Course Learning Outcomes (CLO):				Students would be able to: 1. Understand the gross knowledge of general pharmacology with respect to drugs and its action. 2. Study the basics of general pharmacology with respect to Pharmacodynamics, ADR, drug interaction and drug discovery. 3. Study the pharmacology of drugs acting on peripheral nervous system, w.r.t. ANS, local anesthetics etc. 4. Study the pharmacology of drugs acting on peripheral nervous system, w.r.t. neurotransmitters agents, general anesthetics, sedatives, anti-epileptics, alcohols etc. 5. Study the pharmacology of drugs acting on peripheral nervous system, w.r.t. psychopharmacological agents, CNS stimulants, analgesics, drug addiction.		

Course Contents/Syllabus:

(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
General Pharmacology **Introduction to Pharmacology** Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists (competitive and non-competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy. **Pharmacokinetics** Membrane transport, absorption, distribution, metabolism and excretion of drugs .Enzyme induction, enzyme inhibition, kinetics of elimination	**CLO 1**	**10**
UNIT II		
General Pharmacology **Pharmacodynamics** Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal transduction mechanisms, G-protein–coupled receptors, ion channel receptor, transmembrane enzyme linked receptors, transmembrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action. **Adverse drug reactions** Drug interactions (pharmacokinetic and pharmacodynamics) Drug discovery and clinical evaluation of new drugs- Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.	**CLO 2**	**10**
UNIT III		
Pharmacology of drugs acting on peripheral nervous system Organization and function of ANS. Neurohumoral transmission, co-transmission and classification of neurotransmitters. Parasympathomimetics, Parasympatholytics, Sympathomimetic, sympatholytic. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral). Local anesthetic agents. Drugs used in myasthenia gravis and glaucoma	**CLO 3**	**10**
UNIT IV		
Pharmacology of drugs acting on central nervous system Neurohumoral transmission in the C. N. S. special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine. General anesthetics and pre-anesthetics. Sedatives, hypnotics and centrally acting muscle relaxants. Anti-epileptics Alcohols and disulfiram	**CLO 4**	**08**
UNIT V		
Pharmacology of drugs acting on central nervous system Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, anti-manics and hallucinogens. Drugs used in Parkinson's disease and Alzheimer's disease. CNS stimulants and nootropics. Opioid analgesics and antagonists. Drug addiction, drug abuse, tolerance and dependence.	**CLO 5**	**07**
Total Hours		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning resources:

Textbooks:

1. Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert.
2. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
3. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.

Reference Books:

1. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology
2. 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
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics.
4. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
5. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology,.Churchil Livingstone Elsevier

Online Resources/E-Learning Resources:

1. https://jiwaji.edu/pdf/ecourse/pharmaceutical/General%20Pharmacology%20(B.Pharmacy%203%20Year%20Pharmacology%20III%203T4)%20By%20Dr.%20Bhagat%20Singh%20Jaiswal.pdf
2. https://www.ncbi.nlm.nih.gov/books/NBK507791/
3. https://www.ncbi.nlm.nih.gov/books/NBK554534/
4. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3522494/
5. https://www.youtube.com/playlist?list=PLtEqsPSBZlXu_UkZF1sdE341ebm7G-xsN
6. https://remixeducation.in/drugs-acting-on-central-nervous-system/
7. https://egyankosh.ac.in/bitstream/123456789/38330/1/Unit%209.pdf
8. https://pubmed.ncbi.nlm.nih.gov/6130574/
9. https://www.copbela.org/downloads/2020/SELF%20LEARNING%20MATERIAL%20BPHARMA/semester%204/BP404T/MODULE%205.pdf

COURSE CURRICULUM

Name of the Program:		B. PHARM		Semester: IV		Level: UG	
Course Name		Pharmacognosy and Phytochemistry – I (Theory)		Course Code/ Course Type		BP405T/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	--	1	4	45	25	75	---
Pre-Requisite: Nil							
Course Objectives (CO):				Upon completion of the course, the student shall be able 1. To know the techniques in the cultivation and production of crude drugs 2. To know the crude drugs, their uses and chemical nature 3. To know the evaluation techniques for the herbal drugs 4. To carry out the microscopic and morphological evaluation of crude drugs 5. Explain primary metabolites, ayurvedic drugs, marine drugs and teratogen.		
Course Learning Outcomes (CLO):				1. Recall the history, scope and development of pharmacognosy. 2. Illustrate cultivation, collection, processing and storage of crude drugs. 3. Elaborate the applications of advanced technologies like polyploidy, mutation and hybridization in medicinal plants. 4. Describe the role of Pharmacognosy in various systems of medicine and explain secondary metabolites. 5. Explain primary metabolites, ayurvedic drugs, marine drugs and teratogen.		

Course Contents/Syllabus:

(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Pharmacognosy (a) Definition, history, scope and development of Pharmacognosy (b) Sources of Drugs – Plants, Animals, Marine & Tissue culture (c) Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins). **Classification of drugs** Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and serotaxonomical classification of drugs **Quality control of Drugs of Natural Origin** Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties. Quantitative microscopy of crude drugs including lycopodium spore method, leaf constants, camera lucida and diagrams of microscopic objects to scale with camera lucida.	**CLO 1**	**10**
UNIT II		
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	**CLO 2**	**10**
UNIT III		
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	**CLO 3**	**07**
UNIT IV		
Pharmacognosy in various systems of medicine Role of Pharmacognosy in allopathy and traditional systems of medicine namely, Ayurveda, Unani, Siddha, Homeopathy and Chinese systems of medicine. **Introduction to secondary metabolites** Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins	**CLO 4**	**10**
UNIT V		
Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs **Plant Products** Fibers - Cotton, Jute, Hemp Hallucinogens, Teratogens, Natural allergens **Primary metabolites** General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic used and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites: **Carbohydrates** Acacia, Agar, Tragacanth, Honey **Proteins and Enzymes** Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin). **Lipids (Waxes, fats, fixed oils)** Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax **Marine Drugs** Novel medicinal agents from marine sources	**CLO 5**	**08**

Total Hours		45

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning resources

Textbook

1. A textbook on Pharmacognosy and Phytochemistry – by Biren N. Shah and A.K. Seth
2. Textbook of Pharmacognosy and Phytochemistry I- By MD Rafiul Haque
3. Text Book of Pharmacognosy by T.E. Wallis
4. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
5. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhale (2007), 37th Edition, Nirali Prakashan, New Delhi.

Reference Books:

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. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
4. Essentials of Pharmacognosy, Dr.S H.Ansari, IInd edition, Birla publications, New Delhi, 2007
5. Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhale
6. Anatomy of Crude Drugs by M.A. Iyengar

Online Resources/E-Learning Resources

1. https://www.cbspd.co.in/textbook-of-pharmacognosy-and-phytochemistry-i-theory-and-practical
2. https://pharmabookbank.files.wordpress.com/2019/03/14.2.pharmacognosy-by-biren-shahavinash-seth-1.pdf
3. https://scholar.google.co.in/scholar?q=textbook+on+Pharmacognosy+and+Phytochemistry+%E2%80%93+I+(Theory&hl=en&as_sdt=0&as_vis=1&oi=scholart
4. https://scholar.google.co.in/scholar?q=textbook+on+Pharmacognosy+and+Phytochemistry+%E2%80%93+I+(Theory&hl=en&as_sdt=0&as_vis=1&oi=scholart

COURSE CURRICULUM

Name of the Program:	B. PHARM	Semester: IV	Level: UG
Course Name	Medicinal Chemistry-I (Practical)	Course Code/ Course Type	BP406P/Core

Course Pattern		2024		Version		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
--	4	--	2	60	15	35	--
Pre-Requisite:		**Nil**					
Course Objectives (CO):				Upon completion of the course, the student shall be able to 1. Impart a fundamental knowledge of Medicinal Chemistry. 2. Learn the preparation of drugs 3. Learn the preparation of reaction intermediates 4. Comprehend the basic principles of assay procedure of the drugs to identify the purity of the drugs or drug intermediates. 5. Determine the partition coefficient of the drugs			
Course Learning Outcomes (CLO):				Students would be able to: 1. Perform the preparation of drugs in laboratory. 2. Perform the preparation of drug intermediates. 3. Determine the physical constants such as melting point/boiling point and perform recrystallization procedure. 4. Identify the purity of the selected drugs or medicinal compounds by using assay procedures. 5. Determine the partition coefficient of medicinal compounds of different category			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)
(Students have to perform any 15 Practicals)

Assignment/ Practical/ Activity Number	Assignment/Practical/ Activity Title	Week Number/ Turn	Details	CLO	Hours
I	**Preparation of drugs/ intermediates**				
1	Practical 1:Preparation of intermediate	Week 1/Turn 1	Preparation of 1,3-pyrazole.	CLO1	04 Hrs/ Practical
2.	Practical 2: Preparation of	Week 2/ Turn 1	Preparation of 1,3-oxazole.	CLO1	
3.	Practical 3: Preparation of	Week 3/ Turn 1	Preparation of Benzimidazole.	CLO2	
4	Practical 4: Preparation of	Week 4/ Turn 1	Preparation of Benztriazole.	CLO2	
5	Practical 5: Preparation of	Week 5/ Turn 1	Preparation of 2,3- diphenyl quinoxaline.	CLO2	
6	Practical 6: Preparation of drug	Week 6/ Turn 1	Preparation of Benzocaine.	CLO2	
7	Practical 7: Preparation of drug	Week 7/ Turn 1	Preparation of Phenytoin.	CLO3	
8	Practical 8: Preparation of drug	Week 8/ Turn 1	Preparation of Phenothiazine.	CLO3	
9	Practical 9: Preparation of drug	Week 9/ Turn 1	Preparation of Barbiturate.	CLO4	
II	**Assay of drugs**				
10	Practical 10: Assay of drugs	Week 10/ Turn 1	Assay of Chlorpromazine	CLO4	04 Hrs/ Practical
11	Practical 11: Assay of drugs	Week 11/ Turn 1	Assay of Phenobarbitone	CLO4	
12	Practical 12: Assay of drugs	Week 12/ Turn 1	Assay of Atropine	CLO4	
13	Practical 13: Assay of drugs	Week 13/ Turn 1	Assay of Ibuprofen	CLO5	
14	Practical 14: Assay of drugs	Week 14/ Turn 1	Assay of Aspirin	CLO5	
15	Practical 15: Assay of drugs	Week 15/ Turn 1	Assay of Furosemide	CLO5	
III	**Determination of Partition coefficient for any two drugs**				
16	Practical 16 Partition coefficient determination	Week 16/ Turn 1	Determination of Partition coefficient	CLO5	04 Hrs/ Practical
17	Practical 17 Partition coefficient determination	Week 17/ Turn 1	Determination of Partition coefficient	CLO5	

Learning resources

Practical Text Book:

1. Remington's Pharmaceutical Sciences.
2. Text book of practical organic chemistry- A. I. Vogel.

Reference Books:

1. Martindale's extra pharmacopoeia.
2. Indian Pharmacopoeia.

Online Resources/E-Learning Resources:

1. https://www.miperknlapindia.ac.in/BP406P-medicinal-chemistry1.pdf
2. https://jru.edu.in/studentcorner/lab-manual/bpharm/4th-sem/Medicinal%20Chemistry-I.pdf
3. https://www.youtube.com/watch?v=h54XyEnYZDA
4. https://www.youtube.com/watch?v=59jG3I7wRpQ
5. https://www.youtube.com/watch?v=7hopSX26qqA
6. https://www.youtube.com/watch?v=zyoOmLCX6qM
7. https://www.youtube.com/watch?v=auwvTlQNuM4
8. https://www.bellevuecollege.edu/wpcontent/uploads/sites/140/2014/06/aspirin_tablets_titration.pdf
9. https://www.youtube.com/watch?v=DPcNSn22ayc
10. Experimental Determination of Octanol–Water Partition Coefficients of Selected Natural Toxins, Carina D. Schönsee and Thomas D. Bucheli, *Journal of Chemical & Engineering Data* 2020 *65* (4), 1946-1953, DOI: 10.1021/acs.jced.9b01129

COURSE CURRICULUM

Name of the Program:		B. PHARM		Semester: IV		Level: UG	
Course Name		Physical Pharmaceutics – II (Practical)		Course Code/ Course Type		BP407P/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	15	-	2	60	15	35	--
Pre-Requisite: Nil							
Course Objectives (CO):				Upon completion of the course, the student shall be able to 1. Cover experiments to provide fundamental principles of physical pharmacy necessary 2. Design physically and chemically stable dosage forms and ensure their therapeutic safety and efficacy. 3. Perform optimization of suspending agents 4. Determine the reaction rate constant depending on chemical reactions. 5. Comprehend the shelf life of formulation by implementing the accelerated stability studies.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Determine the significance of physical properties such as particle size and density in the design of dosage forms. 2. Determine the viscosity using Ostwald's and Brookfield's viscometer 3. Select and optimize suspending agent to formulate a stable suspension 4. Conclude the reaction rate constants as per the chemical reaction. 5. Interpret the shelf life of a given formulation by accelerated stability studies			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Practical Plan

Assignment/Practical/Activity Number	Assignment/Practical/Activity Title	Week Number/ Turn	Details	CLO	Hours
1	Practical 1: Particle size	Week 1/Turn1	Determination of particle size, particle size distribution using sieving method	CLO1	04
2	Practical 2: Particle size	Week 2/ Turn1	Determination of particle size, particle size distribution using Microscopic method	CLO1	04
3	Practical 3:Density	Week 3/ Turn1	Determination of bulk density, true density and porosity	CLO1	04
4	Practical 4: angle of repose	Week 4/ Turn1	Determine the angle of repose and influence of lubricant on angle of repose.	CLO1	04
5	Practical 5: Viscosity	Week 5/ Turn1	Determination of viscosity of liquid using Ostwald's viscometer	CLO2	04
6	Practical 6: Viscosity	Week 6/ Turn1	Determination of viscosity of liquid using Ostwald's viscometer	CLO2	04
7	Practical 7: Sedimentation	Week 7/ Turn1	Determination sedimentation volume with effect of different suspending agent	CLO3	04
8	Practical 8: Sedimentation	Week 8/ Turn1	Determination sedimentation volume with effect of different suspending agent	CLO3	04
9	Practical 9: Sedimentation	Week 9/ Turn1	Determination sedimentation volume with effect of different concentration of single suspending agent	CLO3	04
10	Practical 10: Viscosity	Week 10/ Turn1	Determination of viscosity of semisolid by using Brookfield viscometer	CLO2	04
11	Practical 11: Viscosity	Week 11/ Turn1	Determination of viscosity of semisolid by using Brookfield viscometer	CLO2	04
12	Practical 12: Kinetics	Week 12/ Turn1	Determination of reaction rate constant first order	CLO4	04
13	Practical 13: Kinetics	Week 13/ Turn1	Determination of reaction rate constant second order	CLO4	04
14	Practical 14: Stability studies	Week 14/ Turn1	Accelerated stability studies	CLO5	04
15	Practical 15: Stability studies	Week 15/ Turn1	Accelerated stability studies	CLO5	04

Learning resources

Practical Text Book

Laboratory Manual of Physical Pharmaceutics, C.V.S. Subramanyam, J. Thimma settee.

Reference Books:

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

Online Resources/E-Learning Resources:

1. https://jru.edu.in/studentcorner/lab-manual/bpharm/4th-sem/Physical%20Pharmaceutics-II.pdf
2. http://www.sarajapharmacycollege.com/downloads/PP2.pdf
3. https://mlrip.ac.in/wp-content/uploads/2022/03/PHYSICAL-PHARMACEUTICS-II-LAB-MANUAL.pdf

COURSE CURRICULUM

Name of the Program:		B. Pharm		Semester : IV		Level: UG	
Course Name		Pharmacology-I (Practical)		Course Code/ Course Type		BP408P/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme				Assessment Scheme			
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
-	4	-	2	60	15	35	-
Pre-Requisite: Nil							

Course Objectives (CO):	The objectives of Tools for Pharmacology-I are: 1. To study the introduction to experimental pharmacology and various instruments in pharmacology laboratory. 2. To study the common laboratory animals along with the CPCSEA guidelines. 3. To learn common laboratory techniques and different routes of drug administrations to animals. 4. To able to evaluate and simulate the effects of different drugs on tissues/organs of the laboratory animals using the simulating software. 5. To able to evaluate and simulate the effects of different drugs acting on various systems of the laboratory animals using the simulating software.
Course Learning Outcomes (CLO):	Students would be able to: 1. Study the introduction to experimental pharmacology and various instruments in pharmacology laboratory. 2. Study the common laboratory animals along with the CPCSEA guidelines. 3. Learn and explore the common laboratory techniques and different routes of drug administrations to animals. 4. Able to evaluate and simulate the effects of different drugs on tissues/organs of the laboratory animals using the simulating software. 5. Able to evaluate and simulate the effects of different drugs acting on various systems of the laboratory animals using the simulating software.

Course Contents/Syllabus

(All the Practical's carry equal weightage in Summative Assessment and equal engagement)

Practical Plan

Assignment/Practical/Activity Number	Assignment/Practical/ Activity Title	Week Number/Turn	Details	CLO	Hours
1	Practical 1: Introduction to experimental pharmacology	Week1/ Turn 1	1.1To study the introduction to experimental pharmacology.	CLO1	04
2.	Practical 2: Commonly used instruments	Week 2/ Turn 1	2.1 To study the commonly used instruments in experimental pharmacology.	CLO 1	04
3	Practical 3: Study of common laboratory animals.	Week 3/ Turn 1	3.1 To study of common laboratory animals.	CLO 2	04
4	Practical 4: Maintenance of laboratory animals as per CPCSEA guidelines.	Week 4 / Turn 1	4.1 To study maintenance of laboratory animals as per CPCSEA guidelines.	CLO 2	04
5	Practical 5: Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies	Week 5/ Turn 1	5.1 To study the common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies	CLO 3	04
6	Practical 6: Study of different routes of drugs administration in mice/rats.	Week 6 / Turn 1	6.1 To study of different routes of drugs administration in mice/rats.	CLO 3	04
7	Practical 7: Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice.	Week 7 / Turn 1	7.1 To study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice.	CLO 4	04
8	Practical 8: Effect of drugs on ciliary motility of frog esophagus	Week 8 / Turn 1	8.1 To demonstrate the effect of drugs on ciliary motility of frog oesophagus	CLO 4	04
9	Practical 9: Effect of drugs on rabbit eye.	Week 9 / Turn 1	9.1 To examine the effect of drugs on rabbit eye.	CLO 4	04
10	Practical 10: Effects of skeletal muscle relaxants using Rota-rod apparatus.	Week 10 / Turn 1	10.1 To demonstrate the effects of skeletal muscle relaxants using Rota-rod apparatus	CLO 4	04
11	Practical 11: Effect of drugs on locomotor activity using actophotometer.	Week 11 / Turn 1	11.1 To demonstrate effect of drugs on locomotor activity using actophotometer.	CLO 5	04
12	Practical 12: Anticonvulsant effect of drugs by MES and PTZ method.	Week 12 / Turn 1	12.1 To evaluate the anticonvulsant effect of drugs by MES and PTZ method.	CLO 5	04
13	Practical 13: Study of stereotype and anti-catatonic activity of drugs on rats/mice	Week 13 / Turn 1	13.1 To study stereotype and anti-catatonic activity of drugs on rats/mice.	CLO 5	04
14	Practical 14: Study of anxiolytic activity of drugs using rats/mice.	Week 14 / Turn 1	14.1 To determine the anxiolytic activity of drugs using rats/mice.	CLO 5	04
15	Practical 15: Study of local anesthetics by different methods	Week 15 / Turn 1	15.1 To study local anesthetics by different methods	CLO 5	04

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

Learning resources

Textbooks:

1. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
2. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan

Reference Books:

1. K. D. Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
2. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
3. Modern Pharmacology with clinical Applications, by Charles Craig& Robert

Online Resources/E-Learning Resources:

1. https://www.researchgate.net/profile/Kailas Mali/publication/378286842_Laboratory_Manual_of_Pharmacology_I/links/65d0cbe5e51f606f99799948/Laboratory-Manual-of-Pharmacology-I.pdf
2. https://www.slideshare.net/AmitChaudhari39/laboratory-animal-used-in-pharmacological-experiment
3. https://www.ndvsu.org/images/StudyMaterials/LPM/Laboratory-animals.pdf
4. https://care.edu.in/wp-content/uploads/2020/03/cpcsea.pdf
5. https://www.slideshare.net/clickforanwar/expt-9-effect-of-drugs-on-rabbit-eye
6. https://www.slideshare.net/clickforanwar/expt-11-effect-of-drugs-on-locomotor-activity-using-actophotometer
7. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4527063/

Name of the Program:		B. Pharm		Semester: IV		Level: UG	
Course Name		Pharmacognosy & Phytochemistry-I (Practical)		Course Code/ Course Type		BP409P/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	4	-	2	60	15	35	-
Pre-Requisite: Nil							
Course Objectives (CO):				The objectives of Pharmacognosy & Phytochemistry-I are: 1. To understand morphology, microscopy and powder characteristics of crude drugs. 2. To identify unorganized drugs by chemical methods 3. To conduct extraction and estimation of different Phytoconstituents. 4. To elaborate qualitative, quantitative microscopy & its social relevance. 5. To decide staining reagents required for specific part of plant.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Perform physical evaluation of crude drugs. 2. Perform leaf constants and generate quantitative microscopic data. 3. Demonstrate extraction and estimation of different Phytoconstituents. 4. Explain of qualitative, quantitative microscopy & its social relevance. 5. Choose on staining reagents required for specific part of plant.			

