UTTARANCHAL UNIVERSITY

UTTARANCHAL UNIVERSITY

Arcadia Grant, P.O. Chandanwari, Premnagar, Dehradun,
Uttarakhand-248007, INDIA

Detailed Course Structure & Syllabus

B.Pharm.

Applicable for Batch: 2020-24

Under Choice Based Credit System (CBCS)

of

Course Structure & Syllabus B. Pharm.
Applicable for Batch: 2020-24

EVALUATION SCHEME
B.Pharm. - 4 Years
Under Choice Based Credit System (CBCS)

Course Structure & Syllabus B.Pharm.
Applicable for Batch: 2018-22

SEMESTER- I

Course code	Name of the course	No.of hours	Tutorial	Credit points
BP101T	Human Anatomy and Physiology I– Theory	3	1	4
BP102T	Pharmaceutical Analysis I – Theory	3	1	4
BP103T	Pharmaceutics I – Theory	3	1	4
BP104T	Pharmaceutical Inorganic Chemistry – Theory	3	1	4
BP105T	Communication skills – Theory *	2	-	2
BP106RBT BP106RMT	Remedial Biology/ Remedial Mathematics – Theory*	2	-	2
BP107P	Human Anatomy and Physiology – Practical	4	-	2
BP108P	Pharmaceutical Analysis I – Practical	4	-	2
BP109P	Pharmaceutics I – Practical	4	-	2
BP110P	Pharmaceutical Inorganic Chemistry – Practical	4	-	2
BP111P	Communication skills – Practical*	2	-	1
BP112RBP	Remedial Biology – Practical*	2	-	1
	Total	**32/36$/38#**	**4**	**27/29$/30#**

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

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

* Non University Examination (NUE)

SEMESTER- II

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

*****Non University Examination (NUE)

SEMESTER- III

Course code	Name of the course	No.of hours	Tutorial	Credit points
BP301T	Pharmaceutical Organic Chemistry II – Theory	3	1	4
BP302T	Physical Pharmaceutics I – Theory	3	1	4
BP303T	Pharmaceutical Microbiology – Theory	3	1	4
BP304T	Pharmaceutical Engineering – Theory	3	1	4
BP305P	Pharmaceutical Organic Chemistry II – Practical	4	-	2
BP306P	Physical Pharmaceutics I – Practical	4	-	2
BP307P	Pharmaceutical Microbiology – Practical	4	-	2
BP 308P	Pharmaceutical Engineering –Practical	4	-	2
BP105TLE	Communication skills – Theory *$	2	-	2
BP111PLE	Communication skills – Practical*$	2	-	1
	Total	**32**	**4**	**24/27$**

*****Non University Examination (NUE)

$ For Lateral Entry Students Only

SEMESTER- IV

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

*****Non University Examination (NUE)

SEMESTER- V

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

*****Non University Examination (NUE)

SEMESTER- VI

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

*****Non University Examination (NUE)

SEMESTER- VII

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

*****Non University Examination (NUE)

SEMESTER- VIII

Course code	Name of the course	No.of hours	Tutorial	Credit points
BP801T	Biostatistics and Research Methodology	3	1	4
BP802T	Social and Preventive Pharmacy	3	1	4
BP803ET	Pharma Marketing Management	3 + 3 = 6	1 + 1 = 2	4 + 4 = 8
BP804ET	Pharmaceutical Regulatory Science			
BP805ET	Pharmacovigilance			
BP806ET	Quality Control and Standardization of Herbals			
BP807ET	Computer Aided Drug Design			
BP808ET	Cell and Molecular Biology			
BP809ET	Cosmetic Science			
BP810ET	Experimental Pharmacology			
BP811ET	Advanced Instrumentation Techniques			
BP812ET	Dietary Supplements and Nutraceuticals			
BP814ET	Modules of LSSSDC : Pharma Production			
BP815ET	Modules of LSSSDC : Quality Analytics			
BP816ET	Modules of LSSSDC : Medical Representative			
BP813PW	Project Work	12	-	6
	Total	**24**	**4**	**22**

*****Non University Examination (NUE)

Summary of Credits Distribution

Year	Semester	Credit Points
1	I	**27/29[$]/30[#]**
	II	29
2	III	26
	IV	28
3	V	26
	VI	30
4	VII	24
	VIII	22
Extracurricular/ Co curricular activities		01*
Total credit points for the program		**213/211[$]/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

Schemes for Internal Assessments
and
End Semester Examinations
For B.Pharm.

Schemes for internal assessments and end semester examinations semester wise

SEMESTER- I

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP101T	Human Anatomy and Physiology I– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP102T	Pharmaceutical Analysis I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP103T	Pharmaceutics I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP104T	Pharmaceutical Inorganic Chemistry – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP105T	Communication skills – Theory *	5	10	1 Hr	15	35	1.5 Hrs	50
BP106RBT BP106RMT	Remedial Biology/ Mathematics – Theory*	5	10	1 Hr	15	35	1.5 Hrs	50
BP107P	Human Anatomy and Physiology – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP108P	Pharmaceutical Analysis I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP109P	Pharmaceutics I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP110P	Pharmaceutical Inorganic Chemistry – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP111P	Communication skills – Practical*	5	5	2 Hrs	10	15	2 Hrs	25
BP112RBP	Remedial Biology – Practical*	5	5	2 Hrs	10	15	2 Hrs	25
Total		**0/75$/80#**	**15/125$/ 130#**	**3/24$/26#Hrs**	**85/200$/210#**	**90/525$/ 40#**	**1.5/33$/ 35# Hrs**	**75/725$/ 50#**

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

***** Non University Examination(NUE)

Semester II

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP201T	Human Anatomy and Physiology II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP202T	Pharmaceutical Organic Chemistry I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP203T	Biochemistry – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP204T	Pathophysiology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP205T	Computer Applications in Pharmacy – Theory*	10	15	1 Hr	25	50	2 Hrs	75
BP206T	Environmental sciences – Theory*	10	15	1 Hr	25	50	2 Hrs	75
BP207P	Human Anatomy and Physiology II –Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP208P	Pharmaceutical Organic Chemistry I– Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP209P	Biochemistry – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP210P	Computer Applications in Pharmacy – Practical*	5	5	2 Hrs	10	15	2 Hrs	25
Total		**80**	**125**	**20 Hrs**	**205**	**520**	**30 Hrs**	**725**

***** Non University Examination(NUE)

Semester III

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP301T	Pharmaceutical Organic Chemistry II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP302T	PhysicalPharmaceuticsI –Theory	10	15	1 Hr	25	75	3 Hrs	100
BP303T	Pharmaceutical Microbiology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP304T	Pharmaceutical Engineering – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP305P	Pharmaceutical Organic Chemistry II – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP306P	Physical Pharmaceutics I – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP307P	Pharmaceutical Microbiology – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP308P	Pharmaceutical Engineering – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP105TLE	Communication skills – Theory *$	5	10	1 Hrs	15	35	1.5 Hrs	50
BP111PLE	Communication skills – Practical*$	5	5	2 Hrs	10	15	2 Hrs	25
Total		**60**	**100**	**20**	**160**	**440**	**28Hrs**	**600**