Course Contents/Syllabus:

(All the Practical's carry equal weightage in Summative Assessment and equal engagement)
Practical Plan

Assignment/ Practical/ Activity Number	Assignment/Practical/ Activity Title	Week Number/Turn	Details	CLO	Hours
1	Practical 1: Analysis of crude drugs by chemical tests	Week 1/Turn 1	identify the chemical characters of given sample (Tragacanth).	CLO1	04
2	Practical 2: Analysis of crude drugs by chemical tests	Week 2/Turn 1	To identify the chemical characters of given sample (Acacia).	CLO1	04
3	Practical 3: Analysis of crude drugs by chemical tests	Week 3/Turn 1	To identify the chemical characters of given sample (Agar).	CLO1	04
4	Practical 4: Analysis of crude drugs by chemical tests	Week 4/Turn 1	To identify the chemical characters of given sample (Gelatin).	CLO2	04
5	Practical 5: Analysis of crude drugs by chemical tests	Week 5/Turn 1	To identify the chemical characters of given sample (Starch).	CLO2	04
6	Practical 6: Analysis of crude drugs by chemical tests	Week 6/Turn 1	To identify the chemical characters of given sample (Honey).	CLO2	04
7	Practical 7: Determination of stomatal number and index	Week 7/Turn 1	To determine stomatal number and stomatal index	CLO3	04
8	Practical 8: Determination of vein islet number, vein islet termination and palisade ratio.	Week 8/Turn 1	To determine vein islet number, vein islet termination and palisade ratio.	CLO3	04
9	Practical 9: Determination of size of starch grains, calcium oxalate crystals	Week 9/Turn 1	To determine size of starch grains, calcium oxalate crystals by eye piece micrometer.	CLO3	04
10	Practical 10: Determination of Fiber length and width	Week10/Turn1	To determine Fiber length and width	CLO4	04
11	Practical 11: Determination of number of starch grains	Week11/Turn1	To determine number of starch grains by Lycopodium spore method	CLO4	04
12	Practical 12: Determination of Ash value	Week12/Turn1	To determine Ash value	CLO4	04
13	Practical 13: Determination of Extractive values of crude drugs	Week13/Turn1	To determine Extractive values of crude drugs	CLO5	04
14	Practical 14: Determination of moisture content of crude drugs	Week14/Turn1	To determine moisture content of crude drugs	CLO5	04
15	Practical 15:Determination of swelling index and foaming	Week15/Turn1	To determine swelling index and foaming	CLO5	04

Learning resources

Textbooks:

1. Practical Pharmacognosy by Kokate CK., 4th edition, Vallabh Prakashan. Delhi;
2. Practical Pharmacognosy by Khandewal K.R, Nirali Prakashan

Reference Books:

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. Text Book of Pharmacognosy by T.E. Wallis
4. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
5. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhale (2007), 37th Edition, Nirali Prakashan,
6. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
7. Essentials of Pharmacognosy, Dr.S H.Ansari, IInd edition, Birla publications, New Delhi, 2007
8. Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhlae
9. Anatomy of Crude Drugs by M.A. Iyengar

Online Resources/E-Learning Resources

1. Stomatal number: https://www.youtube.com/watch?v=v53Zf2MhrwE
2. Ash vale: https://www.youtube.com/watch?v=n2Qwb8Pw8YE
3. Vein termination number: https://www.youtube.com/watch?v=wvTEe1upZMU
4. Starch grain: https://www.youtube.com/watch?v=Bf-t9jduefc

COURSE CURRICULUM

Name of the Program:		B. Pharm		Semester : 3/4		Level: UG	
Course Name		Constitution of India (Theory)		Course Code/ Course Type		ACCOI201/AC	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
2	--	--	--	30	50	--	--
Pre-Requisite: Nil							
Course Objectives (CO):				The objectives of Constitution of India are: 1. To familiarize the students with the key elements of the Indian constitution. 2. To enable students to grasp the constitutional provisions and values. 3. To acquaint the students with the powers and functions of various constitutional offices and institutions. 4. To make students understand the basic premises of Indian politics. 5. To make students understand the role of constitution and citizen oriented measures in a democracy			
Course Learning Outcomes (CLO):				Students would be able to: 1. Analyze the basic structure of Indian Constitution. 2. Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution. 3. know about our Union Government, political structure & codes, procedures. 4. Understand our State Executive & Elections system of India. 5. Access the Amendments and Emergency Provisions, other important provisions given by the constitution			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Indian Constitution The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly. The Preamble of Indian Constitution & Key concepts of the Preamble. Salient features of India Constitution.	**CLO 1**	**08**
UNIT II		
FR's, FD's and DPSP's Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building	**CLO 2**	**05**
UNIT III		
Governance and Constitution Federalism in India - Features , Local Government -Panchayats –Powers and functions; 73rd and 74th amendments, Election Commission – Composition, Powers and Functions; Electoral Reforms, Citizen oriented measures – RTI and PIL – Provisions and significance..	**CLO 3**	**05**
UNIT IV		
Union Executive Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism.	**CLO 4**	**05**
UNIT V		
State Executive & Elections, Amendments and Emergency Provisions State Executive, Election Commission, Elections & Electoral Process. Amendment to Constitution (How and Why) and Important Constitutional Amendments till today. Emergency Provisions.	**CLO 5**	**07**
Total Hours		**30**

Learning resources:

Text Books:

1. "Constitution of India" (for Competitive Exams) - Published by Naidhruva Edutech Learning Solutions, Bengaluru. – 2022.
2. "Engineering Ethics", M.Govindarajan, S.Natarajan, V.S.Senthilkumar, Prentice –Hall, 2004

Reference Books:

1. "SamvidhanaOdu" - for Students & Youths by Justice HN NagamohanDhas, Sahayana, kerekon.
2. "Constitution of India, Professional Ethics and Human Rights" by Shubham Singles, Charles E. Haries, and et al: published by Cengage Learning India, Latest Edition – 2019.
3. "Introduction to the Constitution of India", (Students Edition.) by Durga Das Basu (DD Basu):Prentice –Hall, 2008.
4. "The Constitution of India" by Merunandan K B: published by Merugu Publication, Second Edition, Bengaluru.

Online Resources/E-Learning Resources:

1. https://indianexpress.com/article/explained/the-preamble-what-does-it-say-andwhat-does-it-mean-to-india-and-its-constitution-6232014/
2. http://egyankosh.ac.in/bitstream/123456789/57869/1/Unit3.pdf
3. https://www.nios.ac.in/media/documents/srsec317newE/317EL5.pdf
4. https://nios.ac.in/media/documents/SecSocSciCour/English/Lesson-15.pdf
5. http://www.ignou.ac.in/upload/bswe-02-block6-unit-27-small%20size.pdf
6. https://blog.ipleaders.in/the-preamble-of-the-indian-constitution/
7. http://www.legalservicesindia.com/article/2003/Is-Preamble-a-Part of- Constitution.html
8. https://youtu.be/LYHAy68pQWA
9. https://www.youtube.com/watch?v=PHdnrWngzKo
10. https://youtu.be/tmaLT-lV1-0
11. https://www.youtube.com/watch?v=4tnsblfv8y0
12. https://unacademy.com/lesson/preamble/VBQ38VLX

COURSE CURRICULUM

<table>
<tr><td colspan="2">Name of the Program:</td><td colspan="2">B. Pharm</td><td colspan="2">Semester : IV</td><td colspan="2">Level: UG</td></tr>
<tr><td colspan="2">Course Name</td><td colspan="2">Foreign Language-II</td><td colspan="2">Course Code/ Course Type</td><td colspan="2">UFL202A/AEC</td></tr>
<tr><td colspan="2">Course Pattern</td><td colspan="2">2024</td><td colspan="2">Version</td><td colspan="2">1.0</td></tr>
<tr><td colspan="4">Teaching Scheme</td><td colspan="4">Assessment Scheme</td></tr>
<tr><td>Theory</td><td>Practical</td><td>Tutorial</td><td>Total Credits</td><td>Hours</td><td>CIA (Continuous Internal Assessment)</td><td>ESA (End Semester Assessment)</td><td>Practical/ Oral</td></tr>
<tr><td>2</td><td>-</td><td>-</td><td>-</td><td>30</td><td>20</td><td>30</td><td>-</td></tr>
<tr><td colspan="8">Pre-Requisite: Nil</td></tr>
<tr><td colspan="4">Course Objectives (CO):</td><td colspan="4">The objectives of Foreign Language-II (German) are:
1. To get along with a basic vocab.
2. To understand German day to day culture.
3. Can communicate in routine situations.
4. To be able to have a direct exchange of information about familiar matters.
5. To describe own surroundings.</td></tr>
<tr><td colspan="4">Course Learning Outcomes (CLO):</td><td colspan="4">Students would be able to:
1. Communicate in the areas of immediate importance.
2. Able to frame simple sentences in formal conversation.
3. Translate simple sentences from English to the German language and vice-versa.
4. Construct a dialogue, in the German language, for basic human interactions in a social context.
5. Take part in an interaction relating to basic conversation</td></tr>
</table>

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
Kontakte Letter writing and understanding, discussion about language learning, find information from texts, understand conversations on various topics, texts related to office life Grammar – Usage of Articles and Prepositions	**CLO 1**	**05**
UNIT II		
Meine Wohnung Understand home advertisements, describe house, how to reply invitations, how to express 'likes and dislikes', speak about different forms of living, how to write a text on house Grammar – Adjectives	**CLO 2**	**05**
UNIT III		
Alles Arbeit? Talk about daily routine, talk about past, understand job advertisements, understand blogs on jobs, express opinions about jobs, prepare telephonic dialogues, speak about jobs Grammar – Past tense, Sentence connectors	**CLO3**	**05**
UNIT IV		
Kleidung und Mode Speak about cloths and shopping, lead a discussion during cloths shopping, discussion in departmental store, understand and research information about Berlin,Grammar – Seprable and non seprable verbs	**CLO4**	**05**
UNIT V		
Gesund und munter & Ab in den Urlaub Learn body parts, Health related dialogue, City orientation, Travel reports, discussion regarding different travel destinations and weather Grammar – Imperative, Time adverbs	**CLO5**	**05**
Total Hours		**30**

Learning resources
Textbooks:

1. Netzwerk A1, Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd.
2. Studio d A1, Cornelesen Verlag & Goyal Publishers & Distributors Pvt. Ltd.
3. Netzwerk Neu A1, Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd

Reference Books:

1. Hallo Deutsch A1,Ernst Klett Verlag, Goyal Publishers & Distributors Pvt. Ltd
2. Themen Aktuell 1, Hueber verlag
3. Maximal Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd.

Online Resources/E-Learning Resources:

1. https://youtube.com/@LearnGermanwithAnja?si=BkJYDPi7TS0fT4lr
2. https://youtube.com/@deutschlernenmitheidi?si=TkICIabzioaU0roZ
3. instagram.com/learngermanwithanja

COURSE CURRICULUM

Name of the Program:	B. Pham	Semester : IV	Level: UG/PG
Course Name	Foreign Language-II	Course Code/Course Type	UFL202B/AEC
Course Pattern	2024	Version	

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
2	--	--	--	30	50	--	--

Pre-Requisite: Desire to get acquainted with the Japanese language. Basic knowledge of Hiragana and Katakana.

Course Objectives (CO):	The objectives of Foreign Language-II (Japanese) are: 1. To meet the needs of ever growing industry, with respect to language support. 2. To get introduced to Japanese society and culture through language.
Course Learning Outcomes (CLO):	After learning the course, the students will be able to: 1. Katakana Script / Kanji 2. Minna no Nihongo lesson no. 1, 2 & 3 3. Minna no Nihongo lesson no. 4 4. Listen and speak basic conversation with basic particles 5. Speak and write about Routine

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
Katakana Script Katakana Script / Writing Kanji	**CLO 1**	**8**
UNIT II		
System of demonstrative words : Minna no Nihongo lesson no. 1,2 & 3	**CLO 2**	**6**
UNIT III		
Minna no Nihongo lesson no. 4 (Write and Speak basic sentences in correct tenses)	**CLO 3**	**8**
UNIT IV		
Reading : Basic conversation using particles Listening : conversation related to particles Speaking : Sentences about give, lend, teach, receive	**CLO 4**	**4**
UNIT V		
Tenses : Writing : Affirmative present ,past & future Negative present ,past,& future sentences Writing : About Routine	**CLO 5**	**4**
Total Hours		**30**

Learning resources

Textbooks:
1. Minna no Nihongo, "Japanese for everyone", Elementary Main Textbook, Goyal Publishers & Distributors Pvt. Ltd.

Reference books:
1. Shyoho Volume 1

Online Resources/E-Learning Resources:
1. https://youtu.be/1JephUxTHxg?si=ouCwTXZc_fYgY9Kh
2. https://youtu.be/9EfbkBkF2ag?si=rLNzc55_REacMoGu
3. https://youtu.be/DpEolYasgyg?si=dya9ue-YMSHO3VOG
4. https://youtu.be/itccOS1_LSk?si=hvPqILKlviuncMvA

SEMESTER-V
T.Y.B. PHARM

COURSE CURRICULUM

Name of the Program:		**B. Pharm**		**Semester: V**		**Level: UG**	
Course Name		**Medicinal Chemistry-II (Theory)**		**Course Code/ Course Type**		**BP501T/Core**	
Course Pattern		**2024**		**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/ Oral**
3	-	1	4	45	25	75	-
Pre-Requisite:		**Nil**					

Course Objectives (CO):	The objectives of Medicinal Chemistry-II are: 1. To understand the classification, nomenclature and structure activity relationship with respect to them mechanism of actions of various anti-histamines, proton pump inhibitors and antineoplastic agents. 2. To recognise the different chemical aspects along with the synthesis, mode of action, medicinal benefits for various classes of cardiovascular agents viz Diuretics, anti-anginal, calcium channel blockers and other antihypertensive agents. 3. To understand the synthetic methods as well as the basic structural requirements, pharmacophoric features as well as the structural activity relationships for various classes of medicinal agents used as anti-arrhythmic, antihyperlipidemic, coagulants and anticoagulants and drugs used in congestive heart failure. 4. To know the role of hormones, their structure, biological and therapeutic significance. 5. To understand the structural aspects and synthesis of various agents used for the treatment of diabetes and drugs applied in Local anaesthesia.
Course Learning Outcomes (CLO):	Students would be able to: 1. Understand the chemistry of drugs with respect to their pharmacological activity 2. Recognise the drug metabolic pathways, adverse effect and therapeutic value of drugs. 3. Know the Structural Activity Relationship of different classes of drugs. 4. Study the chemical synthesis of selected drugs. 5. Understand synthesis of drugs of different diseases

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	CLO	Hours
UNIT I		
Antihistaminic agents: Histamine, receptors and their distribution in the Human body **H1–antagonists:** Diphenhydramine hydrochloride*, Dimenhydrinate, Doxylamines succinate, Clemastine fumarate, Diphenylpyraline hydrochloride, Tripelennamine hydrochloride, Chlorcyclizine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride*, Phenindamine tartrate, Promethazine hydrochloride*, Trimipramine tartrate, Cyproheptadine hydrochloride, Azatadine maleate, Astemizole, Loratadine, Cetirizine, Levocetirizine Cromolyn sodium **H2-antagonists:** Cimetidine*, Famotidine, Ranitidine. **Gastric Proton pump inhibitors:** Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole **Anti-neoplastic agents:** **Alkylating agents:** Mechlorethamine*, Cyclophosphamide, Melphalan, Chlorambucil, Busulfan, Thiotepa **Antimetabolites:** Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine **Antibiotics:** Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin **Plant products:** Etoposide, Vinblastine sulphate, Vincristine sulphate **Miscellaneous:** Cisplatin, Mitotane.	**CLO1**	**10**
UNIT II		
Anti-anginal: **Vasodilators:** Amyl nitrite, Nitro-glycerine*, Pentaerythritol tetranitrate, Isosorbide dinitrile*, Dipyridamole. **Calcium channel blockers:** Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine. **Diuretics:** Carbonic anhydrase inhibitors: Acetazolamide*, Methazolamide, Dichlorphenamide Thiazides: Chlorothiazide*, Hydrochlorothiazide, Hydro-flumethiazide, 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, Methyldopa hydrochloride, * Clonidine hydrochloride, Guanethidine monocolpate, Guanabenz acetate, Sodium Nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride.	**CLO2**	**10**
UNIT III		
Anti-arrhythmic Drugs: Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcainide hydrochloride, Amiodarone, Sotalol. **Anti-hyperlipidaemic agents**: Clofibrate, Lovastatin, Cholestyramine and Colestipol **Coagulant & Anticoagulants**: Menadione, Acetomenadione, Warfarin*, Anisindione, clopidogrel **Drugs used in Congestive Heart Failure:** Digoxin, Digitoxin, Nesiritide, Bosentan Tezosentan.	**CLO3**	**10**
UNIT IV		
Drugs acting on Endocrine system Nomenclature, Stereochemistry and metabolism of steroids **Sex hormones**: Testosterone, Nandrolone, Progesterone, Oestriol, Oestradiol, Oestrione, Diethyl	**CLO4**	**08**

stilbestrol. **Drugs for erectile dysfunction:** Sildenafil, Tadalafil. **Oral contraceptives:** Mifepristone, Norgestril, Levonorgestrol **Corticosteroids:** Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone **Thyroid and antithyroid drugs**: L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.		
UNIT V		
Antidiabetic agents: Insulin and its preparations Sulfonyl urea: Tolbutamide*, Chlorpropamide, Glipizide, Glimepiride. Biguanides: Metformin. Thiazolidinediones: Pioglitazone, Rosiglitazone. Meglitinides: Repaglinide, Nateglinide.Glucosidase inhibitors: Acarbose, Voglibose. **Local Anaesthetics:** SAR of Local anaesthetics **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. *	**CLO5**	**07**
Total		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning Resource

Text Reading:

1. Medicinal Chemistry, Ashutosh Kar, New Age International Publishers.
2. Textbook of Medicinal Chemistry, Vol-I by V. Alagarsamy, Elsevier Publication.
3. Textbook of Medicinal Chemistry, Vol-II by V. Alagarsamy, Elsevier Publication.
4. Principles of Medicinal Chemistry, Vol-I & Vol. II by S. S. Kadam, K. R. Mahadik, K. G. Bothara

References:

1. An Introduction to Medicinal Chemistry, Graham L. Patrick, Oxford University Press.
2. Foye's Principles of Medicinal Chemistry, Thomas L. Lemke, David A Williams, Lippincott Williams & Wilkins.
3. Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, John M. Beale, John H. Block, Lippincott Williams & Wilkins.
4. Fundamentals of Medicinal Chemistry, Gareth Thomas, Wiley, New York.
5. The Organic Chemistry of Drug Design and Drug Action, Richard B. Silverman, Academic Press.
6. Introduction to Medicinal Chemistry, Alex Garinagu, Wiley.
7. The Organic Chemistry of Drug Synthesis, Daniel Lednicer, Lester A. Mitscher, John Wiley and Sons.
8. Pharmaceutical Chemistry, Volume 1, Organic Synthesis, H. J. Roth & A. Kleemann, Ellis Horwood Series in Pharmaceutical Technology, Halsted Series.
9. Burger's Medicinal Chemistry, Vol I to IV.
10. Introduction to Principles of Drug Design- Smith and Williams.
11. Remington's Pharmaceutical Sciences.
12. Martindale's extra pharmacopoeia.
13. Organic Chemistry by I.L. Finar, Vol. II.
14. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1to 5.
15. Indian Pharmacopoeia.

Online resource/ E-learning resource:

1. https://www.youtube.com/watch?v=CHvrJyuuQnE
2. https://www.youtube.com/watch?v=9Tq0wfHTJ0I
3. https://www.youtube.com/watch?v=0yBfnLnJwY0
4. https://www.youtube.com/watch?v=CpyralKApjE
5. https://www.youtube.com/watch?v=3268YLj9VQE
6. https://www.youtube.com/watch?v=SG8sc2wmkww

COURSE CURRICULUM

Name of the Program:	B. Pharm	Semester: V	Level: UG

Course Name		Industrial Pharmacy -I (Theory)		Course Code/ Course Type		BP502T/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
3	-	1	4	45	25	75	-
Pre-Requisite:		Nil					

Course Objectives (CO):	The objectives of Industrial Pharmacy-I are: 1. To utilize and apply the Preformulation concept in pharmaceutical manufacturing of different dosage forms 2. To comprehend the pharmaceutical manufacturing techniques of tablet and liquid oral dosage form. 3. To study the pharmaceutical manufacturing techniques of capsules and pellets dosage form. 4. To know the pharmaceutical manufacturing techniques of parenteral and ophthalmic dosage form. 5. To understand the pharmaceutical manufacturing techniques of cosmetics, pharmaceutical aerosols with packaging materials science for pharmaceutical products.
Course Learning Outcomes (CLO):	Students would be able to: 1. Utilize and apply the Preformulation concept in pharmaceutical manufacturing of different dosage forms 2. Comprehend the pharmaceutical manufacturing techniques of tablet and liquid oral dosage form. 3. Study the pharmaceutical manufacturing techniques of capsules and pellets dosage form. 4. Know the pharmaceutical manufacturing techniques of parenteral and ophthalmic dosage form. 5. Understand the pharmaceutical manufacturing techniques of cosmetics, Pharmaceutical Aerosols with Packaging Materials Science for pharmaceutical products.

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	CLO	Hours
UNIT I		
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 chemical Properties: Hydrolysis, oxidation, reduction, racemization, 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.	**CLO1**	**07**
UNIT II		
Tablets:	**CLO2**	**10**

a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipment's and tablet tooling. b. Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating. c. Quality control tests: In process and finished product tests Liquid orals: Formulation and manufacturing consideration of syrups and elixirs suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia		
UNIT III		
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, palletization process, equipment's for manufacture of pellets	**CLO3**	**08**
UNIT IV		
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 parenteral 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	**CLO4**	**10**
UNIT V		
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 for containers, stability aspects of packaging materials, quality control tests.	**CLO5**	**10**
Total		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning Resource:

Text Reading:

1. A Text book of Pharmaceuticals Formulation by B.M. Mithal, Vallabh Prakashan.

2. Bentleys' Text book of Pharmaceutics, Editor E.A. Rawlins, Elsevier Int.,
3. History of Pharmacy in India by Dr. Harikishan Singh

References:

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

Online resource/ E-learning resource:

1. https://pharmalibrary.in/b-pharma/sem5/industrial-pharmacy-i/
2. https://www.youtube.com/playlist?list=PLGaz8McLWyIzdeZ7Nuej46iLS1RyJOIPg
3. https://pharmdbm.com/bpharm-1st-2nd-3rd-4th-5th-6th-7th-8th-semester-notes/

COURSE CURRICULUM

Name of the Program:	**B. Pharm**	**Semester: V**	**Level: UG**
Course Name	**Pharmacology-II (Theory)**	**Course Code/ Course Type**	**BP503T/Core**
Course Pattern	**2024**	**Version**	1.0
Teaching Scheme		**Assessment Scheme**	

Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	----	1	4	45	25	75	-

Pre-Requisite: Nil

Course Objectives (CO):	The objectives of Pharmacology-II are: 1. To study the mechanism of drug action and its relevance in the treatment of different cardiovascular disorders. 2. To know the mechanism of drug action and its relevance in the treatment of blood and urinary system disorders. 3. To study the classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of autocoids and related drugs. 4. To comprehend the detailed pharmacology of drugs acting on endocrine system. 5. To understand the basic concepts of bioassays.
Course Learning Outcomes (CLO):	Students would be able to: 1. Apply the knowledge of the mechanism of drug action and its relevance in the treatment of different cardiovascular disorders. 2. Know the mechanism of drug action and its relevance in the treatment of blood and urinary system disorders. 3. Comprehend the classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of autocoids and related drugs. 4. Understand the detailed pharmacology of drugs acting on endocrine system. 5. Study the basic concepts of bioassays.

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	CLO	Hours
UNIT I		
Pharmacology of drugs acting on cardiovascular system disorders Introduction to hemodynamic and electrophysiology of heart. Drugs used in congestive heart failure Anti-hypertensive drugs. Anti-anginal drugs. Anti-arrhythmic drugs. Anti-hyperlipidemic drugs.	**CLO1**	**10**
UNIT II		
Pharmacology of drugs acting on blood and urinary system disorders. Drug used in the therapy of shock. Hematinic, coagulants and anticoagulants. Fibrinolytic and anti-platelet drugs Plasma volume expanders **Pharmacology of drugs acting on urinary system:** Diuretics,Anti-diuretics.	**CLO2**	**10**
UNIT III		
Autocoids and related drugs Introduction to autacoids and classification Histamine, 5-HT and their antagonists. Prostaglandins, Thromboxane and Leukotrienes. Angiotensin, Bradykinin and Substance P.Non-steroidal anti-inflammatory agents Anti-gout drug Santi-rheumatic drugs	**CLO3**	**10**
UNIT IV		
Pharmacology of drugs acting on endocrine system Basic concepts in endocrine pharmacology. Anterior Pituitary hormones- analogues and their inhibitors. Thyroid hormones- analogues and their inhibitors.	**CLO4**	**12**

Hormones regulating plasma calcium level- Parathormone, Calcitonin and Vitamin-D. Insulin, Oral Hypoglycemic agents and glucagon. ACTH and corticosteroids. Androgens and Anabolic steroids. Estrogens, progesterone and oral contraceptives. Drugs acting on the uterus.		
UNIT V		
Bioassay Principles and applications of bioassay. Types of bioassays. Bioassay of insulin, oxytocin, vasopressin, ACTH, d-tubocurarine, digitalis, histamine and 5-HT	**CLO5**	**03**
Total		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning Resource

Text Reading:

1. Bamji, M.S., K. Krishnaswamy & G.N.V. Brahmam (2009) Textbook of Human Nutrition (3rd edition) Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
2. Swaminathan (1995) Food & Nutrition (Vol I, Second Edition) The Bangalore Printing &Publishing Co Ltd.,, Bangalore
3. Vijaya Khader (2000) Food, nutrition & health, Kalyan Publishers, New Delhi
4. Srilakshmi, B., (2010) Food Science, (5th Edition) New Age International Ltd., New Delhi

References:

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

Online resource/ E-learning resource

1. https://www.slideshare.net/slideshow/pharmacology-ii-unit-i-pharmacology-of-drugs-acting-on-cardio-vascular-system/272087165
2. https://www.sciencedirect.com/science/article/abs/pii/B9780323998550000166
3. https://www.slideshare.net/slideshow/pharmacology-of-diureticsantidiuretics/238976172
4. https://www.slideshare.net/slideshow/introduction-to-autacoids-and-classification/250055148
5. https://www.jaypeedigital.com/eReader/chapter/9788180615832/ch7
6. https://www.slideshare.net/slideshow/basic-concept-of-endocrine-pharmacologypptx/264649352
7. https://www.slideshare.net/slideshow/bioassay-vasopressin-digitalis-acth/250858233

COURSE CURRICULUM

Name of the Program:	**B. Pharm**	**Semester: V**	**Level: UG**
Course Name	**Pharmacognosy and Phytochemistry-II (Theory)**	**Course Code/ Course Type**	**BP504T/Core**
Course Pattern	**2024**	**Version**	1.0
Teaching Scheme		**Assessment Scheme**	

Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	1	4	45	25	75	-

Pre-Requisite: Nil

Course Objectives (CO):	The objectives of Pharmacognosy and Phytochemistry-II are: 1. To know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents. 2. To understand the preparation and development of herbal formulation. 3. To study the herbal drug interactions. 4. To understand the isolation and identification of phytoconstituents. 5. To familiarize about the government programs and policies on public health.
Course Learning Outcomes (CLO):	Students would be able to: 1. Deduce metabolic pathways for secondary metabolites 2. Judge source, chemical composition and uses of secondary metabolites 3. Isolate and analyze secondary metabolites 4. Produce and estimate secondary metabolites on large scale 5. Utilize advanced techniques of isolation and analysis of secondary metabolites

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	CLO	Hours
UNIT I		
Metabolic pathways in higher plants and their determination a) Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways- Shikimic acid pathway, Acetate pathways and Amino acid pathway. b) Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.	**CLO**	**07**
UNIT II		
General introduction, composition, chemistry & chemical classes, biosources, therapeutic uses and commercial applications of following secondary metabolites: Alkaloids: Vinca, Rauwolfia, Belladonna, Opium, Phenylpropanoids and Flavonoids: Lignans, Tea, Ruta Steroids, Cardiac Glycosides & Triterpenoids: Liquorice, Dioscorea, Digitalis Volatile oils: Mentha, Clove, Cinnamon, Fennel, Coriander, Tannins: Catechu, Pterocarpus,Resins: Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony,Glycosides: Senna, Aloes, Bitter Almond Iridoids, Other terpenoids & Naphthaquinones: Gentian, Artemisia, taxus, carotenoids	**CLO**	**14**
UNIT III		
Isolation, Identification and Analysis of Phytoconstituents a) Terpenoids: Menthol, Citral, Artemisin b) Glycosides: Glycyrhetinic acid & Rutin c)Alkaloids: Atropine, Quinine, Reserpine, Caffeine d)Resins: Podophyllotoxin, Curcumin	**CLO3**	**06**

UNIT IV		
Industrial production, estimation and utilization of the following phytoconstituents: Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastine	**CLO4**	**10**
UNIT V		
Basics of Phytochemistry Modern methods of extraction, application of latest techniques like Spectroscopy, chromatography and electrophoresis in the isolation, purification and identification of crude drugs.	**CLO5**	**08**
Total		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning Resource:

Text Reading:

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, Gokhale (2007), 37th Edition,
4. Nirali Prakashan, New Delhi.

References:

1. Essentials of Pharmacognosy, Dr. SH. Ansari, IInd edition, Birla publications, New Delhi, 2007
2. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi
3. A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.

Online resource/ E-learning resource:

1. https://www.youtube.com/watch?v=wgCuaLcV_lw
2. https://www.youtube.com/watch?v=wYg-XlWBg9c
3. https://www.youtube.com/watch?v=BFqE_hugQsA
4. https://www.youtube.com/watch?v=7hfj3IXuz2g

COURSE CURRICULUM

Name of the Program:		**B. Pharm**		**Semester: V**		**Level: UG**	
Course Name		**Pharmaceutical Jurisprudence (Theory)**		**Course Code/ Course Type**		**BP505T/Core**	
Course Pattern		**2024**		**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA**	**ESA (End Semester Assessment)**	**Practical/ Oral**

					(Continuous Internal Assessment)		
3	-	1	4	45	25	75	-

Pre-Requisite: **Nil**	
Course Objectives (CO):	The objectives of the Pharmaceutical Jurisprudence are: 1. To understand different implications in the development and marketing of pharmaceuticals. 2. To describe the pharmaceutical education in India and its regulation by the regulatory bodies. 3. To know various Indian Pharmaceutical Acts, Laws and schedule of Drug and cosmetic. & to understand the various concepts of the pharmaceutical legislation in India. 4. To enumerate the various rules and the offences-penalties for contravention of the pharmaceutical legislation in during pharmaceutical practice. 5. To learn the knowledge on schedules and functioning of various committees in the Drug and Cosmetic Act and rules.
Course Learning Outcomes (CLO):	Students would be able to: 1. Identify and explain the significance of major pharmaceutical laws and regulations in India and potentially internationally 2. To be familiar with the roles and functions of regulatory bodies, such as the Drug Controller General of India (DCGI), and other relevant agencies & various schedules 3. Understand the key provisions of licensing, registration, and quality control The education regulations 4. To understand the regulations regarding advertising of drugs and magic remedies. & animal protection & Welfare 5. To know the evolution of pharmacy legislation in India. & to understand the implication of IPR.

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	**CLO**	**Hours**
UNIT I		
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	**CLO1**	**10**

drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license		
UNIT II		
Drugs and Cosmetics Act, 1940 and its rules 1945. Detailed study of Schedule G, H and H1, M, N, P, T, U, V, X, Y, Part XII B, Sch F A) Sale of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties Labeling & Packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties Administration of the Act and Rules – Drugs Technical Advisory Board, Central drugs Laboratory, Drugs Consultative Committee, Government drug analysts, licensing authorities, controlling authorities, Drugs Inspectors	**CLO2**	**10**
UNIT III		
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, Offences and Penalties	**CLO3**	**10**
UNIT IV		
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 Stocking of Animals, Performance of Experiments, Records, Offences and Penalties **National Pharmaceutical Pricing Authority**: Drugs Price Control Order (DPCO) 2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of Essential Medicines (NLEM)	**CLO4**	**08**
UNIT V		
Pharmaceutical Legislations – A brief review of Health survey and development committee, Brief note on 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** – a brief review Introduction to Intellectual Right to Information Act **Property Rights (IPR)** – a brief review	**CLO5**	**07**
Total		**45**

Learning Resource

Text Reading:

1. Forensic Pharmacy by B. Suresh
2. Text book of Forensic Pharmacy by B.M. Mithal
3. Hand book of drug law-by M.L. Mehra
4. A text book of Forensic Pharmacy by N.K. Jain
5. Medicinal and Toilet preparations act 1955 by Govt. of India publications.
6. Narcotic drugs and psychotropic substances act by Govt. of India publications

References:

1. Drugs and Cosmetics Act/Rules by Govt. of India publications.
2. Drugs and Magic Remedies act by Govt. of India publication
3. Bare Acts of the said laws published by Government. Reference books (Theory)

Online resource/ E-learning resource:

1. https://cdsco.gov.in/opencms/opencms/en/Home/
2. https://cdsco.gov.in/opencms/export/sites/CDSCO_WEB/Pdf-documents/acts_rules/2016DrugsandCosmeticsAct1940Rules1945.pdf
3. https://ipindia.gov.in/
4. https://pci.gov.in

COURSE CURRICULUM

Name of the Program:		**B. Pharm**		**Semester: V**		**Level: UG**	
Course Name		**Aptitude and Logical Reasoning**		**Course Code/ Course Type**		**ACALR301/AC**	
Course Pattern		**2024**		**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/ Oral**
2	-	-	-	2	20	30	-
Pre-Requisite:							
Course Objectives (CO):				The objectives of Aptitude and Logical Reasoning are: 1. To Familiarize Students with Different Types of Mathematical Problems. 2. To learn and Strengthen Logical Reasoning Skills. 3. To Develop Critical Thinking Skills. 4. To Improve Quantitative and Numerical Skills. 5. To Prepare Students for Standardized Tests and build Confidence in Problem-Solving.		
Course Learning Outcomes (CLO):				Students would be able to: 1. Students will develop enhanced problem-solving abilities through Exposure to various types of aptitude and logical reasoning problems. 2. Sharpen their analytical thinking skills by learning to analyze and interpret different types of data, patterns, and logical structures. 3. Cultivate critical thinking abilities by challenging students to evaluate and assess information, arguments, and scenarios using logical reasoning principles. 4. Apply different forms of logical reasoning, such as deductive reasoning, inductive reasoning, and critical reasoning, to solve problems and make decisions. 5. Students will be able to develop soft skills and communication skills.		

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	**CLO**	**Hours**
UNIT I		
Quantitative Aptitude: Number System, Problems on Ages, Percentage, Average, Time and Work, Profit and Loss, Permutation and Combination	**CLO 1**	**06**
UNIT II		
Logical Reasoning: Number Series, Letter Series, Coding and Decoding, Calendars, Clocks	**CLO 2**	**06**
UNIT III		

Verbal Reasoning: Subject-Verb Agreement, Preposition and Verbal Analogy, Closet test	**CLO3**	**06**
UNIT IV		
Personality Development: Resilience, Motivation and Listening skills, Self-confidence, Body language, Leadership, Goal setting, Emotional intelligence, Personal growth and development	**CLO 4**	**06**
UNIT V		
Soft Skills and Communication Skills: Introduction to Teamwork, Collaboration and Time Management, Communication Skills, Organization Skills, Introduction to Critical Thinking, Leadership, Negotiation and Presentation Skills, Time Management, Adaptability Skills, Actively listening in conversations, Public speaking, Effectively communicating ideas to others, Introduction to Career Development, Goal Setting, Emotional Intelligence Fundamentals, Building Adaptability and Resilience	**CLO5**	**06**

Learning resources

Text Readings:

1. Quantitative Aptitude for Competitive Examinations, R.S Agarwal, 2017
2. Quantitative Aptitude for All Competitive Examinations by Abhijit Guha, 6th edition, 2016
3. Word Power Made Easy by Norman Lewis, 2023

Reference Books:

The Pearson Guide to Quantitative Aptitude for Competitive Examinations by Dinesh khattar, 2nd Edition

CIA Guidelines

Online Quiz (Based on MCQ)- 20 marks
Activity (with short Report Submission) - 20 Marks
Academic Sincerity - 10 marks

Few of the suggested Activities are Assignments, Debates, Poster presentations, Model making, Group presentation, Field visits and Group Discussions.

COURSE CURRICULUM

Name of the Program:		Foreign Language		Semester : V		Level: UG/PG	
Course Name		Basics of German		Course Code/ Course Type		UFL 301 A	
Course Pattern		2024		Version		1.0/1.1/1.2…	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
2	-	-	-	2	50	-	-
Pre-Requisite: Nil							
Course Objectives (CO):				The objectives of (Basics of German) are: 1. To remember new words and their spellings. 2. To understand the new concepts. 3. To apply the vocab and grammar concepts 4. To analyze the text. 5. To evaluate self-knowledge.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Understand day to day vocabulary. 2. Enhance writing skills in German language. 3. Enhance professional speaking skills of German language. 4. Construct a dialogue, in the German language, for basic human interactions in a social context. 5. Take part in an interaction relating to formal conversation			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
Rund ums Essen Kitchen and cooking, Food habits, Emotions and assumptions Grammar – Possessive articles, reflexive verbs	**CLO 1**	**06**
UNIT II		
Nach der Schulzeit Daily activities and experiences during school time, school subjects, school types Grammar – Changing prepositions	**CLO 2**	**06**
UNIT III		
Medien in Alltag Media, activities in media, film Grammar – Degree of comparison	**CLO3**	**06**
UNIT IV		
Groβe und kleine Gefühle Festivals and celebrations, invitation cards, thanksgiving cards, Grammar – Adjective ending	**CLO4**	**06**
UNIT V		
Was machen Sie beruflich? & Ganz schon mobil	**CLO5**	**06**

Daily activities in the working world, different professions, public transport and travelling towards working place Grammar – Clauses, Modalverbs in past tense		
Total Hours		**30**

Learning resources
Textbooks:

1. Netzwerk A1, Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd.
2. Studio d A1, Cornelesen Verlag & Goyal Publishers & Distributors Pvt. Ltd.
3. Netzwerk Neu A1, Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd

References:
1. Hallo Deutsch A1,Ernst Klett Verlag, Goyal Publishers & Distributors Pvt. Ltd
2. Themen Aktuell 1, Hueber verlag
3. Maximal Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd.

Online Resources/E-Learning Resources:
1. https://youtube.com/@LearnGermanwithAnja?si=BkJYDPi7TS0fT4lr
   https://youtube.com/@deutschlernenmitheidi?si=TkICIabzioaU0roZ
2. Instagram : instagram.com/learngermanwithanja

COURSE CURRICULUM

Name of the Program:	B. Pharm	Semester: V	Level: UG
Course Name	Industrial Pharmacy – I (Practical)	Course Code/ Course Type	BP506P/Core
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	15	-	2	60	15	35	--

Pre-Requisite: Nil

Course Objectives (CO):	The objectives of Tools for Industrial Pharmacy-I practical are: 1. To study the preformulation studies, formulation and evaluation on solid oral dosage form. 2. To study and formulate parenteral dosage form 3. To perform quality control test on marketed dosage form as per pharmacopeial specifications 4. To prepare ophthalmic dosage form, semisolid dosage form 5. To evaluate packing material used for dosage form as per pharmacopeial specifications
Course Learning Outcomes (CLO):	Students would be able to: 1. Perform the pre-formulation studies, formulation and evaluation on solid oral dosage form. 2. Formulate parenteral dosage form 3. Perform quality control test on marketed dosage form as per pharmacopeial specifications 4. Prepare ophthalmic dosage form, semisolid dosage form 5. Evaluate packing material used for dosage form as per pharmacopeial specifications

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)
Practical Plan

Assignment/ Practical/Activity Number	Assignment/Practical/ Activity Title	Week Number/ Turn	Details	CLO	Hour
1	Practical 1: Pre-formulation studies of API	Week 1/Turn1	1.1 To perform Preformulation studies on paracetamol	CLO1	04
2.	Practical 2: Preparation of Paracetamol tablets	Week 2/Turn1	2.1 To Prepare and evaluate Paracetamol tablets	CLO1	04
3.	Practical 3: Preparation of Aspirin tablets	Week 3/Turn1	3.1 To Prepare and evaluate Aspirin tablets	CLO1	04

4	Practical 4: perform Coating of tablets	Week 4/Turn1	4.1 To perform and evaluate Coating of tablets (film coating) of tablets or granules	CLO1	04
5	Practical 5: Preparation of Tetracycline capsules	Week 5/Turn1	5.1 To Prepare and evaluate Tetracycline capsules	CLO1	04
6	Practical 6: Preparation of Calcium Gluconate injection	Week 6/Turn1	6.1 To Prepare and evaluate Calcium Gluconate injection	CLO2	04
7	Practical 7: Preparation of Ascorbic Acid injection	Week 7/Turn1	7.1 To Prepare and evaluate Ascorbic Acid injection	CLO2	04
8	Practical 8: Conduct Quality control of Tablets	Week 8/Turn1	8.1 To perform Quality control test of (as per IP) marketed tablets	CLO3	04
9	Practical 9: Conduct Quality control of Capsule	Week 9/Turn1	9.1 To perform Quality control test of (as per IP) marketed capsules	CLO3	04
10	Practical 10: Conduct Quality control of marketed Liquid	Week 10/Turn1	10.1 To perform Quality control test of (as per IP) marketed liquid oral	CLO3	04
11	Practical 11: Preparation of Eye drops	Week 11/Turn1	11.1 To Prepare and evaluate Eye drops	CLO4	04
12	Practical 12: Preparation of Eye ointments	Week 12/Turn1	12.1 To Prepare and evaluate Eye ointments	CLO4	04
13	Practical 13: Preparation cold cream	Week 13/Turn1	13.1 To Prepare and evaluate cold cream	CLO4	04
14	Practical 14: Preparation vanishing cream	Week 14/Turn1	14.1 To Prepare and evaluate vanishing cream	CLO4	04
15	Practical 15: Conduct Quality control of Glass containers as per IP	Week 15/Turn1	15.1 To perform Evaluation of Glass containers (as per IP)	CLO5	04

Learning resources

Text Book

1. Laboratory Manual of Physical Pharmaceutics, C.V.S. Subramanyam, J. Thimma settee.
2. "A Text Book of Industrial Pharmacy (As Per PCI Syllabus)" by Dr. Patel Mineshkumar Ashvinkumar and Dr. Laxmi Rani.
3. "Industrial Pharmacy-II" by Dr. Ilango K.B., Dr. Vikas Kumar Shukla, and Dr. Sameer H. Lakade..
4. "Industrial Pharmacy-I" by Dr. K.L. Senthil, Dr. Atishkumar S. Mundada, and Dr. Rani Kankate.
5. "Pharmaceutical Engineering: A Textbook (According to PCI Syllabus)" by Prof. Kakasaheb J. Kore, Dr. Pashikanti Shailaja, Prof. (Dr.) Varsha Deva, Mrs. D. Chandrikadevi, and Ms. Jimmy Mayurdhvaj Limbachiya.