* Non University Examination (NUE),
$ For Lateral Entry Students Only

Semester IV

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP401T	Pharmaceutical Organic Chemistry III– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP402T	Medicinal Chemistry I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP403T	Physical Pharmaceutics II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP404T	Pharmacology I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP405T	Pharmacognosy I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP406P	Medicinal Chemistry I – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP407P	Physical Pharmaceutics II – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP408P	Pharmacology I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP409P	Pharmacognosy I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP205TLE	Computer Application in Pharmacy-Theory*$	10	15	1 Hrs	25	50	2 Hrs	75
BP210TLE	Computer Application in Pharmacy- Practical*$	5	5	2 Hrs	10	15	2 Hrs	25
Total		**70**	**115**	**21 Hrs**	**185**	**515**	**31 Hrs**	**700**

* Non University Examination (NUE),
$ For Lateral Entry Students Only

Semester V

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

* Non University Examination (NUE)

Semester VI

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

* Non University Examination (NUE)

Semester VII

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP701T	Instrumental Methods of Analysis – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP702T	Industrial Pharmacy – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP703T	Pharmacy Practice – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP704T	Novel Drug Delivery System – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP705 P	Instrumental Methods of Analysis – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP706 PS	Practice School*	25	-	-	25	125	5 Hrs	150
Total		**70**	**70**	**8Hrs**	**140**	**460**	**21 Hrs**	**600**

***** Non University Examination (NUE)

Semester VIII

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP801T	Biostatistics and Research Methodology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP802T	Social and Preventive Pharmacy – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP803ET	Pharmaceutical Marketing –Theory	10 + 10 = 20	15 + 15 = 30	1 + 1 = 2 Hrs	25 + 25 = 50	75 + 75 = 150	3 + 3 = 6 Hrs	100 + 100 = 200
BP804ET	Pharmaceutical Regulatory Science – Theory							
BP805ET	Pharmacovigilance – Theory							
BP806ET	Quality Control and Standardization of Herbals – Theory							
BP807ET	Computer Aided Drug Design – Theory							
BP808ET	Cell and Molecular Biology –Theory							
BP809ET	Cosmetic Science – Theory							
BP810ET	Experimental Pharmacology –Theory							
BP811ET	Advanced Instrumentation Techniques – Theory							
BP812ET	Dietary Supplements and Nutraceuticals							
BP814ET	Modules of LSSSDC : Pharma Production							
BP815ET	Modules of LSSSDC : Quality Analytics							
BP816ET	Modules of LSSSDC : Medical Representative							
BP813PW	Project Work	-	-	-	-	150	4 Hrs	150
	Total	40	60	4 Hrs	100	450	16 Hrs	550

***** Non University Examination (NUE)

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PROGRAM EDUCATIONAL OBJECTIVES (PEOs) and PROGRAM OUTCOMES (POs) for B. Pharm.

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Programme Educational Objective (PEO's)

PEO 1 To produce graduates of the program with strong fundamental concepts in pharmaceutical sciences along with necessary skill set so as to increase inclination to become entrepreneur, pursue career/ higher studies and research.

PEO 2 To generate prospective knowledge pools with interpersonal, collaborative skills to identify, assess, formulate problems, and execute solutions and also to acquire professional manufacturing and research skills in making the pharmaceutical products, integrate critical thinking and providing services in health care system through research based outcome.

PEO 3 To inculcate in students ethical and professional attitude, multidisciplinary approach, strong communication skills and also leadership and entrepreneurship capabilities in future pharmacists.

PEO 4 To develop pharmacist to contribute effectively towards the social health care system and creating awareness about healthcare issues.

PEO 5 To develop awareness among students towards interdisciplinary and holistic approach in pharmaceuticals for social cause, problem solving and life-long learning.

Program Specific Outcomes (PSO's)

PSO 1 Able to apply the in-depth knowledge of pharmaceutics, cosmetology, pharmaceutical & medicinal chemistry, pharmacology, pharmacognosy and other basic knowledge associated with pharmacy and allied sciences.

PSO 2 Able to choose multi-disciplinary career in pharmaceutical industry or institute or healthcare system.

PSO 3 Able to strengthen the professional and ethical approach, effective communication, team work, project skills and adopt in a globe of constantly developing trends.

PSO 4 Able to stream a self esteemed, lifelong career of personal and professional growth with ethical codes.

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Programme Outcomes (PO's)

PO1 Learn and acquire in depth knowledge and core scientific information regarding pharmaceutics, cosmetology, pharmaceutical & medicinal chemistry, pharmacology, Pharmacognosy and other basic knowledge associated with pharmacy and allied sciences.

PO2 Identify, formulate, research review and analyse problem based learning approach, analytical thinking and also an ability to analyse, evaluate, solve and interpret data generated from the pharmaceutical operations.

PO3 Design solutions using domain knowledge for complex pharmaceutical problems related to public health and safety, environment and society.

PO4 Apply research based knowledge including design of experiments, analysis and interpretation of data and synthesis of the information to find valid problems and the methodology to overcome.

PO5 Create, select and apply appropriate techniques, modern pharmaceutical tools, language simulation software, presentation skills, database management and equipment to analyze and solve problems.

PO6 Understand the concept of community pharmacy and be able to participate in health care programs, create awareness about the effective and safe use of medicines.

PO7 Demonstrate the knowledge to develop a healthy, friendly and sustainable professional environment for continuous development providing better pharmacy related solutions to the society.

PO8 Demonstrate knowledge of professional & ethical duties as per pharmaceutical jurisprudence and imbibe ethical principles and moral values in personal and professional endeavors. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles.

PO9 Develop leadership skill in the diverse areas of profession, individual and team work capabilities, plan and implement professional activities. Acquire knowledge in order to execute responsibilities successfully towards developing expertise as per the needs of industry and academia, individually or in a team even in the multi-disciplinary arena.

PO10 Develop an ability to write effective reports, make excellent presentations, and documentations, and communicate effectively, clear exchange of information with the pharmacy community and society.

PO11 Demonstrate a knowledge & Understanding of project & finance management related to clinical, hospital, pharmacy practice and/or development of Active Pharmaceutical Ingredients & formulations within the pharmacy domain or with the multi-disciplinary environments.

PO12 Develop an aptitude for life-long learning and continuous professional development for a highly productive career and to tackle future challenges. Use self assessment and feedback effectively, to identify learning needs and to satisfy them on an ongoing basis.

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COMPREHENSIVE TABLE
for
B.Pharm.