Reference Books:

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

Online Resources/E-Learning Resources

1. https://www.youtube.com/watch?v=hk2hFaYCHyA&list=PLQnNyE1lxfVI7MOdKtjyJyxotjCwZ5w5y
2. https://www.youtube.com/watch?v=a23kVT6yaW0
3. https://www.studocu.com/in/document/chitkara-university/physical-pharmacy/med-chem-practicals-notes/61190401

COURSE CURRICULUM

Course Contents/Syllabus
(All the Practical's carry equal weightage in Summative Assessment and equal engagement)
Practical Plan

Name of the Program:	**B. Pharm**	**Semester: V**	**Level: UG**
Course Name	**Pharmacology-II (Practical)**	**Course Code/ Course Type**	**BP507P/Core**
Course Pattern	**2024**	**Version**	1.0

Teaching Scheme				**Assessment Scheme**			
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
-	4	-	2	60	15	35	-

Pre-Requisite:

Course Objectives (CO):	The objectives of Tools for Pharmacology-II are: 1. To study the introduction to experimental pharmacology 2. To demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments. 3. To study the simple/graded bioassay using isolated tissue preparations. 4. To determine the PA_2 and PD_2 value of drugs using isolated tissue preparations. 5. To study the anti-inflammatory/analgesic activity of drugs using different bioassay methods.
Course Learning Outcomes (CLO):	Students would be able to: 1. Study the introduction to experimental pharmacology 2. Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments. 3. Study the simple/graded bioassay using isolated tissue preparations. 4. Determine the PA_2 and PD_2 value of drugs using isolated tissue preparations. 5. Study the anti-inflammatory/analgesic activity of drugs using different bioassay methods.

Assignment/ Practical/ Activity Number	**Assignment/Practical/ Activity Title**	**Week Number/ Turn**	**Details**	**CLO**	**Hours**
1	Practical 1: - Introduction to in-vitro pharmacology	Week1/ Turn 1	1.1To study introduction to in-vitro pharmacology and Physiological Salt solutions	CLO1	04
2	Practical 2: - Effect of drugs on isolated frog heart	Week 2/ Turn 1	2.1. To study the effect of different drugs on isolated frog heart.	CLO2	04
3	Practical 3: Effect of drugs on BP and HR of dog.	Week 3/ Turn 1	3.1 To study the effect of different drugs on blood pressure and heart rate of dog.	CLO2	04
4	Practical 4: Diuretic activity of drugs	Week 4 / Turn 1	4.1 To study the diuretic activity of drugs using rats/mice.	CLO2	04

	using rats/mice				
5	Practical 5: DRC of acetylcholine	Week 5/ Turn 1	5.1 To study the DRC of acetylcholine using frog rectus abdominis muscle.	CLO3	04
6	Practical6: Effect of physostigmine and atropine on DRC of acetylcholine	Week 6/ Turn 1	6.1 To study the effect of physostigmine and atropine on DRC of acetylcholine using frog rectus abdominis muscle and rat ileum respectively	CLO3	04
7	Practical 7: Bioassay of histamine using guinea pig ileum by matching method	Week 7/ Turn 1	7.1 To study the bioassay of histamine using guinea pig ileum by matching method.	CLO3	04
8	Practical 8: Bioassay of oxytocin using rat uterine horn by interpolation method.	Week 8/ Turn 1	8.1 To study the bioassay of oxytocin using rat uterine horn by interpolation method.	CLO3	04
9	Practical 9: Bioassay of serotonin using rat fundus strip by three-point bioassay.	Week 9/ Turn 1	9.1 To study bioassay of serotonin using rat fundus strip by three-point bioassay.	CLO3	04
10	Practical 10: Bioassay of acetylcholine using rat ileum/colon by four-point bioassay.	Week10/ Turn 1	10.1 To study bioassay of acetylcholine using rat ileum/colon by four-point bioassay.	CLO3	04
11	Practical 11: Effect of spasmogens and spasmolytic using rabbit jejunum.	Week 11/ Turn 1	11.1 To study Effect of spasmogens and spasmolytic using rabbit jejunum.	CLO3	04
12	Practical 12: Determination of PA2 value of prazosin	Week12 / Turn 1	12.1 To determine PA2 value of prazosin using rat anococcygeus muscle (by Schilds plot method).	CLO4	04
13	Practical 13: Determination of PD2 value using guinea pig ileum	Week13/ Turn 1	13.1 To determine PD2 value using guinea pig ileum	CLO4	04
14	Practical 14: Anti-inflammatory activity of drugs	Week14/ Turn 1	14.1 To study the anti-inflammatory activity of drugs using carrageenan induced paw-edema model.	CLO5	04
15	Practical 15: Analgesic activity of drug	Week15 / Turn 1	15.1 To study the analgesic activity of drugs using central/peripheral methods.	CLO5	04

Learning resources

Textbooks:

1. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.
2. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
3. Rang and Dale's Pharmacology by Rang H.P., Dale M.M., Ritter J.M., Flower R.J., Churchill Livingstone Elsevier.
4. The Pharmacological Basis of Therapeutics by Goodman and Gilman's, McGraw Hill, USA.

Reference Books:

1. Principles of Pharmacology, Sharma H.L., Sharma K.K., Paras Medical Publisher.
2. Applied Therapeutics: The Clinical Use of Drugs by Marry Anne K. K., Lloyd Yee Y., Brian K.A. Joseph G. B., Wayne A.K., Bradley R.W., The Point Lippincott Williams & Wilkins.
3. Concepts in Chrono pharmacology by N. Udupa and P.D. Gupta

Online Resources/E-Learning Resources:

1. https://www.scribd.com/document/723090717/PHARMACOLOGY-II-LAB-MANUAL7#:~:text=pharmacology%20laboratory%20manual.,It%20outlines%20the%20objectives%20of%20the%20course%20which%20are%20to,organ%20preparations%20and%20animal%20models.
2. https://www.longdom.org/open-access/biological-assay-its-types-applications-and-challenges-103196.html
3. https://www.slideshare.net/slideshow/pa2-determination-84365157/84365157

COURSE CURRICULUM

Name of the	B. Pharm	Semester: V	Level: UG

Program:							
Course Name		Pharmacognosy and Phytochemistry-II (Practical)		Course Code/ Course Type		BP508P/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	4	-	2	60	15	35	-
Pre-Requisite: Nil							
Course Objectives (CO):				Upon completion of the course, the student shall be able 1. To identify the herbal drug by morphology and microscopy 2. To isolate the phytochemicals present in medicinal plants 3. To perform phytochemical analysis by Paper Chromatography 4. To perform phytochemical analysis by Thin layer Chromatography 5. To evaluate unorganized crude drugs by chemical tests		
Course Learning Outcomes (CLO):				Students would be able to: 1. Study the morphology and microscopy of crude drugs. 2. Isolate phytochemicals from plant 3. Separate compounds by paper chromatography 4. Identify and separate compounds by thin layer chromatography 5. Identify unorganized crude drugs by chemical tests			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)
Practical Plan

Assignment/ Practical/ Activity Number	Assignment/Practical/Activity Title	Week Number/ Turn	Details	CLO	Hours
1.	Practical 1: Morphology and microscopy	Week 1/Turn 1	1.1 To study morphology, histology, powder characteristics, extraction & detection of cinchona	CLO1	04
2.	Practical 2: Morphology and microscopy	Week 2/Turn 1	2.1 To study morphology, histology, powder characteristics, extraction & detection of cinnamon	CLO1	04
3.	Practical 3: Morphology and microscopy	Week 3/Turn 1	3.1 To study morphology, histology, powder characteristics, extraction & detection of senna	CLO1	04
4.	Practical 4: Morphology and microscopy	Week 4/Turn 1	4.1 To study morphology, histology, powder characteristics, extraction & detection of clove and ephedra	CLO1	04
5.	Practical 5: Morphology and microscopy	Week 5/Turn 1	5.1 To study morphology, histology, powder characteristics, extraction & detection of fennel	CLO1	04
6.	Practical 6: Morphology and microscopy	Week 6/Turn 1	6.1 To study morphology, histology, powder characteristics, extraction & detection of coriander	CLO1	04
7.	Practical 7: Isolation of compounds	Week 7/Turn 1	7.1 To isolate caffeine - from tea dust	CLO2	04
8.	Practical 8: Isolation of compounds	Week 8/Turn 1	8.1 To isolate diosgenin from Dioscorea	CLO2	04
9.	Practical 9: Isolation of compounds	Week 9/Turn 1	9.1 To isolate atropine from Belladonna	CLO2	04
10.	Practical 10: Isolation of compounds	Week 10/Turn 1	10.1 To isolate sennosides from Senna	CLO2	04
11.	Practical 11: Paper Chromatography	Week 11/Turn 1	11.1 To separate sugars by Paper chromatography	CLO3	04
12.	Practical 12: Thin Layer Chromatography	Week 12/Turn 1	12.1 To carry out TLC of herbal extract and volatile oils	CLO4	04
13.	Practical 13: Chemical tests	Week 13/Turn 1	13.1 To analyze crude drugs by chemical tests: (i) Asafoetida and (ii) Benzoin	CLO5	04
14.	Practical 14: Chemical tests	Week 14/Turn 1	14.1 To analyze crude drugs by chemical tests: (i) Colophony and (ii) Aloes	CLO5	04
15.	Practical 15: Chemical tests	Week 15/Turn 1	15.1 To analyse crude drugs by chemical tests: (v) Myrrh	CLO5	04

Learning resources

Practical Text Book :

1. Khandelwal, K. (2008). Practical pharmacognosy. Pragati Books Pvt. Ltd..
2. Zafar, R., & Gandhi, N. (1994). *Practical Pharmacognosy*. CBS Publishers and Distributors New Delhi
3. Kokate, C. K. (1991). Practical Pharmacognosy. 3rd ed. New Delhi. *Vallabh Prakashan*

Reference Books:

1. Nema RK, Bhan CS. Experimental Pharmacognosy For Students of B Pharm and M Pharm, CBS Publishers and Distributors Pvt.Ltd.
2. Gokhale SB, Kalaskar MG, Kulkarni YS, Yele SU, PHARMACOGNOSY AND PHYTOCHEMISTRY-II, Nirali Prakashan
3. Ikan R. Natural Products: A Laboratory Guide 2nd Edition, ACADEMIC PRESS, INC.

Online Resources/E-Learning Resources:

1. https://www.youtube.com/watch?v=RIbff5iD0GQ
2. https://www.youtube.com/watch?v=vWC8vJ4aZjc
3. https://www.youtube.com/watch?v=ZoGoNDWumbM
4. https://www.youtube.com/watch?v=RMy8AHO10pg

SEMESTER-VI
T.Y.B. PHARM

COURSE CURRICULUM

Name of the Program:	B. Pharm	Semester: VI	Level: UG

Course Name		Medicinal Chemistry-III (Theory)		Course Code/ Course Type		BP601T/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	--	1	4	45	25	75	--
Pre-Requisite:		Nil					

Course Objectives (CO):	The objectives of Medicinal Chemistry-III are: 1. To understand the stereochemistry, SAR of antibiotics. 2. To learn the chemistry of macrolide antibiotics, antimalarial drugs. 3. To know various anti-tubercular drugs, Urinary Tract anti-infective drugs and anti-viral drugs. 4. To comprehend various antifungal antibiotics, anti-protozoal and anthelmintic drugs. 5. To acquire the knowledge of sulphonamide drugs and sulfones
Course Learning Outcomes (CLO):	Students would be able to: 1. Explain the mechanism of action, SAR and stereochemistry of β-Lactam antibiotics, tetracyclines. 2. Elucidate the SAR of macrolides, prodrug concept, etiology of malaria with quinolones and biguanides as anti-malarial drugs 3. Explicate the MOA, structures and SAR of anti-tubercular, UT-anti-infective and antiviral drugs. 4. Understand the link between the structural activity and biological effects, synthesis of antifungal antibiotics, anti-protozoal and anthelmintic drugs 5. Utilize chemistry of drugs with respect to their pharmacological activity reflected with sulphonamides and sulfones as an antibacterial drugs.

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	CLO	Hours
UNIT I		
Antibiotics Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes. **β-Lactam antibiotics:** Penicillin, Cephalosporins, β-Lactamase inhibitors, Monobactams **Aminoglycosides:** Streptomycin, Neomycin, Kanamycin **Tetracyclines:** Tetracycline, Oxytetracycline, Chlortetracycline, Minocycline, Doxycycline	**CLO1**	**10**
UNIT II		
Antibiotics Historical background, Nomenclature, Stereochemistry, Structure activity	**CLO2**	**10**

relationship, Chemical degradation classification and important products of the following classes. **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, Artesunate, Artemether, Atovaquone		
UNIT III		
Anti-tubercular Agents **Synthetic anti tubercular agents:** Isoniazid*, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid. * **Anti-tubercular antibiotics:** Rifampicin, Rifabutin, Cyclomerize Streptomycin, Capreomycin sulphate. **Urinary tract anti-infective agents** **Quinolones:** SAR of quinolones, Nalidixic Acid, Norfloxacin, Enoxacin, Ciprofloxacin*, Ofloxacin, Lomefloxacin, Sparfloxacin, Gemifloxacin, Moxifloxacin **Miscellaneous:** Furazolidone, Nitrofurantoin*, Methenamine. **Antiviral agents:** Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine trifluoride, Acyclovir*, Gancyclovir, Zidovudine, Didanosine, Zalcitabine, Lamivudine, Loviride, Delavirdine, Ribavirin, Saquinavir, Indinavir, Ritonavir.	**CLO3**	**10**
UNIT IV		
Antifungal agents: **Antifungal antibiotics:** Amphotericin-B, Nystatin, Natamycin, Griseofulvin. **Synthetic Antifungal agents:** Clotrimazole, Econazole, Butoconazole, Oxiconazole Tioconazole, Miconazole*, Ketoconazole, Terconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate*. **Anti-protozoal Agents:** Metronidazole*, Tinidazole, Ornidazole, Diloxanide, Iodoquinol, Pentamidine Isethionate, Atovaquone, Eflornithine. **Anthelmintics:** Diethylcarbamazine citrate Thiabendazole, Mebendazole*, Albendazole, Niclosamide, Oxamniquine, Praziquantel, Ivermectin.	**CLO4**	**08**
UNIT V		
Sulphonamides and Sulfones Historical development, chemistry, classification and SAR of Sulphonamides: Sulphathiazole, Sulfisoxazole, Sulphamethizine, Sulfacetamide*, Sulphapyridine, Sulfamethoxazole*, Sulphadiazine, Mafenide acetate, Sulfasalazine. **Folate reductase inhibitors:** Trimethoprim*, Cotrimoxazole. **Sulfones:** Dapsone*.	**CLO5**	**07**
		45

The total 15 tutorials should be conducted as per the format mentioned above

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

Learning Resource:

Text Reading:

1. Wilson and Griswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Introduction to principles of drug design- Smith and Williams.
4. Organic Chemistry by I.L. Finar, Vol. II.
5. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
6. Text book of practical organic chemistry- A. I. Vogel.

References:

1. Burger's Medicinal Chemistry, Vol I to IV.
2. Remington's Pharmaceutical Sciences.
3. Martindale's extra pharmacopoeia.
4. Indian Pharmacopoeia.

Online resource/ E-learning resource:

1. https://www.slideshare.net/slideshow/1-unit-i-introduction-to-medicinal-chemistry/248757762
2. https://www.ramauniversity.ac.in/online-study-material/pharmacy/bpharma/ivsemester/medicinalchemistry-i/lecture-1.pdf
3. https://utkaluniversity.ac.in/wp-content/uploads/2023/03/Unit-I_Intro_Med-Chem-Drug-Metabolism.pdf
4. https://nootanpharmacy.in/public/upload/yGT7VT08kPN4q9DXJXtY7a5QdX2cGfVOHdLMoKt8.pdf
5. https://www.youtube.com/playlist?list=PLGvozyFU10Y7pMHCgGBpfYAtQd93gUlT7
6. https://copbela.org/downloads/2020/SELF%20LEARNING%20MATERIAL%20BPHARMA/semester%204/BP402T/MODULE%2001.pdf
7. https://depthofbiology.com/wp-content/uploads/2024/08/medicinal-chemistry-4-sem-unit-1.pdf
8. https://depthofbiology.com/bpharm-notes/2nd-year-notes/semester-4-notes/bp402t-medicinal-chemistry-i-notes/
9. https://www.chem.uzh.ch/zerbe/MedChem/MedChem1_Intro.pdf

COURSE CURRICULUM

Name of the Program:	**B. Pharm**	**Semester: VI**	**Level: UG**
Course Name	**Pharmacology-III (Theory)**	**Course Code/ Course Type**	**BP602T /Core**

Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
3	-	1	4	45	25	75	--
Pre-Requisite:							
Course Objectives (CO):				The objectives of Pharmacology-III are: 1. To understand the pharmacology of drugs acting on the respiratory and gastrointestinal systems. 2. To learn about the principles of chemotherapy and the pharmacology of various antimicrobial agents. 3. To comprehend the pharmacology of drugs used in the treatment of tuberculosis, leprosy, and other infectious diseases. 4. To appreciate the correlation of pharmacology with related medical sciences, particularly in chemotherapy and immunopharmacology. 5. To comprehend the principles of toxicology, including various types of toxicities and treatment of different poisonings.		
Course Learning Outcomes (CLO):				Students would be able to: 1. Explain the pharmacology of drugs acting on the respiratory and gastrointestinal systems. 2. Analyse the general principles of chemotherapy and the pharmacology of antimicrobial agents. 3. Evaluate the pharmacological properties of drugs used in the treatment of infectious diseases. 4. Analyze the correlation of pharmacology with related medical sciences, particularly in chemotherapy and immunopharmacology, by understanding the role of immunostimulants, immunosuppressants, monoclonal antibodies, and targeted therapies. 5. Apply the principles of toxicology to identify different types of toxicities, including genotoxicity, carcinogenicity, teratogenicity, and mutagenicity, and implement appropriate treatment strategies for poisoning cases.		

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Topics	CLO	Hours
UNIT I		

Pharmacology of drugs acting on Respiratory system: Anti-asthmatic drugs. Drugs used in the management of COPD. Expectorants and antitussives. Nasal decongestants. Respiratory stimulants. Pharmacology of drugs acting on the Gastrointestinal Tract: Antiulcer agents. Drugs for constipation and diarrhea. Appetite stimulants and suppressants. Digestants and carminatives. Emetics and anti-emetics.	**CLO 1**	**10**
UNIT II		
Chemotherapy: General principles of chemotherapy. Sulfonamides and Cotrimoxazole. Antibiotics- Penicillin's, cephalosporin, chloramphenicol, macrolides, quinolones and fluoroquinolones, tetracycline and aminoglycosides.	**CLO 2**	**10**
UNIT III		
Chemotherapy: Antitubercular agents. Antileprotic agents. Antifungal agents. Antiviral drugs. Anthelmintic. Antimalarial drugs. Ant amoebic agents.	**CLO 3**	**10**
UNIT IV		
Chemotherapy: Urinary tract infections and sexually transmitted diseases. Chemotherapy of malignancy. **Immunopharmacology:** Immunostimulants. Immunosuppressant. Protein drugs, monoclonal antibodies, target drugs to antigen, biosimilar.	**CLO 4**	**08**
UNIT V		
Principles of toxicology: Definition and basic knowledge of acute, sub-acute and chronic toxicity. Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity. General principles of treatment of poisoning. Clinical symptoms and management of barbiturates, morphine, and organophosphosphorus compound and lead, mercury and arsenic poisoning. **Chrono pharmacology:** Definition of rhythm and cycles. Biological clock and their significance leading to chronotherapy.	**CLO 5**	**07**
Total Hours		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning resources

Text reading

1. Rang and Dale's Pharmacology by Rang H.P., Dale M.M., Ritter J.M., Flower R.J., Churchill Livingstone Elsevier.
2. The Pharmacological Basis of Therapeutics by Goodman and Gilman's, McGraw Hill, USA.
3. Essentials of Medical Pharmacology by K.D. Tripathi, Jaypee Brothers Medical Publishers

4. Basic and Clinical Pharmacology by Katzung B.G., Masters S.B., Trevor A.J., Tata McGrawHill.

References

1. Principles of Pharmacology, Sharma H.L., Sharma K.K., Paras Medical Publisher.
2. Applied Therapeutics: The Clinical Use of Drugs by Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A.K., Bradley R.W., The Point Lippincott Williams & Wilkins.
3. Udupa and P.D. Gupta, Concepts in Chrono pharmacology

Online Resources/E-Learning Resources

1. https://www.saetw.org/ebooks/biomicro/252.pdf
2. https://uomustansiriyah.edu.iq/media/lectures/3/3_2021_09_18!09_48_55_AM.pdf
3. https://www.sth.nhs.uk/clientfiles/File/chemo%20for%20study%20day%20finshed_.pdf
4. https://eprints.gla.ac.uk/209178/1/209178.pdf
5. https://chemm.hhs.gov/toxprinciples.htm
6. https://pmc.ncbi.nlm.nih.gov/articles/PMC8624108/

COURSE CURRICULUM

Name of the Program:	B. Pharm	Semester: VI	Level: UG
Course Name	Herbal Drug Technology	Course Code/ Course Type	BP603T/Core

		(Theory)					
Course Pattern		**2024**		**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
3	-	1	4	45	25	75	-
Pre-Requisite: Nil							
Course Objectives (CO):				The objectives of Herbal Drug Technology are: 1. To know the herbs as raw material for production of herbal medicine 2. To know the significance of nutraceuticals and determine the herb-drug interaction 3. To understand the production of herbal cosmetics 4. To evaluate herbal drugs and generate IPRs 5. To know current and future scenario of herbal industries and manufacturing as per GMP		
Course Learning Outcomes (CLO):				Students would be able to: 1. Understand the use of sources of herbs which are used as raw material for herbal medicines 2. Know the importance of nutraceuticals and determine the herb-drug interaction 3. Study the formulation of herbal cosmetics using herbal excipients 4. Know patenting and Regulatory requirements for herbal medicine 5. Know working of GMP listed herbal industries and institutions		

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	**CLO**	**Hours**

UNIT I		
Herbs as raw materials: Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation **Source of Herbs:** Selection, identification and authentication of herbal materials Processing of herbal raw material: Biodynamic Agriculture Good agricultural practices in cultivation of medicinal plants including Organic farming. Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides. **Indian Systems of Medicine** a) Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy b) Preparation and standardization of Ayurvedic formulations viz Aristas and Asawa, Ghutika, Churna, Lehya and Bhasma.	**CLO1**	**11**
UNIT II		
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: Alfalfa, 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: Hypericum, kava-kava, Ginobili, Ginseng, Garlic, Pepper & Ephedra.	**CLO2**	**07**
UNIT III		
Herbal Cosmetics: Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colors, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products **Herbal Excipients** – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes. **Herbal formulations**: Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes	**CLO3**	**10**
UNIT IV		
Evaluation of Drugs WHO & ICH guidelines for the assessment of herbal drugs Stability testing of herbal drugs. **Patenting and Regulatory requirements of natural products:** a) Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting and Biopiracy b) Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma & Neem. **Regulatory Issues** - Regulations in India (ASU DTAB, ASU DCC), Regulation of manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs	**CLO4**	**10**
UNIT V		
General Introduction to Herbal Industry Herbal drugs industry: Present scope and future prospects. A brief account of plant-based industries and institutions involved in work on medicinal and aromatic plants in India. **Schedule T – Good Manufacturing Practice of Indian systems of medicine** Components of GMP (Schedule – T) and its objectives, Infrastructural requirements, working space, storage area, machinery and equipment, standard operating procedures, health and hygiene, documentation and records.	**CLO5**	**07**
Total		**45**

Learning Resource:

Text Reading:

1. Pharmacognosy by Kokate, Purohit and Gokhale
2. Textbook of Pharmacognosy by Trease & Evans.

3. Text Book of Pharmacognosy by T. E. Wallis. CBS Publishers & Distributors Pvt. Ltd

References:

1. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals.
2. Business Horizons Publishers, New Delhi, India, 2002.
3. Pharmacopeial standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy)
4. Anatomy of crude drugs by M. A. Iyengar, Manipal Press Ltd, Manipal

Online resource/ E-learning resource:

1. https://www.researchgate.net/publication/262915156_Guidelines_for_Inspection_of_GMP_compliance_by_Ayurvedic_Siddha_and_Unani_Drug_Industry
2. https://jrespharm.com/uploads/pdf/pdf_MPJ_279.pdf
3. https://www.researchgate.net/publication/12640585_Herb-Drug_Interactions

COURSE CURRICULUM

Name of the Program:	B. Pharm	Semester: VI	Level: UG
Course Name	Biopharmaceutics and Pharmacokinetics (Theory)	Course Code/ Course Type	BP604T/Core
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
3	-	1	4	45	25	75	-

Pre-Requisite: **Nil**	
Course Objectives (CO):	The objectives of Biopharmaceutics and Pharmacokinetics are: 1. To learn about bioavailability, bioequivalence and factor affecting bioavailability. 2. To learn about the pharmacokinetic parameter like drug disposition, absorption, nonlinear and time dependent pharmacokinetics. 3. To understand about the drug interactions & problems, 4. To study multi-compartmental models and calculations. 5. To study non-linear pharmacokinetic parameters to describe the kinetics of drug.
Course Learning Outcomes (CLO):	Students would be able to: 1. Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance. 2. Study pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination. 3. Understand the concepts of bioavailability and bioequivalence of drug products and their significance. 4. Calculate loading and maintenance doses. 5. Apply the non-linear pharmacokinetic parameters to describe the kinetics of drug.

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	CLO	Hours
UNIT I		

Introduction Biopharmaceutics **Absorption;** Mechanisms of drug absorption through GIT, factors influencing drug absorption though GIT, absorption of drug from Non per oral extra-vascular routes. **Distribution:** Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting protein-drug binding. Kinetics of protein binding, Clinical significance of protein binding of drugs	**CLO1**	**10**
UNIT II		
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 **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.	**CLO2**	**10**
UNIT III		
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.	**CLO3**	**10**
UNIT IV		
Multi-compartment models: Two compartment open model. IV bolus Kinetics of multiple dosing, steady state drug levels, calculation of loading and maintenance doses and their significance in clinical settings	**CLO4**	**08**
UNIT V		
Nonlinear Pharmacokinetics: a. Introduction, b. Factors causing non-linearity. c. Michaelis-Menton method of estimating parameters, Explanation with example of drugs	**CLO5**	**07**
Total		**45**

Learning Resource:

Text reading:

1. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B. Jaiswal, Vallabh Prakashan Pitampura, Delhi
2. Current concepts in the Pharmaceutical Sciences 'Biopharmaceutics James Swarbrick, Lea & Febiger, Philadelphia
3. Clinical Pharmacokinetics, Concepts and Applications: By Malcolm Rowland

References:

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 International edition. USA
4. By Milo Glbaldi Donald, R. Marcel Dekker Inc.
5. Thomas, N. Tozen, Lea and Febrger, Philadelphia, 1995.
6. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company, Pharmacokinetics Pennsylvania

Online resource/ E-learning resource:

1. Biopharmaceutics-and-pharmacokinetics | EasyPharma Notes
2. Biopharmaceutics And Clinical Pharmacokinetics By Milo Gibaldi
3. Biopharmaceutics and Pharmacokinetics
4. Biopharmaceuticsand pharmacokinetics ppt | PPT

COURSE CURRICULUM

Name of the Program:	**B. Pharm**	**Semester: VI**	**Level: UG**

Course Name		Pharmaceutical Biotechnology (Theory)		Course Code/ Course Type		BP605T/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	1	4	45	25	75	-
Pre-Requisite: Nil							

Course Objectives (CO):	The objectives of Pharmaceutical Biotechnology are: 1. To understand the principle of biotechnology 2. To understand importance of immobilized enzymes in pharmaceutical industries. 3. To study application of genetic engineering in relation to production of pharmaceuticals 4. To know the theoretical concepts of genetic engineering and protein engineering 5. To understand theoretical concepts of fermentation technology
Course Learning Outcomes (CLO):	Students would be able to: 1. Understanding the principle of biotechnology 2. Genetic engineering applications in relation to production of pharmaceuticals 3. Importance of Monoclonal antibodies in Industries 4. Appreciate the use of microorganisms in fermentation technology 5. Importance of Immobilized enzymes in Pharmaceutical Industries

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	CLO	Hours
UNIT I		
Brief introduction to Biotechnology with reference to Pharmaceutical Sciences. **Enzyme Biotechnology**- Methods of enzyme immobilization and applications. **Biosensors-** Working and applications of biosensors in Pharmaceutical Industries. **Brief introduction to Protein Engineering.** Use of microbes in industry. **Production of Enzymes**- General consideration Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase. Basic principles of genetic engineering	**CLO1**	**10**
UNIT II		
Study of cloning vectors, restriction endonucleases and DNA ligase. Recombinant DNA technology. Application of genetic engineering in medicine. 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	**CLO2**	**10**
UNIT III		
Types of immunity- humoral immunity, cellular immunity	**CLO3**	**10**

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 vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity. e) Storage conditions and stability of official vaccines f) Hybridoma technology- Production, Purification and Applications g) Blood products and Plasma Substitutes		
UNIT IV		
Immune blotting techniques- ELISA, Western blotting, Southern blotting. Genetic organization of Eukaryotes and Prokaryotes. Microbial genetics including transformation, transduction, conjugation, plasmids and transposons. Introduction to Microbial biotransformation and applications. Mutation: Types of mutation/mutants.	**CLO4**	**08**
UNIT V		
Fermentation methods and general requirements, study of media, equipment, sterilization methods, aeration process, stirring. Large scale production fermenter design and its various controls. Study of the production of- penicillin, citric acid, Vitamin B12, Glutamic acid, Griseofulvin, Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma substitutes.	**CLO5**	**07**
Total		**45**

Learning Resource:

Text Reading:

1."Textbook of Pharmaceutical Biotechnology" by Kokate
2."Biotechnology and Its Applications In Pharmacy" by Kulkarni
3. "Pharmaceutical Biotechnology" by S P Vyas.

Reference:

1. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of Recombinant DNA: ASM Press Washington D.C.
2. RA Golds yet. 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.
5. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication.
6. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi

Online resource/ E-learning resource

1. https://www.bing.com/search?q=pharmaceutical+biotechnology&qs=AS&pq=pharmaceutical+bi&sk=AS1&sc=12-17&cvid=C8FF9E73FAB14AE9A401B5D68116D0B3&FORM=QBRE&sp=2&ghc=1&lq=0
2. Pharmaceutical Biotechnology : Unit 1 Notes : Bpharm
3. https://youtu.be/LCC43WLLVD0
4. Introduction to Pharmaceutical Biotechnology | Request PDF

COURSE CURRICULUM

Name of the Program:	**B. Pharm**	**Semester: VI**	**Level: UG**
Course Name	**Quality Assurance (Theory)**	**Course Code/ Course Type**	**BP606T/Core**

Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	1	4	45	25	75	-
Pre-Requisite:							
Course Objectives (CO):				The objectives of Pharmaceutical Quality Assurance are: 1. To understand the quality assurance, quality management, ICH guidelines along with the concepts of QbD, cGMP, ISO and NABL used in the industry 2. To study the organization, personnel, premises, equipment's and raw materials. 3. To analyze quality control parameters and good laboratory practices. 4. To study the complaints and document maintenance in industry. 5. To know calibration, validation and warehousing practices			
Course Learning Outcomes (CLO):				Upon completion of the course student shall be able to: 1. Understand the quality assurance, quality management, ICH guidelines along with the concepts of QbD, cGMP, ISO and NABL used in the industry 2. Study the organization, personnel, premises, equipment's and raw materials. 3. Analyze quality control parameters and good laboratory practices. 4. Evaluate the complaints and document maintenance in industry. 5. Elaborate on calibration, validation and warehousing practices			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	CLO	Hours
UNIT I		
Quality Assurance and Quality Management concepts: Definition and concept of Quality control, Quality assurance and GMP	**CLO1**	**10**

Total Quality Management (TQM): Definition, elements, philosophies **ICH Guidelines**: purpose, 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		
UNIT II		
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. **Equipment's and raw materials:** Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials	**CLO2**	**10**
UNIT III		
Quality Control: Quality control test for containers, rubber closures and secondary packing material **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	**CLO3**	**10**
UNIT IV		
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.	**CLO4**	**8**
UNIT V		
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	**CLO5**	**7**
Total		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning Resource:

Text Reading:

1. A Textbook of Pharmaceutical Quality Assurance Shourya Pratap Hakim Singh Rajput, Dr. N. Trilochna, Santosh Shukla
2. A Textbook of Pharmaceutical Quality Assurance
3. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.

References:

1. Quality Assurance Guide by organization of Pharmaceutical Products of India.
2. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69.
3. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Related materials Vol I WHO Publications.
4. A guide to Total Quality Management- Kaushik Maitra and Sedhan K Ghosh
5. How to Practice GMP's – P P Sharma.
6. ISO 9000 and Total Quality Management – Sadhank G Ghosh

Online resource/ E-learning resource:

1. https://www.ich.org/page/ich-guidelines
2. https://pmc.ncbi.nlm.nih.gov/articles/PMC4070262/
3. https://www.sciencedirect.com/science/article/pii/S2949866X23000953

COURSE CURRICULUM

Name of the Program:	B. Pharm	Semester: VI	Level: UG
Course Name	Artificial Intelligence in	Course Code/ Course Type	ACAIP301/AC

		Pharmaceuticals					
Course Pattern		**2024**		**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
2	-	-	-	2	20	30	-
Pre-Requisite:		**Nil**					
Course Objectives (CO):				The objectives of Artificial Intelligence in Pharmaceuticals are: 1. To study the introduction to the basic principles, techniques, and applications of Artificial Intelligence and Machine Learning. 2. To know the knowledge of AI and machine learning basics, applications and case studies. 3. To study the role of AI and ML in pharmacy. 4. To understand the theoretical models, and use-cases of AI and ML. 5. To know the fundamental programming application of AI and ML in pharma datasets, statistical and probabilistic analysis.				
Course Learning Outcomes (CLO):				Students would be able to: 1. Understand the fundamental principles of Artificial Intelligence and AI agents. 2. Study the introduction to Searching. 3. Evaluate the Knowledge representation issues. 4. Understand the introduction to Machine Learning. 5. Enable to understand the Machine Learning and Medical bio-sensors.			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLOs	Hrs
Unit I		
Introduction to Artificial Intelligence: AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of	**CLO1**	**06**

agents, problem solving agents, problem formulation.		
Unit II		
Introduction to Searching: Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A*, AO* Algorithms, Problem reduction.	**CLO2**	**06**
Unit III		
Knowledge representation issues: Predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules-based deduction systems.	**CLO3**	**06**
Unit IV		
Introduction to Machine Learning: Introduction, Types of Machine Learning, Supervised, Unsupervised, Reinforcement learning and Transfer Learning, Applications, Classification vs Prediction Problems, Regression models (Prediction Problem), Mean Square Error, R2 Score, Rule-based machine learning (Association Learning).	**CLO4**	**06**
Unit V		
Machine Learning and Medical bio-sensors: ML in micro biosensors and devices for electronic data capture (ECG, Actigraphy, Oximetry), data disambiguation techniques, Bayesian ML, SVM-optimal mix, Shallow learning, Ensemble Learning, anomaly detection.	**CLO5**	**06**
Total Hours		**30**

Learning Resource :

Text Reading:

1. Russell, Norvig, Arti_cial Intelligence: A Modern Approach, Third edition, Prentice Hall, 2010
2. Hastie, Tibshirani, Friedman. The elements of statistical learning, Second edition, Springer, 2009
3. Tsang. Foundations of constraint satisfaction, Academic press, 1993.

References:

1. Daphne Koller and Friedman. Probabilistic Graphical Models - Principles and Techniques. The MIT Press, 2009.
2. Machine Learning with R: Expert techniques for predictive modeling, by Brett Lantz, 3rd Edition.
3. Hands-on programming with R: Write your own functions and simulations by Garrett Grolemund, 2014.
4. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education.
5. David Poole, Alan Mackworth, Randy Goebel," Computational Intelligence: a logical approach", Oxford University Press.
6. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education.
7. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.

Online resource/ E-learning resource

1. https://tevgeniou.github.io/FoundationsML/index.html

CIA Guidelines

- Online Quiz (Based on MCQ)- 20 marks
- Activity (with short Report Submission) - 20 Marks
- Academic Sincerity - 10 marks

Few of the suggested activities are Assignments, Debates, Group presentation, and Group discussions.

Few of suggested topics related to IKS-Indian Health System: Debate, Activity & Assignment

COURSE CURRICULUM

Course Contents/Syllabus:

Name of the Program:		**Foreign Language**		**Semester: VI**		**Level: UG/PG**	
Course Name		**Basics of German**		**Course Code/ Course Type**		UFL 302 A	
Course Pattern		**2024**		**Version**		1.0/1.1/1.2…	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
2	-	-	-	2	-	-	-
Pre-Requisite:	**Nil**						
Course Objectives (CO):				The objectives of (Basics of German) are: 1. To remember new words and their spellings. 2. To understand the new concepts. 3. To apply the vocab and grammar concepts 4. To Analyse the text. 5. To Evaluate self -knowledge. &To Design and create texts in German			
Course Learning Outcomes (CLO):				Students would be able to: 1. Understand new vocabulary terms. 2. Enhance expression skills in German language. 3. Enhance professional speaking skills of German language. 4. Construct a dialogue, in the German language, for basic human interactions in a social context. 5. Take part in an interaction relating to formal conversation			

(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	**CLO**	**Hours**
UNIT I		
Gelernt ist gelernt Different learning problems, exams and presentations Grammar – KII, Genetive	**CLO 1**	**06**
UNIT II		
Sportlich sportlich Different sport activities, connection between sport and different emotions, Grammar – deshalb and trotzdem	**CLO 2**	**06**
UNIT III		
Zusammen leben Conflicts in an apartment, living in different types and living with pets.Grammar – Connectors (als and wenn)	**CLO3**	**06**
UNIT IV		
Gute unterhaltung Describe a picture, discussion on different music styles Grammar – Interrogative articles	**CLO4**	**06**

UNIT V		
Wie die Zeit vergeht! & Typisch, oder? Express different wishes, write a story, speak about proverbs, speak about cliche Grammar – Relative sentences	**CLO5**	**06**
Total Hours		**30**

Learning resources:

Textbooks:

1. Netzwerk A1, Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd.
2. Studio d A1, Cornelesen Verlag & Goyal Publishers & Distributors Pvt. Ltd.
3. Netzwerk Neu A1, Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd

Reference Books:

1. Hallo Deutsch A1,Ernst Klett Verlag, Goyal Publishers & Distributors Pvt. Ltd
2. Themen Aktuell 1, Hueber verlag
3. Maximal Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd.

Online Resources/E-Learning Resources:

1. https://youtube.com/@LearnGermanwithAnja?si=BkJYDPi7TS0fT4lr
2. https://youtube.com/@deutschlernenmitheidi?si=TkICIabzioaU0roZ
3. instagram.com/learngermanwithanja

COURSE CURRICULUM

Name of the Program:	B. Pharm	Semester: VI	Level: UG
Course Name	Medicinal Chemistry-III (Practical)	Course Code/ Course Type	BP607P/Core
Course Pattern	2024	Version	1.0

Teaching Scheme				Assessment Scheme			
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
--	4	--	2	60	15	35	-

Pre-Requisite:	
Course Objectives (CO):	The objective of tools for Medicinal Chemistry-III are- 1. Synthesize of drugs and drug intermediates using appropriate synthetic methods. 2. Estimation of different types of drugs by using quantitative methods of analysis. 3. Illustration of the chemical structures of compounds using computational tools 4. Identification of the purity of the drugs. 5. Prediction of physicochemical properties using some software
Course Learning Outcomes (CLO):	Students would be able to: 1. Synthesize different drug intermediates and drugs 2. Perform the assay and identify purity of given drug sample. 3. Prepare medicinally important compounds using microwave radiation technique. 4. Draw the structures in software like chemdraw. 5. Determine physicochemical properties of drugs using Lipinski Rule of 5.

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Practical Plan

Assignment/ Practical/ Activity Number	Assignment/Practical/ Activity Title	Week Number/ Turn	Details	CLO	Hours
1	Practical 1: Synthesis of medicinal compound	Week 1/Turn 1	1.1 To synthesize sulfanilamide from aniline	**CLO1**	**04**

2.	Practical 2: Synthesis of medicinal compound	Week 2 /Turn 1	2.1To synthesize 4-Hydroxy, 4-methyl coumarin from resorcinol	**CLO1**	**04**
3.	Practical 3: Synthesis of medicinal compound	Week 3 /Turn 1	3.1 To synthesize chlorobutanol from acetone and chloroform	**CLO1**	**04**
4	Practical 4: Synthesis of medicinal compound	Week 4 /Turn 1	4.1 To synthesize Triphenyl imidazole (2, 4, 5-triphenyl imidazole) from benzil.	**CLO1**	**04**
5	Practical 5: Synthesis of medicinal compound	Week 5 /Turn 1	5.1 To synthesize Tolbutamide from toluene sulfonamide and butyl isocyanates.	**CLO1**	**04**
6	Practical 6: Synthesis of medicinal compound	Week 6 /Turn 1	6.1 To synthesize Hexamine from formaldehyde.	**CLO1**	**04**
7	Practical 7: Assay of drug	Week 7 /Turn 1	7.1 To perform assay of Isoniazid	**CLO2**	**04**
8	Practical 8: Assay of drug	Week 8 /Turn 1	8.1 To perform assay of Chloroquine Phosphate	**CLO2**	**04**
9	Practical 9: Assay of drug	Week 9 /Turn 1	9.1 To perform assay of Metronidazole.	**CLO2**	**04**
10	Practical 10: Assay of drug	Week 10 /Turn 1	10.1 To perform assay of Dapsone.	**CLO2**	**04**
11	Practical 11: Assay of drug	Week 11/Turn 1	11.1 To perform assay of Chlorpheniramine Maleate	**CLO2**	**04**
12	Practical 12: Assay of drug	Week 12/Turn 1	12.1 To perform assay of Benzyl penicillin Potassium	**CLO2**	**04**
13	Practical 13: Synthesis of Medicinal Compounds	Week 13 / Turn 1	13.1 Synthesis of Phenytoin (5, 5-diphenyl hydantoin)/ 3H-Quinazolin-4-one / Tetrahydro pyrimidine/Thiopyrimidine by microwave irradiation technique.	**CLO3**	**04**
14	Practical 14: Study using Cheminformatics	Week 14/ Turn 1	14.1 To draw the structures of class of drugs given in course	**CLO4**	**04**
15	Practical 15: Study using Cheminformatics	Week 15 / Turn 1	15.1 To determine physicochemical parameter of given Antibiotic and Antimalarial drugs using cheminformatics	**CLO5**	**04**

Learning resources:

Reference Books:

1. 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.

Practical Text Book

1. Remington's Pharmaceutical Sciences.
2. Martindale's extra pharmacopoeia.
3. Organic Chemistry by I.L. Finar, Vol. II.
4. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
5. Indian Pharmacopoeia.
6. Text book of practical organic chemistry- A. I. Vogel.

Online Resources/E-Learning Resources:

1. https://www.hrpatelpharmacy.co.in/files/manuals/MANUAL-BOOK-HTJ.pdf
2. https://mlrip.ac.in/wp-content/uploads/2022/03/MEDICINAL-CHEMISTRY-III-LAB-MANUAL.pdf
3. https://www.scribd.com/document/619130843/Med-Chem-III-Lab-Manual-1
4. https://smillingpharmacy.com/bp406p-medicinal-chemistry-iii-lab-manual/

COURSE CURRICULUM

Name of the Program:		B. Pharm		Semester: VI		Level: UG	
Course Name		Pharmacology-III (Practical)		Course Code/ Course Type		BP608P/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme				Assessment Scheme			
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
-	4	-	2	60	15	35	-
Pre-Requisite:							

Course Objectives (CO):	The objectives of Tools for Pharmacology-III are: 1. To understand the fundamentals of experimental pharmacology, including dose calculation and the use of laboratory instruments. 2. To demonstrate the ability to evaluate drug effects on various physiological systems, including gastrointestinal motility, mast cell stabilization, and hypoglycemic activity. 3. To analyze and interpret biochemical and physiological responses induced by different drugs using analytical techniques. 4. To assess toxicity and safety parameters, including acute oral toxicity, skin and eye irritation, and pyrogenicity, in experimental models. 5. To apply biostatistical methods such as Student's t-test, ANOVA, Chi-square test, and Wilcoxon Signed Rank test for data analysis and validation in experimental pharmacology.
Course Learning Outcomes (CLO):	Students would be able to: 1. Understand the fundamentals of experimental pharmacology, including dose calculation and the use of laboratory instruments. 2. Demonstrate the ability to evaluate drug effects on various physiological systems, including gastrointestinal motility, mast cell stabilization 3. Analyze and interpret biochemical and physiological responses induced by different drugs using analytical techniques. 4. Assess toxicity and safety parameters, including acute oral toxicity, skin and eye irritation 5. Apply biostatistical methods such as Student's t-test, ANOVA, Chi-square test, and Wilcoxon Signed Rank test for data analysis and validation in experimental pharmacology.