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Arcadia Grant, P.O. Chandanwari, Premnagar, Dehradun, Uttarakhand

S.No.	Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
1	BP101T	Human Anatomy And Physiology-I	2	2	-	-	1	-	-	-	-	-	-	2	2.16	1.16	2	2
2	BP102T	Pharmaceutical Analysis	2	2	-	-	1	-	-	-	-	-	-	2	2.16	1.16	2	2
3	BP103T	Pharmaceutics-I	3	2	2	-	-	-	-	-	-	2	-	2	2	2	1	1
4	BP104T	Pharmaceutical Inorganic Chemistry	2	2	-	-	-	2	-	-	-	1	-	2	1	1	1.33	1.33
5	BP105T	Communication Skills -Theory	3	1	–	1	–	–	–	–	2	3	–	2	1	1.67	1	1
6	BP106RBT	Remidial Biology-Theory	2.2	-	-	-	-	1.7	1	-	1	2	-	1.5	1	-	1	1
7	BP106RMT	Remedial Mathematics – Theory	3	2.8	2.2	2	1.75	-	1	-	-	-	1	1	3	2	-	1
8	BP107P	Human Anatomy And Physiology-Practical	5	1	-	-	-	-	-	-	-	-	-	1	1.5	1.3	1	1
9	BP108P	Pharmaceutical Analysis Practical	2.2	1	-	-	2	-	-	-	1	-	-	-	2.25	1.75	2	2.5
10	BP109P	Pharmaceutics Practical	3	2	-	-	-	-	-	-	-	2	-	2	2	2	1	1.5
11	BP110P	Pharmaceutical Inorganic chemistry	2.2	-	-	-	-	-	-	-	1	1	2	1.5	1	1	1	1
12	BP111P	Communication Skills -Practical	3	1	1	1	1	1	–	–	2	3	–	2	1	1	1.4	1

13	BP112RBP	Remidial Biology-Practical	2	-	-	-	3	2	-	-	1	-	-	2	1	1	1	1
14	BP201T	Human Anatomy And Physiology-II	2	1	-	-	-	-	-	-	-	1	1	1	2.4	1.6	1.25	2
15	BP202T	Pharmaceutical Organic Chemistry –I	2.1	1	2	-	-	-	-	-	1	-	1	1	2.6	1.6	1.25	1.8
16	BP203T	Biochemistry	3	2	2	-	-	-	-	-	-	2	-	2	3	2.3	1.3	1.83
17	BP204T	Pathophysiology	2.75	-	-	-	2.5	2	2.33	2	1	2	2	2.2	1	1	1	1
18	BP205T	Computer Application in Pharmacy Theory	3	2	1	–	1	–	–	–	2	1	–	1	1	–	1	1
19	BP206T	Environmental Studies	3	2	2	_	_	_	2.6	–	3	2	_	1.2	1	1	1	2
20	BP207P	Human Anatomy And Physiology-II-Practical	5	1	-	-	-	-	-	-	-	-	-	1	1.5	1.3	1	1
21	BP208P	Pharmaceutical Organic Chemistry –I Practical	2.25	1.3	-	-	-	-	-	-	1	1	-	1	2.5	1.3	1	1.75
22	BP209P	Biochemistry Practical	3	2	-	-	-	-	-	-	1	1	-	2	2.5	1.75	2	1.5
23	BP210P	Computer Application in Pharmacy Practical	3	1	1	1	1	–	–	–	1	1	–	1	1	1	–	1
24	BP301T	Pharmaceutical Organic Chemistry –II	1.5	2.5	3	1	-	1.3	1	-	1	1	-	2.3	1.16	1	1	1

25	BP302T	Physical Pharmaceutics- I	3	1	2	1	-	1	-	-	-	1	-	2	1.16	1	1	1.66
26	BP303T	Pharmaceutical Microbiology	3	1.2	1	-	1	-	1	-	1	-	-	2	1	1	1	1
27	BP304T	Pharmaceutical Engineering	3	1.25	2	-	2	1.5	1	-	2	1.67	0	1	1	1	1	1
28	BP305P	Pharmaceutical organic chemistry-II	2.5	1.2	1	-	-	-	-	-	1	-	-	2	1.7	1	1	-
29	BP306P	Physical Pharmaceutics I	3	2	1	1.5	1	-	-	-	1.5	1	-	1.33	1	1	1	1
30	BP307P	Pharmaceutical Microbiology	3	1	1	1.3	1.6	-	-	-	1.4	1	-	2	1	1	0.6	0.6
31	BP308P	Pharmaceutical Engineering	2.8	1	1	1	1	-	-	-	1	1	-	1	1	1	1	1
32	BP105TLE	Communication Skills Theory	3	1	–	1	–	–	–	–	2	3	–	2	1	1.67	1	1
33	BP111PLE	Communication Skills -Practical	3	1	1	1	1	1	–	–	2	3	–	2	1	1	1.4	1
34	BP401T	Pharmaceutical Organic Chemistry –III	2.6	2.33	2	-	-	-	-	-	-	-	-	1	2.6	2.2	1.6	2
35	BP402T	Medicinal Chemistry-I	2	–	1	–	–	1	–	–	–	–	–	1.5	1.2	1	–	1
36	BP403T	Physical Pharmaceutics-II	3	1.75	1.6	1.5	1.5	-	-	-	-	1	-	2	3	2	1	2
37	BP404T	Pharmacology-I	2	2	-	1	1	2	-	-	-	2	-	1.66	1	1	1	1
38	BP405T	Pharmacognosy-I	3	1	-	-	1	-	-	-	2	-	-	1	3	2	1	1
39	BP406P	Medicinal Chemistry-I	1.75	-	-	-	2	-	-	-	1	-	-	2	1	1	-	1
40	BP407P	Physical Pharmaceutics II	3	2	1.5	2	1.5	-	-	-	1.3	-	-	2	3	2	1	2