Course Contents/Syllabus
(All the Practical's carry equal weightage in Summative Assessment and equal engagement)

Practical Plan

Assignment /Practical/ Activity Number	Assignment/Practical/ Activity Title	Week Number/ Turn	Details	CLO	Hours
1	Practical 1: - Dose calculation	Week1/ Turn 1	1.1To study dose calculation in Pharmacological experiments	**CLO1**	**04**
2	Practical 2: - Calculation of pharmacokinetic parameters	Week2/Tu rn1	2.1. To calculate pharmacokinetic parameters from a given data	**CLO1**	**04**
3	Practical 3: Antiallergic activity	Week 3/ Turn 1	3.1 To study Anti-allergic activity by mast cell stabilization assay	**CLO2**	**04**
4	Practical 4: anti-ulcer activity	Week 4/ Turn 1	4.1 To study anti-ulcer activity of a drug using pylorus ligand (SHAY) rat model and NSAIDS induced ulcer model.	**CLO2**	**04**
5	Practical 5: gastrointestinal motility.	Week 5 / Turn 1	5.1 To study the effect of drugs on gastrointestinal motility.	**CLO2**	**04**
6	Practical 6: Effect of agonist and antagonists	Week 6/ Turn 1	6.1 To study the effect of agonist and antagonists on Guinea pig ileum.	**CLO2**	**04**
7	Practical 7: Estimation of serum biochemical parameters	Week 7/ Turn 1	7.1 To study the estimation of serum biochemical parameters by using semi-autoanalyser.	**CLO3**	**04**
8	Practical 8: saline purgative effect	Week 8/ Turn 1	8.1 To Study the effects of saline purgative on frog intestine.	**CLO3**	**04**
9	Practical 9: Insulin hypoglycemic effect in rabbit.	Week 9/ Turn 1	9.1 To study Insulin hypoglycemic effects in rabbit	**CLO3**	**04**
10	Practical 10: pyrogens Test	Week 10/ Turn 1	10.1 To study test for pyrogens (Rabbit method)	**CLO4**	**04**
11	Practical 11: acute oral toxicity (	Week 11/Turn 1	11.1 To determine acute oral toxicity (LD50) of a drug from given data To determine acute oral toxicity (LD50) of a drug from given data	**CLO4**	**04**
12	Practical 12: acute skin irritation / corrosion of a test substance.	Week 12 / Turn 1	12.1 To Determination of acute skin irritation/corrosion of a test substance.	**CLO4**	**04**
13	Practical 13: acute eye irritation / corrosion of a test substance.	Week13 / Turn 1	13.1 To Determination of acute eye irritation/corrosion of a test substance	**CLO4**	**04**
14	Practical 14: Biostatistics methods in experimental	Week14/ Turn 1	14.1 To study the Biostatics methods in experimental	**CLO5**	**04**

	pharmacology		pharmacology (Student's t test, ANOVA).		
15	Practical 15: Biostatistics methods in experimental pharmacology	Week15 / Turn 1	15.1 To study the Biostatics methods in experimental pharmacology (Chi square test, Wilcoxon Signed Rank test).	**CLO5**	**04**
Total					**60**

Learning resources

Textbooks:

1. Rang and Dale's Pharmacology by Rang H.P., Dale M.M., Ritter J.M., Flower R.J., Churchill Livingstone.
2. The Pharmacological Basis of Therapeutics by Goodman and Gilman's, McGraw Hill, USA.
3. Essentials of Medical Pharmacology by K.D. Tripathi, Jaypee Brothers Medical Publishers
4. Basic and Clinical Pharmacology by Katzung B.G., Masters S.B., Trevor A.J., Tata McGrawHill.

Reference Books:

1.Principles of Pharmacology, Sharma H.L., Sharma K.K., Paras Medical Publisher.
2. Applied Therapeutics: The Clinical Use of Drugs by Marry Anne K. K., Lloyd Yee Y., Brian K. A., Joseph G. B., Wayne A.K., Bradley R.W., The Point Lippincott Williams & Wilkins.
3. Concepts in Chronopharmacology by N. Udupa and P.D. Gupta
4. Handbook of Experimental Pharmacology by Kulkarni S.K., Vallabh Prakashan,

Online Resources/E-Learning Resources

1. https://www.jvwu.ac.in/documents/Title%20Pharmacology-III%20Practical%20Book.pdf
2. https://mlrip.ac.in/wp-content/uploads/2022/03/PHARMACOLOGY-III-LAB-MANUAL.pdf
3. https://jru.edu.in/studentcorner/lab-manual/bpharm/6th-sem/Pharmacology-III.pdf

Name of the Program:		B. PHARM		Semester: VI		Level: UG	
Course Name		Herbal drug technology (Practical)		Course Code/ Course Type		BP609P/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	4	-	2	60	15	35	
Pre-Requisite: Nil							
Course Objectives (CO):				The objectives of Tools for Herbal Drug Technology are: 1: To determine different types of phytochemicals 2: To perform quantitative chemical analysis 3: To evaluate unorganized crude drugs by chemical tests 4: To formulate herbal drug into dosage form and evaluate it 5: To prepare monograph of herbal drugs			
Course Learning Outcomes (CLO):				Students would be able to: 1: Detect the different classes of phytochemicals 2: Perform quantitative chemical analysis 3: Identify unorganized crude drugs by chemical tests 4: Prepare and evaluate herbal formulations 5: Prepare monograph of herbal drugs			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)
Practical Plan

Assignment/Practical/ Activity Number	Assignment/Practical/ Activity Title	Week Number/ Turn	Details	CLO	Hours
1.	Practical 1: Phytochemical screening	Week 1/Turn 1	1.1 To perform preliminary phytochemical screening of crude drugs	CLO1	04
2.	Practical 2: Quantitative chemical analysis	Week 2/Turn 1	2.1 To determine the alcohol content of Asava	CLO2	04
3.	Practical 3: Quantitative chemical analysis	Week 3/Turn 1	3.1 To determine the alcohol content of Arista	CLO2	04
4.	Practical 4: Chemical test	Week 4/Turn 1	4.1 To evaluate excipients of natural origin (Tragacanth)	CLO3	04

5.	Practical 5: Chemical test	Week 5/Turn 1	5.1 To evaluate excipients of natural origin (Starch)	CLO3	04
6.	Practical 6: Preparation of herbal formulation	Week 6/Turn 1	6.1 To prepare, standardize the extract and incorporate it in cream; and evaluate it	CLO4	04
7.	Practical 7: Preparation of herbal formulation	Week 7/Turn 1	7.1 To prepare, standardize the extract and incorporate it in lotion; and evaluate it	CLO4	04
8.	Practical 8: Preparation of herbal formulation	Week 8/Turn 1	8.1 To prepare, standardize the extract and incorporate it in shampoo; and evaluate it	CLO4	04
9.	Practical 9: Preparation of herbal formulation	Week 9/Turn 1	9.1 To prepare, standardize the extract and incorporate it in syrup, and evaluate it	CLO4	04
10.	Practical 10: Preparation of herbal formulation	Week 10/Turn 1	10.1 To prepare, standardize the extract and incorporate it in mixtures, and evaluate it	CLO4	04
11.	Practical 11: Preparation of herbal formulation	Week 11/Turn 1	11.1 To prepare, standardize the extract and incorporate it in tablet, and evaluate it	CLO4	04
12.	Practical 12: Preparation of herbal monograph	Week 12/Turn 1	12.1 To prepare monograph of herbal drugs (from recent Pharmacopoeias)	CLO5	04
13.	Practical 13: Quantitative chemical analysis	Week 13/Turn 1	13.1 To determine aldehyde content	CLO2	04
14.	Practical 14: Quantitative chemical analysis	Week 14/Turn 1	14.1 To determine phenol content	CLO2	04
15.	Practical 15: Quantitative chemical analysis	Week 15/Turn 1	15.1 To determine total alkaloids	CLO2	04

Learning resources

Practical Text Book

1. Khandelwal, K. (2008). Practical pharmacognosy. Pragati Books Pvt. Ltd..
2. Shinde & Bodas-Yadav (2021). A Practical Book of Herbal Drug Technology. Nirali Prakashan, New Delhi
3. Kokate, C. K. (1991). Practical Pharmacognosy. 3rd ed. New Delhi. *Vallabh Prakashan*

Reference Books:

1. Nema RK, Bhan CS. Experimental Pharmacognosy For Students Of B Pharm And M Pharm, CBS Publishers and Distributors Pvt.Ltd.
2. Gokhale SB, Kalaskar MG, Kulkarni YS, Yele SU, PHARMACOGNOSY AND PHYTOCHEMISTRY-I, Nirali Prakashan
3. Ikan R. Natural Products: A Laboratory Guide 2nd Edition, ACADEMIC PRESS, INC.

Online Resources/E-Learning Resources

1. https://www.youtube.com/watch?v=jZXqPcvExx8
2. https://www.youtube.com/watch?v=MTsAyjSOaVQ
3. https://www.youtube.com/watch?v=kRrgwszFR6E

SEMESTER-VII
FINAL Y.B. PHARM

COURSE CURRICULUM

Name of the Program:		B. Pharm		Semester: VII		Level: UG	
Course Name		Instrumental Method of Analysis (Theory)		Course Code/ Course Type		BP701T/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	1	4	45	25	75	-
Pre-Requisite:		Nil					

Course Objectives (CO):	The objectives of Instrumental Method of Analysis are: 1. To study the principle and instrumentation of UV/Visible spectrophotometry, and its application to the quantitative analysis of various ions 2. To learn the principles of IR, Atomic Absorption and flame photometry 3. To understand the importance of separation techniques such as solvent extraction and to explore the principles and procedures of chromatographic techniques including paper, thin layer, 4. To study the principle and application of gas chromatography 5. To understand the importance of separation techniques such as ion exchange gel chromatography.
Course Learning Outcomes (CLO):	Students would be able to: 1. Understand various analytical technique for a variety of samples. 2. Interpret the theoretical principles of selected instrumental methods with spectrophotometric methods. 3. Explain the theoretical principles of various separation techniques and analytical techniques in chromatography and their typical applications 4. Understand separation technique using gas chromatography 5. Comprehend analytical techniques in ion exchange chromatography

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	CLO	Hours
UNIT I		
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 **Fluorimetry:** Theory, Concepts of singlet, doublet and triplet electronic states, internal and external conversions, factors affecting fluorescence, quenching, instrumentation and applications	**CLO1**	**10**
UNIT II		
IR spectroscopy: Introduction, fundamental modes of vibrations in poly atomic molecules, sample handling, factors affecting vibrations Instrumentation- Sources of radiation, wavelength selectors, detectors- Golay cell, Bolometer, Thermocouple, Thermistor, Pyroelectric detector and applications **Flame Photometry:** Principle, interferences, instrumentation and applications **Atomic absorption spectroscopy:** Principle, interferences, instrumentation and applications **Nepheloturbidometry:** Principle, instrumentation and applications	**CLO2**	**10**
UNIT III		
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	**CLO3**	**10**
UNIT IV		
Gas chromatography: Introduction, theory, instrumentation, derivatization, temperature programming, advantages, disadvantages and applications **High performance liquid chromatography (HPLC)** Introduction, theory, instrumentation, advantages and applications.	**CLO4**	**8**
UNIT V		
Ion exchange chromatography: Introduction, classification, ion exchange resins, properties, mechanism of ion exchange process, factors affecting ion exchange, methodology and applications **Gel chromatography:** Introduction, theory, instrumentation and applications **Affinity chromatography:** Introduction, theory, instrumentation and applications	**CLO5**	**7**
Total		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning Resource:

Text Reading:

1. Text book of Pharmaceutical Analysis by Kenneth A. Connors
2. Vogel's Text book of Quantitative Chemical Analysis by A. I. Vogel
3. Quantitative Analysis of Drugs by D. C. Garrett
4. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P.D. Sethi 10. Spectrophotometric identification of Organic Compounds by Silverstein

References:

1. **Instrumental Methods of Chemical Analysis by B.K Sharma**
2. **Organic spectroscopy by Y. R Sharma**
3. **Organic Chemistry by I. L. Finar**
4. **Organic spectroscopy by William Kemp**

Online resource/ E-learning resource:

1. https://pubchem.ncbi.nlm.nih.gov/ 2 http://www.chemspider.com/ 2.
2. http://go.microsoft.com/fwlink/p/?LinkId=255141
3. https://www.youtube.com/watch?v=ZpPzImDSfqc&t=4s/

COURSE CURRICULUM

Name of the Program:		B. Pharm		Semester: VII		Level: UG	
Course Name		Industrial Pharmacy-II (Theory)		Course Code/ Course Type		BP702T/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	1	4	45	25	75	-
Pre-Requisite: Nil							
Course Objectives (CO):				The objectives of Industrial Pharmacy-II are 1. To Know the process of pilot plant and scale up of pharmaceutical dosage forms. 2. To Understand the process of technology transfer from lab scale to commercial batch. 3. To Know different Laws and Acts that regulate pharmaceutical industry 4. To Understand the approval process and regulatory requirements for drug products 5. To understand Indian regulatory system & concerned organizations.		
Course Learning Outcomes (CLO):				Students would be able to: 1. Outline Pilot plant scale up techniques 2. Outline Technology development and transfer. 3. Explain Regulatory requirements for drug approval. 4. Outline Indian Regulatory Requirements. 5. Explain Quality management systems.			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	CLO	Hours
UNIT I		
Pilot plant scale up techniques: General considerations - including significance of personnel requirements, space requirements, raw materials, Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation, SUPAC guidelines, Introduction to platform technology	**CLO1**	**07**
UNIT II		
Technology development and transfer: WHO guidelines for Technology Transfer(TT): Terminology, Technology transfer protocol, Quality risk management, Transfer from R & D to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packaging materials) Documentation, Premises and 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	**CLO2**	**08**

UNIT III		
Regulatory affairs: Introduction, Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals. **Regulatory requirements for drug approval**: Drug Development Teams, Non-Clinical Drug Development, Pharmacology, Drug 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.	**CLO3**	**10**
UNIT IV		
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	**CLO4**	**10**
UNIT V		
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.	**CLO5**	**10**
Total		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning Resource

Text Reading:

1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman &J.B. Schwartz
2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman
3. Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman
4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition
5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)

References:

1. Theory and Practice of Industrial Pharmacy by Liberman & Lachman
2. Pharmaceutics- The science of dosage form design by M.E. Aulton, Churchill livingstone, Latest edition
3. Introduction to Pharmaceutical Dosage Forms by H. C. Ansel, Lea &Febiger, Philadelphia, 5thedition, 2005
4. Drug stability - Principles and practice by Carstensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.

Online resource/ E-learning resource

1. https://onlinecourses.swayam2.ac.in/cec20_lb05/preview
2. https://www.rpharms.com/resources/careers-information/career-options-in-pharmacy/industrial-pharmacy
3. https://www.tandfonline.com/journals/iddi20

COURSE CURRICULUM

Name of the Program:	**B. Pharm**	**Semester: VII**	**Level: UG**
Course Name	**Pharmacy Practice (Theory)**	**Course Code/ Course Type**	**BP703T/Core**

Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	1	4	45	25	75	-
Pre-Requisite: Nil							

Course Objectives (CO):	The objectives of Pharmacy Practice are: 1. To understand the organization of hospitals and acquire the knowledge of ADR and community pharmacy. 2. To study therapeutic drug monitoring, Hospital formulary, TDM, medication adherence, Patient medication history interview, Community pharmacy management 3. To obtain medication history interview and counsel the patients and identify drug related problems 4. To eexplain the principles of drug store management, investigational drugs, OTC sales, budget and inventory control methods during practice. 5. To know the Drug store management and inventory control, Investigational use of drugs, and interpretation of Clinical Laboratory Tests
Course Learning Outcomes (CLO):	Students would be able to: 1. Outline the organization of hospitals and acquire the knowledge of ADR and community pharmacy. 2. Acquire the knowledge of therapeutic drug monitoring, Hospital formulary, TDM, medication adherence, Patient medication history interview, Community pharmacy management 3. Explain the Pharmacy & therapeutic committee, Drug information services, Patient counselling, Education and training program, prescribed medication order and communication skills in the hospital 4. Explain the principles of drug store management, investigational drugs, OTC sales, budget and inventory control methods during practice. 5. Know the Drug store management and inventory control, Investigational use of drugs, and interpretation of Clinical Laboratory Tests

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	CLO	Hours
UNIT I		
a) Hospital and it's organization Definition, Classification of hospital- Primary, Secondary and	**CLO1**	**10**

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. **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.		
UNIT II		
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 dispensing of 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 Drug Monitoring. **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.	**CLO2**	**10**
UNIT III		
a) Pharmacy and therapeutic committee Organization, functions, Policies of the pharmacy and therapeutic committee in including drugs into formulary, inpatient and outpatient prescription, automatic stop order, and emergency drug list preparation. **b) Drug information services** Drug and Poison information centre, Sources of drug information, Computerised services, and storage and retrieval of information. **c) Patient counselling** Definition of patient counselling; steps involved in patient counselling, and Special cases that require the pharmacist **d) Education and training program in the hospital** Role of pharmacist in the education and training program, Internal and external training program, Services to the nursing homes/clinics, Code of ethics for community pharmacy, and Role of pharmacist in the interdepartmental communication and community health education. **e) Prescribed medication order and communication skills** Prescribed medication order- interpretation and legal requirements, and Communication skills- communication with prescribers and patients.	**CLO3**	**10**
UNIT IV		
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**	**CLO4**	**08**

Introduction and sale of over the counter, and Rational use of common over the counter medications.		
UNIT V		
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, haematology, and urinalysis	**CLO5**	**07**
Total		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning Resource

Text Reading:

1. Merchant S.H. and Dr. J.S. Quadry. *A textbook of hospital pharmacy*, 4th ed Ahmadabad: B.S. Shah .
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.

References:

1. Tipnis Bajaj. *Hospital Pharmacy*, 1st ed. Maharashtra: Career Publications; 2008.
2. Scott LT. *Basic skills in interpreting laboratory data*, 4thed. American Society of Health System Pharmacists Inc; 2009.
3. Parmar N.S. *Health Education and Community Pharmacy,* 18th ed. India: CBS Publishers & Distributers; 2008.

Online resource/ E-learning resource:

1. https://books.google.co.in/books?id=OMXHEAAAQBAJ&printsec=frontcover&redir_esc=y#v=onepage&q&f=false
2. https://onlinelibrary.wiley.com/journal/20552335
3. https://journals.sagepub.com/home/jpp
4. https://academic.oup.com/crawlprevention/governor?content=%2fijpp

COURSE CURRICULUM

Name of the Program:		**B. Pharm**		**Semester: VII**	**Level: UG**	
Course Name		**Novel Drug Delivery System – (Theory)**		**Course Code/ Course Type**	**BP704T/Core**	
Course Pattern		**2024**		**Version**	**1.0**	
Teaching Scheme				**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total**	**Hours**	**CIA**	**ESA**	**Practical/Oral**

			Credits		(Continuous Internal Assessment)	(End Semester Assessment)	
3	-	1	4	45	25	75	-
Pre-Requisite:		**Nil**					
Course Objectives (CO):			The objectives of Novel Drug Delivery System are: 1. To study different novel drug delivery systems. 2. To learn basic knowledge on the area of novel drug delivery systems 3. To understand various approaches for development of novel drug delivery systems 4. To understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, 5. To understand their formulation and evaluation.				
Course Learning Outcomes (CLO):			Students would be able to: 1. Learn about the fundamental principles and technologies used in the design and development of controlled and targeted drug delivery systems. 2. Understand the criteria for selecting appropriate drugs and polymers for the development of novel drug delivery systems. 3. Gain knowledge about various types of NDDS, including controlled release, targeted delivery, and sustained release systems. 4. Highlight the advantages of NDDS compared to conventional formulations, such as improved efficacy, reduced side effects, and enhanced patient compliance. 5. Explore the various applications of NDDS in treating different diseases, including cancer, diabetes, and infections.				

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	CLO	Hours
UNIT I		
Controlled drug delivery systems: Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design-controlled release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations **Polymers**: Introduction, classification, properties, advantages and application of polymers in	**CLO1**	**10**

formulation of controlled release drug delivery systems		
UNIT II		
Microencapsulation: Definition, advantages and disadvantages, microspheres /microcapsules, microparticles, methods of microencapsulation, applications **Mucosal Drug Delivery system**: Introduction, Principles of bio adhesion / cohesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems **Implantable Drug Delivery Systems**: Introduction, advantages and disadvantages, concept of implants and osmotic pump	**CLO2**	**10**
UNIT III		
Transdermal Drug Delivery Systems: Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches **Gastroprotective drug delivery systems**: Introduction, advantages, disadvantages, approaches for GRDDS – Floating, high-density systems, inflatable and gastropathies systems and their applications **Naso pulmonary drug delivery system**: Introduction to Nasal and Pulmonary routes of drug delivery, Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers	**CLO3**	**10**
UNIT IV		
Targeted drug Delivery: Concepts and approaches advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications	**CLO4**	**08**
UNIT V		
Ocular Drug Delivery Systems: Introduction, intra ocular barriers and methods to overcome – Preliminary study, ocular formulations and ocuserts Intrauterine Drug Delivery Systems: Introduction, advantages and disadvantages, development of intra uterine devices (IUDs) and applications	**CLO5**	**07**
Total		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning Resource:

Text Reading:

1. Encyclopedia of Controlled Delivery. Edith Mathiowitz, Published by Wiley Inter science Publication, John Wiley and Sons, Inc, New York. Chichester/Weinheim
2. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).
3. Bentleys' Text book of Pharmaceutics, Editor E.A. Rawlins, Elsevier Int.,

References:

1. Y W. Chien, Novel Drug Delivery Systems, 2 nd 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, 199
3. S.P. Vyas and R.K. Khar, Controlled Drug Delivery -concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002.

Online resource/ E-learning resource:

1. https://www.udemy.com/course/pharmaceutical-novel-drug-delivery-system-course-2023/?srsltid=AfmBOorINnp13_3eyp5wy6lsGBO0bNauFASP8-tG3CaJCmB_izFj0lkz

Name of the Program:		**B. Pharm**		**Semester: VII**		**Level: UG**	
Course Name		**Instrumental Method of Analysis (Practical)**		**Course Code/ Course Type**		**BP701P/Core**	
Course Pattern		**2024**		**Version**		**1.0**	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
-	4	-	2	60	15	35	
Pre-Requisite:		**Nil**					
Course Objectives (CO):				The objectives of Tools for Instrumental Method of Analysis are: 1. To apply knowledge of spectroscopy and colorimetry for analysis of different drugs 2. To apply knowledge of flame photometry for detection of different ions such as sodium, potassium etc. 3. To perform different types of chromatographic techniques 4. To understand application of nepheloturbidimetry for different organic compounds 5. To demonstrate High Profile Liquid Chromatography and Gas Chromatography		
Course Learning Outcomes (CLO):				Students would be able to: 1. Experiment with selected drugs by UV-visible spectroscopy and fluorimetry. 2. Estimate the amount of sodium and potassium ions by flame photometry. 3. Characterize and quantify the organic compounds/amino acids/plant pigments by using various chromatographic methods. 4. Analyze the various organic compounds using Nepheloturbidimetry. 5. Maximize the knowledge of integration and interpretation of chromographs and spectra with demonstration of sophisticated analytical instruments		

2. https://pmc.ncbi.nlm.nih.gov/articles/PMC11124876/
3. https://sure.sunderland.ac.uk/id/eprint/11524/

COURSE CURRICULUM

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)
Practical Plan

Assignment/ Practical/ Activity Number	Assignment/Practical/ Activity Title	Week Number/ Turn	Details	CLO	Hours
1	Practical 1: Determine absorption	Week 1/Turn 1	1.1 To determine absorption maxima and effect of solvents on absorption maxima of organic compounds.	CLO1	04
2.	Practical 2: Estimation of dextrose by colorimetry	Week 2/Turn 1	2.1 To estimate dextrose by colorimetry.	CLO1	04
3.	Practical 3: Estimation of sulfanilamide by colorimetry	Week 3/Turn 1	3.1 To estimate sulfanilamide by colorimetry.	CLO1	04
4	Practical 4: Performance of assay of by UV-spectrophotometry	Week 4/Turn 1	4.1 To perform the assay of paracetamol by UV-spectrophotometry.	CLO1	04
5	Practical 5: Simultaneous estimation of drug by UV- spectroscopy	Week 5/Turn 1	5.1 To carry out the simultaneous estimation of ibuprofen and paracetamol by UV- spectroscopy.	CLO1	04
6	Practical 6: Estimation quinine sulfate by fluorimetry	Week 6/Turn 1	6.1 To estimate quinine sulfate by fluorimetry.	CLO1	04
7	Practical 7: Study of quenching of fluorescence.	Week 7/Turn 1	7.1 To study quenching of fluorescence.	CLO1	04
8	Practical 8: Determination sodium by flame photometry	Week 8/Turn 1	8.1 To determine sodium by flame photometry.	CLO2	04

9	Practical 9: Determination potassium by flame photometry	Week 9/Turn 1	9.1 To determine potassium by flame photometry.	CLO2	04
10	Practical 10: Determination chlorides and sulphates by nephelo-turbidometry.	Week 10/Turn 1	10.1 To determine chlorides and sulphates by nepheloturbidometry.	CLO4	04
11	Practical 11: Separation of amino acids by paper chromatography	Week 11/Turn 1	11.1 To carry out the separation of amino acids by paper chromatography.	CLO3	04
12	Practical 12: Separation of sugars by thin-layer chromatography	Week 12/Turn 1	12.1 To carry out the separation of sugars by thin-layer chromatography.	CLO3	04
13	Practical 13: Separation of plant pigments by column chromatography	Week 13/Turn 1	13.1 To carry out the separation of plant pigments by column chromatography.	CLO3	04
14	Practical 14: Demonstration experiment on HPLC	Week 14/Turn 1	14.1 To perform a demonstration experiment on HPLC.	CLO5	04
15	Practical 15: Demonstration experiment on gas chromatography	Week 15/Turn 1	15.1 To perform a demonstration experiment on gas chromatography.	CLO5	04

Learning resources:

Reference Books:

1. Beckett AH, Stenlake JB. Practical Pharmaceutical Chemistry, Part Two. Athlone Press, London.
2. Garratt DC. The Quantitative Analysis of Drugs. Chapman and Hall Ltd, London
3. Sethi PD. Quantitative Analysis of Drugs in Pharmaceutical Formulations. CBS Publishers and Distributors, New Delhi.

Practical Text Book

1. Vogel's Text book of Quantitative Chemical Analysis by A. I. Vogel
2. Practical Pharmaceutical Chemistry by A. H. Beckett and J. B. Stenlake
3. Organic spectroscopy by William Kemp
4. Quantitative Analysis of Drugs by D. C. Garrett
5. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. Sethi
6. Spectrophotometric identification of Organic Compounds by Silverstein

Online Resources/E-Learning Resources:

1. https://pubchem.ncbi.nlm.nih.go
2. http://www.chemspider.com/
3. https://www.youtube.com/watch?v=kz_egMtdnL4/
4. https://www.youtube.com/watch?v=ZpPzImDSfqc&t=10s/

SEMESTER-VIII
FINAL Y.B. PHARM

COURSE CURRICULUM

Name of the Program:		**B. Pharm**		**Semester: VIII**		**Level: UG**	
Course Name		**Biostatistics and Research Methodology (Theory)**		**Course Code/ Course Type**		**BP801T/Core**	
Course Pattern				**Version**			
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
3	-	1	4	45	25	75	-
Pre-Requisite:		**Nil**					
Course Objectives (CO):				The objectives of Biostatistics and Research methodology are: 1. To Know about biostatistics and its correlation in pharmacy 2. To understand statistical techniques in solving the problems. 3. To study different non-parametric tests, graphs and designing the methodology 4. To learn the operations of M.S. Excel, SPSS, R and MINITAB®, DoE 5. To study statistical design and optimization techniques		
Course Learning Outcomes (CLO):				Students would be able to: 1. Recognize the importance of biostatistics in pharmacy 2. Discuss the methods of collection of data and its analysis and Interpretation 3. Understand the research methodology in the design of pharmacoepidemiologic study 4. Discuss and evaluate various software for statistical analysis of data 5. Discuss optimization techniques in Pharma		

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Topic	CLO	Hours
UNIT I		
Introduction: Introduction: Statistics, Biostatistics, Frequency distribution **Measures of central tendency:** Mean, Median, Mode- Pharmaceutical examples **Measures of dispersion:** Dispersion, Range, standard deviation, pharmaceutical problems **Correlation:** Definition, Karl Pearson's coefficient of correlation, Multiple correlation pharmaceuticals examples	**CLO1**	**10**
UNIT II		
Regression: Curve fitting by the method of least squares, fitting the lines y= a + bx and x = a+by, Multiple regression, standard error of regression– Pharmaceutical Examples **Probability:**Definition of probability, Binomial distribution, Normal distribution, Poisson's distribution, properties- problems Sample, Population, 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 **Parametric test**: t-test (Sample, Pooled or Unpaired and Paired), ANOVA, (One way and Two way), Least Significance difference	**CLO2**	**10**
UNIT III		
Non-Parametric tests: Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Walli's test, Friedman Test 156 **Introduction to Research:** Need for research, Need for design of Experiments, Experiential Design Technique, plagiarism **Graphs:** Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph **Designing the methodology:** Sample size determination and Power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases.	**CLO3**	**10**
UNIT IV		
Blocking and confounding system: **Regression modelling**: Hypothesis testing in Simple and Multiple regression models. **Introduction to Practical components of Industrial and Clinical Trials** **Problems:** Statistical Analysis Using Excel, SPSS, MINITAB®, DESIGN OF EXPERIMENTS, R - Online Statistical Software to Industrial and Clinical trial approach.	**CLO4**	**8**
UNIT V		
Design and analysis of experiments: **Factorial Design**: Definition, 2^2, 2^3 design. Advantage of factorial design. **Response Surface methodology:** Central composite design, Historical design, Optimization Techniques.	**CLO5**	**7**
Total Hours		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning Resource:

Text Reading:

1. Jekel's Epidemiology, Biostatistics, Preventive Medicine, and Public Health Daniel, Wayne W. I7th Edition20073
2. Medical Statistics A Textbook for The Health Sciences Campbell, Machin & Walter\
3. Essentials of Biostatistics in Public Health Sullivan, Lisa M. (Lisa Marie) Second Edition1

References:

1. **Biostatistics for the Biological and Health Sciences" by Marc M Triola and Mario F Triola**
2. Biostatistics For Dummies" by John Pezzullo
3. Modern Issues and Methods in Biostatistics (Statistics for Biology and Health)" by Mark Chang

Online resource/ E-learning resource:

1. http://www.whoumc.org/DynPage.aspx?id=105825&mn1=7347&mn2=7259&mn3=7297
2. http://www.ich.org/

COURSE CURRICULUM

Name of the Program:		B. Pharm		Semester: VIII		Level: UG	
Course Name		Social and Preventive Pharmacy (Theory)		Course Code/ Course Type		BP802T/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	1	4	45	25	75	-
Pre-Requisite:		Nil					

Course Objectives (CO):	The objectives of Social and Preventive Pharmacy are: 1. To describe the concepts of health, disease, and public health, and explain the impact of social and nutritional factors on health. 2. To explain the principles of prevention and control of communicable and non-communicable diseases. 3. To analyse the objectives, functioning, and outcomes of major national health programs in India. 4. To discuss the role of national health intervention programs and the World Health Organization (WHO) in improving healthcare services. 5. To identify the functions of primary healthcare centres (PHCs) and describe the importance of community health services in rural, urban, and school health programs.
Course Learning Outcomes (CLO):	Students would be able to: 1. Acquire high consciousness/realization of current issues related to health and pharmaceutical problems within the country and worldwide. 2. Have a critical way of thinking based on current healthcare development. 3. Evaluate alternative ways of solving problems related to health and pharmaceutical issues 4. Discuss about different programs and health care services

	5. Understand the principles of public health, disease prevention, national health programs, and community health services to contribute effectively to healthcare initiatives.

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	CLO	Hours
UNIT I		
Concept of health and disease: Definition, concepts and evaluation of public health. Understanding the concept of prevention and control of disease, social causes of diseases and social problems of the sick. **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	**CLO1**	**10**
UNIT II		
Preventive medicine: General principles of prevention and control of diseases such as cholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse	**CLO2**	**10**
UNIT III		
National health programs, its objectives, functioning and outcome of the following: HIV AND AIDS control programme, TB, Integrated disease surveillance program (IDSP), National leprosy control programme, National mental health program, National programme for prevention and control of deafness, Universal immunization programme, National programme for control of blindness, Pulse polio programme	**CLO3**	**10**
UNIT IV		
National health intervention programme for mother and child, National family welfare programme, National tobacco control programme, National Malaria Prevention Program, National programme for the health care for the elderly, social health programme; role of WHO in Indian national program	**CLO4**	**08**
UNIT V		
Community services in rural, urban and school health: Functions of PHC, Improvement in rural sanitation, national urban health mission, Health promotion and education in school	**CLO5**	**07**
Total Hours		**45**

***The total 15 tutorials should be conducted as per the format mentioned above**

Learning Resource:
Text Reading:

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 Rabindra Nath, Saha Indranil, 4th Edition, 2013, ISBN: 9789350901878, JAYPEE Publications
3. Textbook of social pharmacy (pharm) (1st year) strictly as per the syllabus framed under education regulation 2020 by pharmacy council of India.

Reference:

1. Review of Preventive and Social Medicine (Including Biostatistics), Jain Vivek, 6th Edition, 2014, ISBN: 9789351522331, JAYPEE Publications.
2. Park Textbook of Preventive and Social Medicine, K Park, 21st Edition, 2011, ISBN-14: 9788190128285, BANARSIDAS BHANOT PUBLISHERS.
3. Community Pharmacy Practice, Ramesh Adepu, BSP publishers, Hyderabad

Online resource/ E-learning resource:

1. https://noteskarts.com/social-pharmacy-notes-pdf/
2. https://pharmacyinfoline.com/social-pharmacy-definition-and-scope/
3. https://pharmdbm.com/social-pharmacy-notes-dpharm-1st-year/

COURSE CURRICULUM

Name of the Program:		**B. Pharm**		**Semester: VIII**		**Level: UG**	
Course Name		**Pharma Marketing Management (Theory)**		**Course Code/ Course Type**		**BP803ET/Core**	
Course Pattern		**2024**		**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
3	-	1	4	45	25	75	-
Pre-Requisite:		**Nil**					
Course Objectives (CO):				The objectives of Pharma Marketing Management are: 1. To outline the marketing concepts & develop techniques and their applications in the pharmaceutical industry. 2. To classify product design, explain product life cycle. 3. To give overview of sales and product promotion, pharmaceutical marketing channels and duties of PSR. 4. To explain various channels of marketing, describe qualities of a professional service representative 5. To overview on pricing strategies and role of DPCO, NPPA with introduction of emerging concepts in marketing and brand management			
Course Learning Outcomes (CLO):				Students would be able to: 1. Explain the key concepts and terminologies related to pharmaceutical marketing management 2. Describe the principles and theories underlying marketing strategies in the pharmaceutical industry 3. Apply the acquired knowledge to develop effective marketing plans for pharmaceutical products 4. Value the effectiveness of different marketing strategies and tactics used in the pharmaceutical industry			

	5. Design innovative marketing campaigns and promotional activities to create a competitive edge in the market

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	CLO	Hours
UNIT I		
Marketing: Definition, general concepts and scope of marketing; Distinction between marketing &selling; Marketing environment; Industry and competitive analysis; Analyzing consumer buying behavior; industrial buying behavior. **Pharmaceutical market**: Quantitative and qualitative aspects; size and composition of the market; demographic descriptions and socio-psychological characteristics of the consumer; market segmentation& targeting. Consumer profile; Motivation and prescribing habits of the physician; patients' choice of physician and retail pharmacist. Analyzing the Market; Role of market research.	**CLO1**	**10**
UNIT II		
Product decision: Classification, product line and product mix decisions, product life cycle, product portfolio analysis; product positioning; New product decisions; Product branding, packaging and labeling decisions, Product management in pharmaceutical industry.	**CLO2**	**10**
UNIT III		
Promotion: Methods, determinants of promotional mix, promotional budget; An overview of personal selling, advertising, direct mail, journals, sampling, retailing, medical exhibition, public relations, online promotional techniques for OTC Products.	**CLO3**	**10**
UNIT IV		
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.	**CLO4**	**10**
UNIT V		
Pricing: Meaning, importance, objectives, and 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.	**CLO5**	**10**
Total Hours		**45**

* **The total 15 tutorials should be conducted as per the format mentioned above**

Learning Resource
Text Reading:

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

References:

1. Rajan Saxena: Marketing Management; Tata MC Graw-Hill (India Edition)
2. Ramaswamy, U.S & Nanakamari, S: Marketing Managemnt:Global Perspective, 3. IndianContext,Macmilan India, New Delhi.
4. Shanker, Ravi: Service Marketing, Excell Books, New Delhi
5. Subba Rao Changanti, Pharmaceutical Marketing in India (GIFT – Excel series) Excel Publications.

Online resource/ E-learning resource:

1. https://pharmacyinfoline.com/bp803et-pharma-marketing-management/
2. https://pharmacyinfoline.com/pharmaceuical-market-notes/?query-0-page=1
3. https://pharmdbm.com/pharma-marketing-management-notes-bpharm-8th-sem/

COURSE CURRICULUM

Name of the Program:		**B. Pharm**		**Semester: VIII**		**Level: UG**	
Course Name		**Pharmaceutical Regulatory Science (Theory)**		**Course Code/ Course Type**		**BP804ET/Core**	
Course Pattern		**2024**		**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/ Oral**
3	-	1	4	45	25	75	-
Pre-Requisite:		**Nil**					
Course Objectives (CO):				The objectives of Pharmaceutical Regulatory Science are: 1. To Know about the process of drug discovery and development 2. To understand the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals 3. To study the regulatory approval process and their Registration in Indian and international markets. 4. To know about protocols of clinical trials. 5. To know the regulatory concepts and terminologies.		
Course Learning Outcomes (CLO):				Students would be able to: 1. Understand drug discovery, Drug development process. 2. Know the different competent regulatory authorities globally. 3. To know regulatory guidelines and directions to place the drug products in market for marketing approvals. 4. Implement Good Clinical Practices in the Healthcare and related Industries. 5. Prepare for the readiness and conduct of audits and inspections.		

Course Contents/Syllabus:

(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	**CLO**	**Hours**

UNIT I		
New Drug Discovery and development Stages of drug discovery, Drug development process, pre-clinical studies, non-clinical activities, clinical studies, Innovator and generics, Concept of generics, Generic drug product development.	**CLO1**	**10**
UNIT II		
Regulatory Approval Process Approval processes and timelines involved in Investigational New Drug (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA). Changes to an approved NDA / ANDA. **Regulatory authorities and agencies** Overview of regulatory authorities of India, United States, European Union, Australia, Japan, Canada (Organization structure and types of applications)	**CLO2**	**10**
UNIT III		
Registration of Indian drug product in overseas market Procedure for export of pharmaceutical products, technical documentation, Drug Master Files (DMF), Common Technical Document (CTD), electronic Common Technical Document (eCTD), ASEAN Common Technical Document (ACTD) research.	**CLO3**	**10**
UNIT IV		
Clinical trials Developing clinical trial protocols, Institutional Review Board / Independent Ethics committee - formation and working procedures, Informed consent process and procedures, GCP obligations of Investigators, sponsors & Monitors, Managing and Monitoring clinical trials, Pharmacovigilance – safety monitoring in clinical trials	**CLO4**	**08**
UNIT V		
Regulatory Concepts Basic terminology, guidance, guidelines, regulations, Laws and Acts, Orange book, Federal Register, Code of Federal Regulatory, Purple book	**CLO5**	**07**
Total Hours		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning Resource

Text Reading:

1. Drug Regulatory Affairs by Sachin Itkar, Dr. N.S. Vyawahare, Nirali Prakashan.
2. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and Isader Kaufer, Marcel Dekker series, Vol.143.
3. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance by Fay A. Rozovsky and Rodney K. Adams
4. Principles and Practices of Clinical Research, Second Edition Edited by John I. Gallin and Frederick Ognibene. Drugs: From Discovery to Approval, Second Edition by Rick N

References:

1. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P. Martin,
2. Drugs and the Pharmaceutical Sciences, Vol.185. Informa Healthcare 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 / Sandy Weinberg. 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.

Online reading

1. https://advanced.jhu.edu/about/on-the-advance/mastering-your-future/what-is-regulatory-science/
2. Outline of Regulatory Science | Pharmaceuticals and Medical Devices Agency
3. 978-1-5275-8674-1-https://www.cambridgescholars.com/resources/pdfs/978-1-5275-8674-1-sample.pdfsample.pdf

Name of the Program:		B. Pharm		Semester: VIII		Level: UG	
Course Name		Pharmacovigilance (Theory)		Course Code/ Course Type		BP805ET/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	1	4	45	25	75	-
Pre-Requisite:							
Course Objectives (CO):				The objectives of Pharmacovigilance are: 1. To study the basic terminologies in pharmacovigilance and ADRs. 2. To learn coding in pharmacovigilance and establishing programs. 3. To understand the vaccine safety surveillance, methods and communication process. 4. To comprehend safety data generation and ICH guidelines. 5. To study the pharmacogenomics of ADRs, drug safety evaluation, CIOMS, CDSCO.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Explain the introduction to basics of pharmacovigilance and ADRs. 2. Classify drug and diseases, describe coding in pharmacovigilance including the establishment of programs. 3. Know the vaccine safety surveillance, methods and communication process. 4. Generate the safety data, and study the ICH guidelines. 5. Explain the pharmacogenomics of ADRs, drug safety evaluation, CIOMS, CDSCO.			