41	BP408P	Pharmacology-II	2.25	-	-	-	2	2.5	2	3	-	2.5	-	2.75	2.5	1.75	1.75	2.25
42	BP409P	Pharmacognosy-I	3	-	-	-	-	-	-	-	1	-	-	1	1.5	0.5	0.5	0.25
43	BP205TLE	Computer Application in Pharmacy Theory	3	2	1	–	1	–	–	–	2	1	–	1	1	–	1	1
44	BP210PLE	Computer Application in Pharmacy Practical	3	1	1	1	1	–	–	–	1	1	–	1	1	1	–	1
45	BP501T	Medicinal Chemistry-II	2.33	–	–	–	–	–	1	–	–	1	–	1	1	1	1	1
46	BP502T	Industrial Pharmacy-I	2.33	1.25	2	—	2	—	—	—	1	1	—	1	1	1	1	1
47	BP503T	Pharmacology-II	2	1	-	-	-	2	-	-	-	1	-	1	1	1	1	1
48	BP504T	Pharmacognosy-II	3	1	-	-	-	-	1	-	-	-	1	1.5	3	1.5	1.5	1
49	BP505T	Pharmaceutical Jurisprudence	3	-	-	-	-	1.25	-	3	-	1	-	2	1.5	1.5	1.5	2
50	BP506P	Industrial Pharmacy-Practical	2.3	1	1	-	-	-	-	-	1	1	-	1	1	1	1	1
51	BP507P	Pharmacology-II	1.75	1	1	2	1	1	1	1	1	1	1.5	2	1	1	1	1
52	BP508P	Pharmacognosy-II	3	1	-	-	1	-	1	-	1	-	-	2	3	1	2	1
53	BP601T	Medicinal Chemistry-III	2.2	-	1	--	1.33	1.5	--	-	-	-	-	2	1	1	-	-
54	BP602T	Pharmacology-III	2.3	1	2.5	2	-	1	-	-	-	0.83	-	2	1.5	1	1	1
55	BP603T	Herbal Drug Technology	3	2	-	-	-	-	1	1	1	-	-	1	2.6	2	1	1
56	BP604T	Biopharmaceutics & Pharmacokinetics	3	1	-	-	1.5	-	-	-	1	-	-	2	1	1	1	1

57	BP605T	Pharmaceutical Biotechnology	2	1	-	-	-	-	-	-	1	1	-	1	1	1	1	1
58	BP606T	Quality Assurance	3	1	-	1	1	1	-	-	1	1	-	1	1	1	1	1
59	BP607P	Medicinal Chemistry-III	1.75	-	1	-	2.33	-	-	-	1	-	-	1	1.33	1	1	1
60	BP608P	Pharmacology-III	2.3	-	3	1	2	-	-	-	2	1	-	2	1	1	1	1
61	BP609P	Herbal Drug Technology	3	1.3	-	-	1	-	-	-	1	-	-	1	1.6	1.5	1	1
62	BP701T	Instrumental Method of Analysis	2.75	1	1	1	–	–	1	–	1	–	–	1.5	1	1	1	1
63	BP702T	Industrial Pharmacy-I	2.75	2.5	2	2	2	—	—	2	1	1	—	2	1.75	1	1	1
64	BP703T	Pharmacy Practice	2	1	1	1	-	1.83	-	1.16	1	2	-	1.8	1	1.5	1.33	1.33
65	BP704T	Noval Drug Delivery System	3	2	2	1	2	-	-	-	1.5	-	-	2	1	1	1	1.5
66	BP705P	Instrumental Method of Analysis	2.25	2.33	–	–	1	–	–	–	1.5	–	–	1	2.25	1.25	1	1
67	BP706PS	Practice School	3	2.33	3	1	1.33	2	1	2	0.87	1	1	2	1.33	1	2	1.5
68	BP801T	Biostatistics and Research Methodology	3	3.75	2	2.5	2.4	–	1	–	–	2	1.75	1.66	2	1	1	2
69	BP802T	Social and Preventive Pharmacy	2.1	2	1.6	2	–	1.8	2	2	1.4	1.5	–	2.5	1.8	1.25	1	2
70	BP803ET	Pharmaceutical Marketing	3	1	–	2	2	3	1	1	3	3	–	3	2	1	1	2
71	BP804ET	Pharmaceutical Regulatory Science	3	2	2	-	-	-	-	-	-	2	-	2	1	2	1.4	1.2

72	BP805ET	Pharmacovigilance	3	2	-	-	-	-	-	-	-	2	-	2	1.5	2.5	1.5	1.5
73	BP806ET	Quality Control and Standardization of Herbals	3	1	–	–	2	1	–	–	1	1	–	1	1.2	1.5	1	1
74	BP807ET	Computer Aided Drug Design	3	2	2	-	-	-	-	-	-	2	-	2	3	2.4	1.4	1.8
75	BP808ET	Cell And Molecular Biology	3	2	-	-	-	-	-	-	-	2	-	2	2.5	2	1.5	1.5
76	BP809ET	Cosmetic Science	2.6	1.25	1.5	1	2	_	_	_	2	2	2	1.5	1	1	1	1
77	BP810ET	Pharmacological Screening Methods	3	2	-	-	1	-	1	1	1	-	-	1.3	2.6	2	1	1
78	BP811ET	Advanced Instrumentation Techniques	3	2	-	-	1	-	1	1	1	-	-	1.3	2	1.5	1	1
79	BP812ET	Dietary Supplements and Nutraceuticals	3	1	-	-	-	-	1	-	-	1.33	1	1	1.4	1	1	1

80	BP814ET	Pharma Production	3	1.5	3	–	–	–	1.5	–	–	–	1.5	1	1	1	–	1
81	BP815ET	Quality Analytics	3	1.5	1	–	2	1	1.5	1	–	–	2	1	1	1	1	1
82	BP816ET	Medical Representative	3	2	2	1.5	1	1	–	–	1.5	2	2	2	1	1	1	1
83	BP813PW	Project Work	3	1.5	2	1.75	1.5	1	–	–	1.75	1.75	1.75	2	1.25	1	1	1

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SYLLABUS
of
B. Pharm.

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SEMESTER –I

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Programme Name	B.Pharm.	Programme Code	29
Course Code	BP101T	Credit	4
Year/Sem	1/1	L-T-P	3-1-0
Course Name	**Human Anatomy And Physiology-I**		

Objectives of the Course:

1. Explain the gross morphology, structure and functions of various organs of the human body.
2. Describe the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of human body.
4. Perform the various experiments related to special senses and nervous system.
5. Appreciate coordinated working pattern of different organs of each system

UNIT-I (Total Hours 10)

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.

UNIT II (Total Hours10)

Integumentary system: Structure and functions of skin

Skeletal system: Divisions of skeletal system, types of bone, salient features and functionsof 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

UNIT- III (Total Hours10)

Body fluids and blood: Body fluids, composition and functions of blood, hemopoeisis, formation ofhemoglobin, 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 oflymphatic system

UNIT-IV (Total Hours8)

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.

UNIT-V (Total Hours7)

Cardiovascular system

Heart – anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, elements of conduction system of heart and heart beat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.

Course Outcome (CO)

BP101T. CO1. Demonstrate competency in identifying the human body structure
BP101T. CO2. Identify the various tissues and organs of different systems of human body.
BP101T. CO3. Compare and contrast the different parts of human tissue, organ and system
BP101T. CO4. Diagrammatic representation of human organ and system
BP101T. CO5. Estimate different components available in human tissue and body fluid.
BP101T. CO6. Recognize the major organs and vessels and understand the function of different human system.

References:

1.Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
2.Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypeebrothers medical publishers, New Delhi.
3.Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co,Riverview,MI USA

CO/PO Articulated Matrix

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
BP101T. CO 1	2	-	-	-	-	-	-	-	-	-	-	-	3	2	3	3
BP101T. CO 2	2	-	-	-	-	-	-	-	-	-	-	2	2	1	-	-
BP101T. CO 3	2	2	-	-	-	-	-	-	-	-	-	2	2	1	2	2
BP101T. CO 4	2	2	-	-	-	-	-	-	-	-	-	-	2	1	-	-
BP101T. CO 5	2	2	-	-	-	-	-	-	-	-	-	-	2	1	1	-
BP101T. CO 6	2	-	-	-	1	-	-	-	-	-	-	-	2	1	-	1
AVERAGE	2	2	-	-	1	-	-	-	-	-	-	2	2.2	1.2	2	2

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP102T	Credit	4
Year/Sem	1/1	L-T-P	3-1-0
Course Name	**Pharmaceutical Analysis**		

Objectives of the Course:

1.Upon completion of the course the student shall be able to know
2.Understand the principles of volumetric and electro chemical analysis
3. Carryout various volumetric and electrochemical titrations.
4.Develop analytical skills

UNIT-I (Total Hours10)

(a) Pharmaceutical analysis- Definition and scope
i) Different techniques of analysis
ii) Methods of expressing concentration
iii) Primary and secondary standards.
iv) Preparation and standardization of various molar and normal solutions-Oxalic acid, sodium hydroxide, hydrochloric acid, sodium thiosulphate, sulphuric acid, potassium permanganate and ceric ammonium sulphate
(b)Errors: Sources of errors, types of errors, methods of minimizing errors,
accuracy, precision and significant figures
(c)Pharmacopoeia, Sources of impurities in medicinal agents, limit tests.

UNIT II(Total Hours10)

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

UNIT- III (Total Hours10)

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. Purityof the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate. Basic Principles, methods and application of diazotisation titration.

UNIT-IV (Total Hours 8)

Redox titrations
(a) Concepts of oxidation and reduction
(b) Types of redox titrations (Principles and applications)
Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate

UNIT-V (Total Hours 7)

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

Course Outcome (CO)

BP102T CO 1 understand the importance of analytical chemistry and its scope
BP102T CO 2 describe various methods used for identification and estimation of compounds
BP102T CO 3 Illustrate the importance of standardization of chemical substances and propose the assay of different drugs
BP102T CO 4 classify analytical errors and describe sources of impurities
BP102T CO 5 assess the instrumentation applicable in electrochemical method of analysis
BP102T CO 6 Describe the concept of concentration, acid base theory, redox reaction and indicators.

CO/PO Articulated Matrix

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
BP102T. CO 1	2	-	-	-	-	-	-	-	-	-	-	-	3	2	3	3
BP102T. CO 2	2	-	-	-	-	-	-	-	-	-	-	2	2	1	-	-
BP102T. CO 3	2	2	-	-	-	-	-	-	-	-	-	2	2	1	2	2
BP102T. CO 4	2	2	-	-	-	-	-	-	-	-	-	-	2	1	-	-
BP102T. CO 5	2	2	-	-	-	-	-	-	-	-	-	-	2	1	1	-
BP102T. CO 6	2	-	-	-	1	-	-	-	-	-	-	-	2	1	-	1
AVERAGE	2	2	-	-	1	-	-	-	-	-	-	2	2.2	1.2	2	2

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

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Programme Name	B.Pharm	Programme Code	29
Course Code	BP103T	Credit	4
Year/Sem	1/1	L-T-P	3-1-0
Course Name	**Pharmaceutics- I**		

Objectives of the Course:

1. Know the history of profession of pharmacy
2. Understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations
3. Understand the professional way of handling the prescription
4. Preparation of various conventional dosage forms

UNIT I (Total Hours 10)

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. Pediatric dose calculations based on age, body weight and body surface area.

UNIT II(Total Hours 10)

Pharmaceutical calculations: Weights and measures – Imperial & Metric system, Calculations involving percentage solutions, allegation, proof spirit and isotonic solutions based on freezing point and molecular weight.

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

UNIT- III (Total Hours 10)

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.

UNIT-IV (Total Hours 8)

Suppositories: Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories.

Pharmaceutical in compatibilities: Definition, classification, physical, chemical and therapeutic incompatibilities with examples.

UNIT-V (Total Hours7)

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

Course Outcome (CO)

BP103T CO 1 Describe history of Pharmacy, development of pharmacy profession and industry in India
BP103T CO2 Understand the pharmaceutical dose calculation required for compounding and dispensing.
BP103T CO3 Identify monophasic and biphasic liquids.
BP103T CO4 Examine and classify pharmaceutical incompatibilities
BP103T CO5 Evaluate suppositories and semisolid dosage forms.

References:

1. Ansel,H.C.,Popovich,N.G., &Allen, L. V.Pharmaceutical Dosage Form and Drug Delivery System, Lippincott William.s and Walkins, New Delhi.
2. Aulton, M.E., Pharmaceutics The Science& Dosage Form Design, Churchill Livingstone, Edinburgh.
3. Liebermans,L.,Theory and Practice of Industrial Pharmacy, Lea & Febiger Publisher, The University of Michigan.

CO/PO Articulated Matrix

PO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4
BP103.CO1	3	-	-	-	-	-	-	-	-	-	-	2	2	-	1	-
BP103.CO2	3	-	-	-	-	-	-	-	-	2	-	-	2	2	1	-
BP103.CO3	3	-	-	-	-	-	-	-	-	-	-	-	2	2	1	2
BP103.CO4	3	2	-	-	-	-	-	-	-	-	-	-	2	-	1	1
BP103.CO5	3	-	2	-	-	-	-	-	-	2	-	2	2	2	1	1
AVERAGE	3	2	2	-	-	-	-	-	-	2	-	2	2	2	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP104T	Credit	4
Year/Sem	1/1	L-T-P	3-1-0
Course Name	**Pharmaceutical Inorganic chemistry**		

Objectives of the Course:

1. Upon completion of the course the student shall be able to know
2. The sources of impurities and methods to determine the impurities in inorganic
3. Understand the medicinal and pharmaceutical importance of inorganic compounds.

UNIT I (Total Hours 10)

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

UNIT II ((Total Hours 10)

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.

UNIT- III (Total Hours-10)

Gastrointestinal agents

Acidifiers: Ammonium chloride* and Dil. HCl

Antacid: Ideal properties of antacids, combinations of antacids, Sodium Bicarbonate*, Aluminum 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

UNIT-IV (Total Hours-8)

Miscellaneous compounds

Expectorants: Potassium iodide, Ammonium chloride*.

Emetics: Copper sulphate*, Sodium potassium tartarate

Haematinics: Ferrous sulphate*, Ferrous gluconate

Poison and Antidote: Sodium thiosulphate*, Activated charcoal, Sodium nitrite333

Astringents: Zinc Sulphate, Potash Alum

UNIT-V (Total Hours-7)

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.