COURSE CURRICULUM

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	CLO	Hours
UNIT I		
Introduction to Pharmacovigilance: History and development of Pharmacovigilance; Importance of safety monitoring of Medicine; WHO international drug monitoring programme; Pharmacovigilance Program of India (PvPI) **Introduction to adverse drug reactions:** Definitions and classification of ADRs; Detection and reporting; Methods in Causality assessment; Severity and seriousness assessment; Predictability and preventability assessment; Management of adverse drug reactions **Basic terminologies used in pharmacovigilance:** Terminologies of adverse medication related events; Regulatory terminologies	**CLO 1**	**10**
UNIT II		
Drug and disease classification: Anatomical, therapeutic and chemical classification of drugs; International classification of diseases; Daily defined doses; International Nonproprietary Names for drugs **Drug dictionaries and coding in pharmacovigilance:** WHO adverse reaction terminologies; MedDRA and Standardized MedDRA queries; WHO drug dictionary; Eudravigilance medicinal product dictionary **Information resources in pharmacovigilance:** Basic drug information resources; Specialized resources for ADRs **Establishing pharmacovigilance programme:** Establishing in a hospital, Establishment & operation of drug safety department in industry; Contract Research Organisations (CROs); Establishing a national programme	**CLO2**	**10**
UNIT III		
ccine safety surveillance: Vaccine Pharmacovigilance; Vaccination failure; Adverse events following immunization **armacovigilance methods:** Passive surveillance – Spontaneous reports and case series; Stimulated reporting; Active surveillance – Sentinel sites, drug event monitoring and registries; Comparative observational studies – Cross sectional study, case control study and cohort study; Targeted clinical investigations **Communication in pharmacovigilance:** Effective communication in Pharmacovigilance; Communication in Drug Safety Crisis management; Communicating with Regulatory Agencies, Business Partners, Healthcare facilities &Media	**CLO3**	**10**
UNIT IV		
Safety data generation: Pre clinical phase; Clinical phase; Post approval phase (PMS) **ICH Guidelines for Pharmacovigilance:** Organization and objectives of ICH; Expedited reporting; Individual case safety reports; Periodic safety update reports; Post approval expedited reporting; Pharmacovigilance planning; Good clinical practice in pharmacovigilance studies	**CLO4**	**08**
UNIT V		
armacogenomics of adverse drug reactions: Genetics related ADR with example focusing PK parameters. **Drug safety evaluation in special population:** Paediatrics; Pregnancy and lactation; Geriatrics **CIOMS:** CIOMS Working Groups; CIOMS Form **CDSCO (India) and Pharmacovigilance:** D&C Act and Schedule Y; Differences in Indian and	**CLO5**	**07**

global pharmacovigilance requirements		
Total Hours		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning resources:

Text readings:

1. Textbook of Pharmacovigilance: S K Gupta, Jaypee Brothers, Medical Publishers.
2. Textbook of Pharmacoepidemiology edited by Brian L. Strom, Stephen E Kimmel, Sean Hennessy, Wiley Publishers
3. A Textbook of Clinical Pharmacy Practice -Essential Concepts and Skills: Parthasarathi, Karin NyfortHansen, Milap C. Nahata
4. Text book of Pharmacovigilance: concept and practice by GP Mohanta and PKManna
5. Text Book of Medicine by Yashpal Munjal

References:

1. Mann's Pharmacovigilance: Elizabeth B. Andrews, Nicholas, Wiley Publishers.
2. Practical Drug Safety from A to Z By Barton Cobert, Pierre Biron, Jones and Bartlett Publishers.
3. Introduction to Pharmacovigilance: Patrick Waller, Wiley Publishers.

Online Resources/E-Learning Resources:

1. http://www.whoumc.org/DynPage.aspx?id=105825&mn1=7347&mn2=7259&mn3=7297
2. http://www.ich.org/
3. http://cdsco.nic.in/
4. http://www.who.int/vaccine_safety/en/
5. http://www.ipc.gov.in/PvPI/pv_home.html

COURSE CURRICULUM

Name of the Program:		B. Pharm		Semester: VIII		Level: UG	
Course Name		Quality Control and Standardization of Herbals (Theory)		Course Code/ Course Type		BP806ET/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	1	4	45	25	75	-
Pre-Requisite: Nil							
Course Objectives (CO):		The objectives of Quality Control and Standardization of Herbals are: 1. To know WHO guidelines for quality control of herbal drugs. 2. To understand WHO guidelines (cGMP) for Herbal Medicines. 3. To appreciate EU and ICH guidelines for quality control of herbal drugs 4. To fulfil the requirements as per GMP and Drugs & Cosmetics Act. 5. To monitor the safety of herbal medicines as per WHO guidelines.					
Course Learning Outcomes (CLO):		Students would be able to: 1. Reveal various parameters of the herbal drugs as per WHO guidelines for quality control of herbal drugs. 2. Understand the quality standards set as per WHO guidelines (cGMP) for Herbal Medicines 3. Research as per EU and ICH guidelines for quality control of herbal drugs. 4. Know chromatographic standardization of the herbal medicine and documentation as per GMP requirements and Drugs & Cosmetics Act provisions. 5. Keep pharmacovigilance as per WHO guidelines on safety monitoring of herbal medicines.					

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	CLO	Hours
UNIT I		
Basic tests for drugs – Pharmaceutical substances, Medicinal plants materials and dosage forms WHO guidelines for quality control of herbal drugs. Evaluation of commercial crude drugs intended for use	**CLO**	**10**
UNIT II		
Quality assurance in herbal drug industry of cGMP, GAP, GMP and GLP in traditional system of medicine. WHO Guidelines on current good manufacturing Practices (cGMP) for Herbal Medicines WHO Guidelines on GACP for Medicinal Plants	**CLO**	**10**
UNIT III		
EU and ICH guidelines for quality control of herbal drugs. Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines	**CLO3**	**10**
UNIT IV		
Stability testing of herbal medicines. Application of various chromatographic techniques in standardization of herbal products. Preparation of documents for new drug application and export registration. GMP requirements and Drugs & Cosmetics Act provisions.	**CLO4**	**08**
UNIT V		
Regulatory requirements for herbal medicines. WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems Comparison of various Herbal Pharmacopoeias. Role of chemical and biological markers in standardization of herbal products	**CLO5**	**07**
Total		**45**

Learning Resource
Text Reading:

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, Gokhale (2007), 37th Edition,
4. Nirali Prakashan, New Delhi.

References:

1. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007
2. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi
3. A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.

Online resource/ E-learning resource:

1. https://iris.who.int/bitstream/handle/10665/44479/9789241500739_eng.pdf
2. https://www.who.int/publications/i/item/9789241547161
3. https://www.ich.org/page/quality-guidelines
4. https://www.who.int/publications/i/item/9241546271

COURSE CURRICULUM

Name of the Program:		**B. Pharm**		**Semester: VIII**		**Level: UG**	
Course Name		**Computer Aided Drug Design (Theory)**		**Course Code/ Course Type**		**BP 807ET/Core**	
Course Pattern		**2024**		**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
3	--	1	4	45	25	75	--
Pre-Requisite:		**Nil**					
Course Objectives (CO):				The objectives of Computer Aided Drug design are: 1. To study design and discovery of lead molecules 2. To study concept of QSAR. COMFA & COMSIA 3. To understand the concept of Molecular modelling and virtual screening techniques 4. To learn various strategies to develop new drug like molecules. 5. To comprehend design of new drug molecules using molecular modelling software			
Course Learning Outcomes (CLO):				Students would be able to: 1. Explain the various stages of rational approaches to lead discovery and apply the concept of bioisosterism and drug resistance 2. Analyze the various physicochemical parameters (QSAR), illustrate the Hansch analysis, free Wilson methods & its applications for QSAR. 3. Apply the rigid and flexible docking procedures in some examples, concept of pharmacophore 4. Understand various chemical, biochemical and pharmaceutical databases. 5. Classify the different Energy Minimization Methods, molecular modeling, quantum mechanics			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	CLO	Hours
UNIT I		
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	**CLO1**	**10**
UNIT II		
Quantitative Structure Activity Relationship (QSAR) SAR versus QSAR, History and development of QSAR, Types of physicochemical parameters, experimental and theoretical approaches 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	**CLO2**	**10**
UNIT III		
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.	**CLO3**	**10**
UNIT IV		
Informatics & Methods in drug design Introduction to Bioinformatics, chemoinformatics. ADME databases,chemical, biochemical and pharmaceutical databases.	**CLO4**	**08**
UNIT V		
Molecular Modeling: Introduction to molecular mechanics and quantum mechanics. Energy Minimization methods and Conformational Analysis, global conformational minima determination	**CLO5**	**07**
Total		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning Resource:

Text Reading:

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

References:

1. Wolf ME, ed "The Basis of Medicinal Chemistry, Burger's Medicinal Chemistry" JohnWiley& Sons, New York.
2. Patrick Graham, L., An Introduction to Medicinal Chemistry, Oxford Universit Press.
3. Smith HJ, Williams H, eds, "Introduction to the principles of Drug Design" Wright Boston.
4. Silverman R.B. "The organic Chemistry of Drug Design and Drug ActionAcademic Press New York.

Online resource/ E-learning resource:

1. https://anadolu.edu.tr/en/academics/faculties/course/226102/computer-aided-drug-design/learning-outcomes
2. https://s3.smu.edu/dedman/catco/syllabus/CHEM6344.pdf
3. https://research.vu.nl/en/courses/computer-aided-drug-design-and-virtual-screening-4
4. https://pharmaeducare.com/computer-aided-drug-design-cadd/
5. https://ijcrt.org/papers/IJCRT2110259.pdf
6. http://ndl.ethernet.edu.et/bitstream/123456789/37245/1/Ahindra%20Nag.pdf

COURSE CURRICULUM

Name of the Program:		B. Pharm		Semester: VIII		Level: UG	
Course Name		Cell and Molecular Biology (Theory)		Course Code/ Course Type		BP808ET/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	----	1	4	45	25	75	-
Pre-Requisite: Nil							
Course Objectives (CO):				The objectives of Cell and Molecular Biology are: 1. To understand the cell and molecular biology history, cellular functioning, composition, and chemical foundations of cell biology. 2. To learn the DNA properties of cell biology. 3. To study protein structure, functions and cellular membrane structure and function. 4. To know the basic molecular genetic mechanisms. 5. To study the cell cycle, cell signaling, and regulation of cell signaling.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Explain the cell and molecular biology history, cellular functioning, composition, and chemical foundations of cell biology. 2. Summarize the DNA properties of cell biology. 3. Describe protein structure, functions and cellular membrane structure and function. 4. Describe basic molecular genetic mechanisms. 5. Summarize the cell cycle, cell signaling, and regulation of cell signaling.			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics”	CLO	Hours

UNIT I		
Cell and Molecular Biology: Definitions theory and basics and Applications. Cell and Molecular Biology: History and Summation. Properties of cells and cell membrane. Prokaryotic versus Eukaryotic Cellular Reproduction Chemical Foundations – an Introduction and Reactions (Types)	**CLO1**	**10**
UNIT II		
DNA and the Flow of Molecular Information DNA Functioning DNA and RNA Types of RNA Transcription and Translation	**CLO2**	**10**
UNIT III		
Proteins: Defined and Amino Acids Protein Structure Regularities in Protein Pathways Cellular Processes Positive Control and significance of Protein Synthesis	**CLO3**	**10**
UNIT IV		
Science of Genetics Transgenics and Genomic Analysis Cell Cycle analysis Mitosis and Meiosis e) Cellular Activities and Checkpoints	**CLO4**	**08**
UNIT V		
Cell Signals: Introduction Receptors for Cell Signals Signaling Pathways: Overview Misregulation of Signaling Pathways Protein-Kinases: Functioning	**CLO5**	**07**
Total		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning Resource

Text Reading:

1. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
2. Walker, John M, Rapley, Ralph. Molecular biology and biotechnology Edition: 4th.
3. Veer Bala Rastogi, Principles of Molecular Biology, 2nd Edn.

References:

1. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
2. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
3. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
4. Rose: Industrial Microbiology.
5. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
6. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
7. Peppler: Microbial Technology.
8. Edward: Fundamentals of Microbiology.
9. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly Company.
10. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of Recombinant DNA: ASM Press Washington D.C.
11. RA Goldshy et. al., Kuby Immunology.

Online resource/ E-learning resource:

1. https://www.ncbi.nlm.nih.gov/books/NBK21054/
2. https://atdbio.com/nucleic-acids-book/Transcription-Translation-and-Replication
3. https://byjus.com/chemistry/nucleic-acids/
4. https://www.slideshare.net/slideshow/cell-cycle-its-regulation-and-checkpoints/102923932
5. https://pmc.ncbi.nlm.nih.gov/articles/PMC6663871/

COURSE CURRICULUM

Name of the Program:		B. Pharm		Semester: VIII		Level: UG	
Course Name		Cosmetic Science (Theory)		Course Code/ Course Type		BP809TE/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	1	4	45	25	75	-
Pre-Requisite:		Nil					
Course Objectives (CO):				The objectives of Cosmetic Science are: 1. To understand the classification, regulations, and basic components of cosmetic and cosmeceutical products. 2. To explain the principles of formulation and key ingredients used in skincare, haircare, and oral care products. 3. To understand the role of sunscreens, herbal ingredients, and analytical methods in cosmetic formulations. 4. To learn cosmetic evaluation techniques for assessing skincare and haircare products. 5. To study common cosmetic problems related to skin, hair, and scalp, along with suitable solutions.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Explain the classification, regulations, and essential excipients used in cosmetic and cosmeceutical formulations. 2. Describe the principles of formulation and key ingredients used in skincare, haircare, and oral care products. 3. Discuss the classification of sunscreens, SPF, herbal ingredients, and analytical techniques used in cosmetics. 4. Understand cosmetic evaluation techniques and their role in assessing product efficacy. 5. Analyse the common cosmetic issues related to skin, hair, and scalp, and recommend suitable cosmetic solutions.			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	CLO	Hours
UNIT I		
Classification of cosmetic and cosmeceutical products Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticals from cosmetics, cosmetics as quasi and OTC drugs **Cosmetic excipients:** Surfactants, rheology modifiers, humectants, emollients, preservatives. Classification and application **Skin**: Basic structure and function of skin. **Hair:** Basic structure of hair. Hair growth cycle. **Oral Cavity:** Common problem associated with teeth and gums.	**CLO1**	**10**
UNIT II		
Principles of formulation and building blocks of skin care products: Face wash, Moisturizing cream, Cold Cream, Vanishing cream and their advantages and disadvantages. Application of these products in formulation of cosmeceuticals. **Antiperspants & deodorants**- Actives & mechanism of action. Principles of formulation and building blocks of Hair care products: Conditioning shampoo, Hair conditioner, anti-dandruff shampoo. Hair oils. Chemistry and formulation of Para-phylene diamine-based hair dye. **Principles of formulation and building blocks of oral care products**: Toothpaste for bleeding gums, sensitive teeth. Teeth whitening, Mouthwash.	**CLO2**	**10**
UNIT III		
Sun protection, Classification of Sunscreens and SPF. **Role of herbs in cosmetics**: Skin Care: Aloe and turmeric Hair care: Henna and amla. Oral care: Neem and clove **Analytical cosmetics:** BIS specification and analytical methods for shampoo, skin cream and toothpaste.	**CLO3**	**10**
UNIT IV		
Principles of Cosmetic Evaluation: Principles of sebumeter, craniometer. Measurement of TEWL, Skin Color, Hair tensile strength, Hair combing properties Soaps, and syndet bars. Evolution and skin benefits.	**CLO4**	**08**
UNIT V		
Oily and dry skin, causes leading to dry skin, skin moisturization. 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	**CLO5**	**07**
Total		**45**

***The total 15 tutorials should be conducted as per the format mentioned above**

Learning Resource:

Text Reading:

1. Harry's Cosmetology, Wilkinson, Moore, Seventh Edition, George Godwin.
2. Cosmetics– Formulations, Manufacturing and Quality Control, P.P. Sharma, 4th Edition, Vandana Publications Pvt. Ltd., Delhi.
3. Text book of cosmelicology by Sanju Nanda & Roop K. Khar, Tata Publishers.

Reference Reading

1. Poucher's perfume cosmetics and Soaps, 10th edition.
2. Cosmetics - Formulation, Manufacture and quality control, PP. Sharma,4th edition
3. Handbook of cosmetic science and Technology Amoebae, M.Paye and H.I. Maibach.3rdedition
4. Cosmetic and Toiletries recent supplier's catalogue.

Online resource/ E-learning resource:

1. https://www.edx.org/
2. https://www.scs.org.uk/
3. https://www.researchgate.net/

Name of the Program:		B. Pharm		Semester: VIII		Level: UG	
Course Name		Experimental pharmacology (Theory)		Course Code/ Course Type		BP810ET/Core	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	1	4	45	25	75	-
Pre-Requisite: Nil							
Course Objectives (CO):				The objectives of Experimental pharmacology are: 1. To appreciate the applications of various commonly used laboratory animals in preclinical research. 2. To learn various screening methods used in preclinical research. 3. To study the importance of biostatistics and research methodology in preclinical studies. 4. To design research hypothesis independently. 5. To learn preclinical research data using statistical tools and graphical representation.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Explain the role and significance of different laboratory animals used in research. 2. Comprehend preclinical screening methods for various pharmacological activities. 3. Apply biostatistical methods and research methodology in preclinical studies. 4. Understand the design of research hypothesis, including execution. 5. Analyze and interpret preclinical data using statistical tools such as Student's t-test and One-way ANOVA.			

COURSE CURRICULUM

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics	CLO	Hours
UNIT I		
Laboratory Animals: Study of CPCSEA and OECD guidelines for maintenance, breeding and conduct of experiments on laboratory animals, Common lab animals: Description and applications of different species and strains of animals. Popular transgenic and mutant animals. Techniques for collection of blood and common routes of drug administration in laboratory animals, Techniques of blood collection and euthanasia	**CLO 1**	**08**
UNIT II		
Preclinical screening models: a. Introduction: Dose selection, calculation and conversions,	**CLO 2**	**10**

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. b. **Study of screening animal models** : Diuretics, nootropics, anti-Parkinson 's, antiasthma tics **Preclinical screening models:** for CNS activity- analgesic, antipyretic, anti10 Page 159 of 161 inflammatory, general anesthetics, sedative and hypnotics, antipsychotic, antidepressant, antiepileptic, ant parkinsonism, Alzheimer's disease		
UNIT III		
Preclinical screening models: for ANS activity, sympathomimetics, sympatholytic, parasympathomimetic, parasympatholytic, skeletal muscle relaxants, drugs acting on eye, local anesthetics	**CLO 3**	**10**
UNIT IV		
Preclinical screening models: for CVS activity- antihypertensives, diuretics, antiarrhythmic, antidyslepidemic, anti-aggregatory, coagulants, and anticoagulants Preclinical screening models for other important drugs like antiulcer ,antidiabetic, anticancer and antiasthma tics.	**CLO 4**	**10**
UNIT V		
Research methodology and Bio-statistics Selection of research topic, review of literature, research hypothesis and study design pre-clinical data analysis and interpretation using Students _t'test and One way ANOVA. Graphical representation of data	**CLO 5**	**7**
Total Hours		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning resources:

Text Reading:

1. Hand book of Experimental Pharmacology-S.K.Kulakarni
2. Fundamentals of experimental Pharmacology-byM.N.Ghosh
3. Introduction to biostatistics and research methods by PSS Sundar Rao and JRichard

Reference:

1. Drug Screening Methods by Suresh Kumar Gupta and S. K. Gupta
2. Drug discovery and Evaluation by Vogel H.G.
3. CPCSEA guidelines for laboratory animal facility.

Online Resources/E-Learning Resources:

1. https://www.slideshare.net/slideshow/common-laboratory-animals/117125794
2. https://pdf.ipinnovative.com/pdf/18886
3. https://www.ajpbp.com/ajpbp-articles/preclinical-screening-techniques-for-antidiarrheal-drugs-a-comprehensive-review.pdf
4. https://mfs.mkcl.org/images/ebook/Fundamental%20of%20Research%20Methodology%20and%20Statistics%20by%20Yogesh%20Kumar%20Singh.pd

Name of the Program:		B. Pharm		Semester: VIII		Level: UG	
Course Name		Advanced Instrumentation Techniques (Theory)		Course Code/ Course Type		BP811ET	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
3	-	1	4	45	25	75	-
Pre-Requisite:		Nil					
Course Objectives (CO):				The objectives of Advanced Instrumentation Techniques are: 1. To illustrate the principle of the advanced instruments used and justify its applications in drug analysis. 2. To formulate and justify techniques for the analysis of drugs using various analytical instruments. 3. To explain the importance and methods for the calibration of various analytical instruments. 4. To explain principle, application, and procedure employed in radio-immuno assay and extraction techniques. 5. To understand the chromatographic separation andanalysis of drugs.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Understand the advanced instruments used and its applications in drug analysis. 2. Know analysis of drugs using various analytical instruments. 3. Perform the calibration of various analytical Instruments. 4. Explain radio-immuno assay and extraction techniques. 5. Understand the principles of chromatographic separation and its application in analysis of drugs.			

Course Contents/Syllabus:
(All the units carry equal weightage in Summative Assessment and equal engagement)

Descriptors/Topics"	CLO	Hours
UNIT I		
Nuclear Magnetic Resonance spectroscopy Principles of H-NMR and C-NMR, chemical shift, factors affecting chemical shift, coupling constant, Spin - spin coupling, relaxation, instrumentation and applications **Mass Spectrometry**- Principles, Fragmentation, Ionization techniques- Electron impact, chemical ionization, MALDI, FAB, Analyzers-Time of flight and Quadrupole, instrumentation, applications	**CLO1**	**10**
UNIT II		
Thermal Methods of Analysis: Principles, instrumentation and applications of Thermogravimetric Analysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC) **X-Ray Diffraction Methods:** Origin of X-rays, basic aspects of crystals, X-ray Crystallography, rotating crystal technique, single crystal diffraction, powder diffraction, structural elucidation and applications.	**CLO2**	**10**
UNIT III		
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	**CLO3**	**10**
UNIT IV		
Radio immunoassay: Importance, various components, Principle, different methods, Limitation and Applications of Radio immunoassay **Extraction techniques**: General principle and procedure involved in the solid phase extraction and liquid-liquid extraction	**CLO4**	**08**
UNIT V		
Hyphenated techniques-LC-MS/MS, GC-MS/MS, HPTLC-MS.	**CLO5**	**07**
Total Hours		**45**

*** The total 15 tutorials should be conducted as per the format mentioned above**

Learning Resource
Text Reading:

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Elementary organic spectroscopy-Principles and Chemical Applications, by Y.R Sharma, S. Chand & Company Ltd, New Delhi, India.
3. Textbook of Pharmaceutical Analysis by Kenneth A. Connors
4. Spectroscopy of Organic compounds by P.S.Kalsi
5. Ashutosh Kar, Pharmaceutical Drug Analysis, New Age International (P) Ltd. Publishers, India.
6. S. S. Mahajan, Instrumental Methods of Analysis, Popular Prakashan Pvt Ltd., India.
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