Course Outcome (CO)

BP104T CO1 Understand sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals

BP104T CO2 Appraise the physical and chemical properties of inorganic compounds.

BP104T CO3 Classify the different class of inorganic compounds

BP104T CO4 Understand the procedure to perform specific test and limit test of inorganic medicinal compounds as per official pharmacopoeia

BP104T CO5 Describe the application of radiopharmaceutical substances and mesurment.

BP104T CO 6 Describe the basic concept of acid base and physiological buffer system

References:

1. Anand & Chatwal, Inorganic Pharmaceutical Chemistry 5th edition 2018.
2. P. Gundu Rao, Inorganic Pharmaceutical Chemistry, Vallabh publication 3rd Edition
3. A.I. Vogel, Text Book of Quantitative Inorganic analysis

Articulated Matrix

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP104T.CO1	3	2	-	-	-	2	-	-	-	1	-	2	-	1	1	1
BP104T.CO2	2	2	-	-	-	2	-	-	-	-	-	-	1	-	2	1
BP104T.CO3	2	-	-	-	-	-	-	-	-	-	-	-	1	1	-	1
BP104T.CO4	3	2	-	-	-	-	-	-	-	-	-	-	1	-	1	-
BP104T.CO5	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1
BP104T.CO6	1	-	-	-	-	2	-	-	-	-	-	-	-	1	-	-
AVERAGE	2	2	-	-	-	2	-	-	-	1	-	2	1	1	1.3	1.3

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP105T	Credit	4
Year/Sem	1/1	L-T-P	2-0-0
Course Name	**Communication Skills Theory**		

Objectives of the Course:

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

UNIT I (Total Hours- 07)

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

UNIT II (Total Hours-7)

Elements of Communication: Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication

Communication Styles: Introduction, The Communication Styles Matrix with example for each Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style

UNIT- III (Total Hours-7)

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

UNIT-IV (Total Hours-05)

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

UNIT-V (Total Hours-04)

Group Discussion: Introduction, Communication skills in group discussion, Do‘s and Dont‘s of group discussion

Reading Skills: Reading Skill; Purpose of Reading; Types of Reading; Techniques for Effective Reading

Remedial Grammar and Usage, Important Aspects of English Grammar and Usage, Phrases and Clauses.

Course Outcome (CO)

BP105T CO1 Understand the meaning and the process of effective communication along with its classification into various types.

BP105T CO2 Comprehend the different elements and barriers to effective communication and develop ways to overcome the same.

BP105T CO3 Construct clear concepts of writing, listening and speaking skills in English Communication

BP105T CO4 Acquire the knowledge of body language and presentation skill to communicate in interviews and professional situations.

BP105T CO5 Understand the concept of teamwork, leadership and importance of personal development skills

References:

1. Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, Basic communication skills for Technology, 2011
2. Sanjay Kumar, Pushpalata, Communication skills 1stEdition, Oxford Press, 2011
3. Stephen .P. Robbins, 1stEdition, Pearson, 2013 Brilliant- Communication skills, Gill Hasson, 1stEdition, Pearson Life, 2011 Organizational Behaviour,
4. GopalaSwamy Ramesh, The Ace of Soft Skills: Attitude, Communication and Etiquette for success 5thEdition, Pearson, 2013
5. Deborah Dalley, Lois Burton, Margaret, Green hall, Developing your influencing skills, 1st Edition Universe of Learning LTD, 2010

CO/PO Articulated Matrix

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
BP105.CO1	3	–	–	–	–	–	–	–	2	3	–	2	1	2	1	1
BP105.CO2	3	1	-	–	–	–	–	–	2	3	–	2	1	–	1	1
BP105.CO.3	3	–	–	–	–	–	–	–	2	3	–	2	1	1	1	1
BP105.CO.4	3	–	–	–	–	–	–	–	2	3	–	2	1	–	1	1
BP105.CO.5	3	–	–	1	–	–	–	–	2	3	–	2	1	2	–	1
AVERAGE	3	1	–	1	–	–	–	–	2	3	–	2	1	1.7	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-35)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	5	10	35

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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Programme Name	B.Pharm.	Programme Code	29
Course Code	BP106RMT	Credit	2
Year/Sem	1/I	L-T-P	2-0-0
Course Name	Remedial Mathematics – Theory		

Objectives of the Course:

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

1. Know the theory and their application in Pharmacy
2. Solve the different types of problems by applying theory
3. Appreciate the important application of mathematics in Pharmacy

UNIT - I (Total Hours- 6)

Partial fraction

Introduction, Polynomial, Rational fractions, Proper and Improper fractions,Partial fraction , Resolving into Partial fraction, Application of PartialFraction in Chemical Kinetics and Pharmacokinetics

Logarithms

Introduction, Definition, Theorems/Properties of logarithms, Commonlogarithms, Characteristic and Mantissa, worked examples, application oflogarithm 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 $_{nn}$ definition) , lim $x - a = na_{n-1}$, lim $\sin\theta = 1$,

UNIT -II (Total Hours-6)

Matrices and Determinant:

Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties ofdeterminants , Product of determinants, Minors and co-Factors, Adjointor adjugate of a square matrix , Singular and non-singular matrices,Inverse of a matrix, Solution of system of linear of equations using matrixmethod, Cramer's rule, Characteristic equation and roots of a squarematrix, Cayley–Hamilton theorem,Applicationof Matrices in solvingPharmacokinetic equations

UNIT- III(Total Hours-6)

CalculusDifferentiation : Introductions, Derivative of a function, Derivative of aconstant, Derivative of a product of a constant and a function , Derivativeof the sum or difference of two functions, Derivative of the product of twofunctions (product formula), Derivative of the quotient of two functions (Quotient formula) – **Without Proof**, Derivative of *xn w.r.t*x,where *n* is anyrational number, Derivative of *ex*,, Derivative of loge *x* , Derivative of*ax* Derivative of trigonometric functions from first principles **(withoutProof)**, Successive Differentiation, Conditions for a function to be amaximum or a minimum at a point. Application

UNIT-IV (Total Hours-6)

Analytical Geometry

Introduction: Signs of the Coordinates, Distance formula,

Straight Line : Slope or gradient of a straight line, Conditions forparallelism and perpendicularity of two lines, Slope of a line joining twopoints, Slope – intercept form of a straight line, circle, parabola

Integration:

Introduction, Definition, Standard formulae, Rules of integration , Method ofsubstitution, Method of Partial fractions, Integration by parts, definiteintegrals, application

UNIT-V (Total Hours-6)

Differential Equations : Some basic definitions, Order and degree,Equations in separable form , Homogeneous equations, LinearDifferential equations, Exact equations, Application in solvingPharmacokinetic equations

Laplace Transform: Introduction, Definition, Properties of Laplacetransform, Laplace Transforms of elementary functions, InverseLaplace transforms, Laplace transform of derivatives, Application tosolve Linear differential equations, Application in solving Chemicalkinetics and Pharmacokinetics equations

Course Outcome (CO)

BP106RMT. CO1 Describe the concept of matrix. Definite and indefinite integral, derivatives and Laplace transform and its application in pharmaceutical science.

BP106RMT. CO2 Applications of mathematical concepts and principles to perform computations for Pharmaceutical Sciences and research field in pharmacy.

BP106RMT. CO3 Create, use and analyze mathematical representations, mathematical relationships and Communicate mathematical knowledge and understanding to help in the field of Clinical Pharmacy.

BP106RMT. CO4 Construct and develop basic tools that are employed in working out numerical problems in day-to-day operations in the labs, in the wards, in the community and related professional environments.

BP106RMT. CO5 The knowledge acquired in this subject will be useful in ensuing fields like pharmaceutical engineering and pharmaceutical analysis.

Recommended Books (Latest Editions)

1. Dhall G.D., Chhibber S.N., Frank mathematics, 1st edition 2004, Frank Bros.& Co.ltd.
2. Malik S.C., Arora Savita, Mathmetical Analysis 5th edition, 2017,New Age International ltd.

CO/PO Articulated Matrix

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
BP106RMT.CO 1	3	3	2	1	-	-	-	-	-	-	-	1	3	1	-	-
BP106RMT.CO 2	3	3	2	3	2	-	-	-	-	-	-	-	3	2	-	-
BP106RMT.CO 3	3	3	2	2	2	-	-	-	-	-	-	-	3	2	-	-
BP106RMT.CO 4	3	3	3	2	2	-	1	-	-	-	1	-	3	2	-	1
BP106RMT.CO 5	3	2	2	2	1	-	-	-	-	-	-	1	3	3	-	1
AVERAGE	3	2.8	2.2	2	1.7	-	1	-	-	-	1	1	3	2	-	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-35)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	5	10	35

*Calculate as per criteria given in PCI syllabus # Average of best of two Sessional

Programme Name	B.Pharm.	Programme Code	29
Course Code	BP106RBT	Credit	2
Year/Sem	1/1	L-T-P	2-0-0
Course Name	**Remidial Biology**		

Objectives of the Course:

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

UNIT I (Total Hours- 07)

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.

UNIT II (Total Hours-07)

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

UNIT- III(Total Hours-07)

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

UNIT- IV (Total Hours-05)

Plants and mineral nutrition:

Essential mineral, macro and micronutrients, Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation

Photosynthesis

Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affectingPhtosynthesis.

UNIT-V (Total Hour-04)
Plant respiration: Respiration, glycolysis, fermentation (anaerobic).
Plant growth and development
Phases and rate of plant growth, Condition of growth,Introduction to plant growthregulators
Cell - The unit of life
Structure and functions of cell and cell organelles.Cell division
Tissues
Definition, types of tissues, location and functions
General structure of life insect of like mosquito, Housefly, Mites and Silk worm.

Course Outcome (CO)

BP106RBT. CO1 Compare the salient features of five kingdoms of life.
BP106RBT. CO2 Classify the basic components of plant anatomy and physiology
BP106RBT. CO3 Compare the basic components of animal anatomy and physiology with special referer
BP106RBT. CO4 Discuss the various components of living world

References: Books must be available in the Library / Central Library

1. Gokhale S.B.,Text book of Biology, 2nd Edition, NiraliPrakasan.
2. Gokhale S.B., Kokate C.K., A manual for pharmaceutical biology practical.

CO/PO Articulated Matrix

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP106RBT.CO1	2	-	-	-	-	2	1	-	-	2	-	2	1	-	-	-
BP106RBT.CO2	2	-	-	-	-	2	-	-	-	-	-	2	1	-	-	-
BP106RBT.CO3	3	-	-	-	-	3	1	-	-	-	-	1	1	-	1	-
BP106RBT.CO4	2	-	-	-	-	-	-	-	1	-	-	1	1	-	-	-
AVERAGE	2.2	-	-	-	-	1.7	1	-	1	2	-	1.5	1	-	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-35)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	5	10	35

*Calculate as per criteria given in PCI syllabus # Average of best of two sessional

Name of Department	Department of Pharmacy		
Programme Name	B.Pharm.	Programme Code	29
Course Code	BP 107P	Credit	2
Year/Sem	1/1	L-T-P	0-0-4
Course Name	**Human Anatomy and Physiology (Practical)**		

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

1. Explain the gross morphology, structure and functions of various organs of the human body.
2. Describe the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of human body.
4. Perform the various experiments related to special senses and nervous system.
5. Appreciate coordinated working pattern of different organs of each system

Practical to be conducted

1. Study of compound microscope.
2. Microscopic study of epithelial and connective tissue
3. Microscopic study of muscular and nervous tissue
4. Identification of axial bones
5. Identification of appendicular bones
6. Introduction to hemocytometry.
7. Enumeration of white blood cell (WBC) count
8. Enumeration of total red blood corpuscles (RBC) count
9. Determination of bleeding time
10. Determination of clotting time
11. Estimation of hemoglobin content
12. Determination of blood group.
13. Determination of erythrocyte sedimentation rate (ESR).
14. Determination of heart rate and pulse rate.
15. Recording of blood pressure.

Course Outcomes (CO)

BP107P. CO1 Enumerate various components of body fluids.
BP107P. CO2 Compare micro and macroscopic data of human tissue.
BP107P. CO3 Determine the various biological processes.
BP107P. CO4 Illustrate bones and tissue on the basis of their structure and roles

References:

1. Ghai C.L., Textbook of Practical Physiology, Jaypee brother's medical publishers, New Delhi.
2. Srinageswari K., Sharma Rajeev, Practical workbook of Human Physiology, Jaypee brother's medical publishers, New Delhi.
3. Kathleen J., Wilson W., Anatomy and Physiology in Health and Illness, Churchill Livingstone, New York

CO/ PO Articulated Matrix

PO/PSO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP107P. CO 1	2	1	-	-	-	-	-	-	-	-	-	1	1	2	1	1
BP107P.CO 2	2	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1
BP107P.CO 3	2	-	-	-	-	-	-	-	-	-	-	1	2	1	-	1
BP107P. CO 4	2	-	-	-	-	-	-	-	-	-	-	1	2	-	-	1
BP107P. CO 5	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVERAGE	5	1	-	-	-	-	-	-	-	-	-	1	1.5	1.3	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-35)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	5	10	35

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP108P	Credit	2
Year/Sem	1/1	L-T-P	0-0-4
Course Name	**Pharmaceutical Analysis Practical**		

Objectives of the Course:

1.Upon completion of the course the student shall be able to know
2.Understand the principles of volumetric and electro chemical analysis
3.Carryout various volumetric and electrochemical titrations
4.Develop analytical skills

Practical to be conducted(Total Hours- 4hr per week)

I Limit Test of the following

(1) Chloride
(2) Sulphate
(3) Iron
(4) Arsenic

IIPreparation and standardization of

(1) Sodium hydroxide
(2) Sulphuric acid
(3) Sodium thiosulfate
(4) Potassium permanganate
(5) Ceric ammonium sulphate

IIIAssay of the following compounds along with Standardization of Titrant

(1) Ammonium chloride by acid base titration
(2) Ferrous sulphate by Cerimetry
(3) Copper sulphate by Iodometry
(4) Calcium gluconate by complexometry
(5) Hydrogen peroxide by Permanganometry
(6) Sodium benzoate by non-aqueous titration
(7) Sodium Chloride by precipitation titration

IVDetermination of Normality by electro-analytical methods

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

Course Outcome (CO)

BP108P. CO1 Reproduce the calibration of glassware.
BP108P. CO2 Prepare the solution of different strength & standardization.
BP108P. CO3 Assess the assay of the drug by volumteric analysis.
BP108 P. CO4 Assess the standardization by electrochemical analysis

References:

1.Vogel A.I., Text Book of Quantitative Inorganic analysis Fir 3D ed publishers.
2. Gundu Rao P., Inorganic Pharmaceutical Chemistry Vallabh publications.

CO/PO Articulated Matrix

PO / CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP108P. CO 1	2	1	-	-	-	-	-	-	1	-	-	-	3	3	2	3
BP108P. CO 2	2	-	-	-	-	-	-	-	1	-	-	-	2	2	-	2
BP108P. CO 3	2	-	-	-	-	-	-	-	1	-	-	-	2	1	-	2
BP108P. CO 4	3	-	-	-	2	-	-	-	1	-	-	-	2	1	2	3
AVERAGE	2.2	1	-	-	2	-	-	-	1	-	-	-	2.25	1.75	2	2.5

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-35)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	5	10	35

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

Programme Name	B. Pharm.	Programme Code	29
Course Code	BP109P	Credit	2
Year/Sem	1/1	L-T-P	0-0-4
Course Name	**Pharmaceutics Practical**		

Objectives of the Course:

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

1. Know the history of profession of pharmacy
2. Understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations
3. Understand the professional way of handling the prescription
4. Preparation of various conventional dosage forms

Practical to be conducted(Total Hours- 4hr per week)

1. Syrups
a) Syrup IP'66
b) Compound syrup of Ferrous Phosphate BPC'68
2. Elixirs
a) Piperazine citrate elixir
b) Paracetamol pediatric elixir
3.Linctus
a) Terpin Hydrate Linctus IP'66
4. Solutions
a) Iodine Throat Paint (Mandles Paint)
b) Strong solution of ammonium acetate
c) Cresol with soap solution
d) Lugol's solution
5. Suspensions
a) Calamine lotion
b) Magnesium Hydroxide mixture
c) Aluminimum Hydroxide gel
6. Emulsions
a) Turpentine Liniment
b) Liquid paraffin emulsion
7. Powders and Granules
a) ORS powder (WHO)
b) Effervescent granules
c)Dusting powder
d)Divded powders 8. Suppositories
a) Glycerogelatin suppository
b) Coca butter suppository
c) Zinc Oxide suppository
8. Semisolids
a) Sulphur ointment
b) Non staining-iodine ointment with methyl salicylate
c) Carbopal gel
9. Gargles and Mouthwashes
a) Iodine gargle
b) Chlorhexidine mouthwash

Course Outcome (CO)

BP109P. CO1 Demonstrate dosage forms of various pharmaceutical preparations
BP109P. CO2 Examine preparation and formulation in relation to I.P
BP109P. CO3 Assess physical incompatibilities and methods to overcome them
BP109P. CO4 Illustrate uses and storage of Pharmaceutical Preparation

References:
1. Ansel H.C., Popovich,N.G., & Allen, L. V.Pharmaceutical Dosage Form and Drug Delivery System, Lippincott William.s and Walkins, New Delhi.
2. Carter S.J., Cooper and Gunn's-Dispensing for Pharmaceutical Students, CBS publishers, New Delhi.
3. Aulton M.E., Pharmaceutics The Science& Dosage Form Design, Churchill Livingstone, Edinburgh.
4. Liebermans L.,Theory and Practice of Industrial Pharmacy, Lea &Febiger Publisher, The University of Michigan.

CO/PO Articulated Matrix

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3	PSO4
BP109.CO1	3	-	-	-	-	-	-	-	-	-	-	2	3	2	1	1
BP109.CO2	3	-	-	-	-	-	-	-	-	2	-	-	2	2	1	2
BP109.CO3	3	-	-	-	-	-	-	-	-	-	-	-	1	2	1	1
BP109.CO4	3	2	-	-	-	-	-	-	-	-	-	-	2	2	1	2
AVERAGE	3	2	-	-	-	-	-	-	-	2	-	2	2	2	1	1.5

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-35)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	5	10	35

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

Programme Name	B. Pharm.	Programme Code	29
Course Code	BP110P	Credit	2
Year/Sem	1/1	L-T-P	0-0-4
Course Name	**Pharmaceutical Inorganic chemistry**		

Objectives of the Course:

1. Upon completion of the course the student shall be able to know
2. The sources of impurities and methods to determine the impurities in inorganic
3. Understand the medicinal and pharmaceutical importance of inorganic compounds.

Practical to be conducted(Total Hours- 4hr per week)

ILimit tests for following ions

Limit test for Chlorides and Sulphates

Modified limit test for Chlorides and Sulphates

Limit test for Iron

Limit test for Heavy metals

Limit test for Lead

Limit test for Arsenic

II Identification test

Magnesium hydroxide

Ferrous sulphate

Sodium bicarbonate

Calcium gluconate

Copper sulphate

III Test for purity

Swelling power of Bentonite

Neutralizing capacity of aluminum hydroxide gel

Determination of potassium iodate and iodine in potassium Iodide

IV Preparation of inorganic pharmaceuticals

Boric acid

Potash alum

Ferrous sulphate

Course Outcome (CO)

BP110P. CO1 Discuss handling of glasswares and chemicals with safety precaution
BP110P. CO2 Critique the identification of the organic compounds
BP110P. CO3 Find out the limit of impurities in pharmaceutical substance
BP110P. CO4 Produce the inorganic compounds in laboratory

References:

1. Anand & Chatwal, Inorganic Pharmaceutical Chemistry 5th edition 2018.
2. Gundu Rao P., Inorganic Pharmaceutical Chemistry, Vallabh Publication, 3rd Edition
3. Vogel A.I., Text Book of Quantitative Inorganic analysis

CO/PO Articulated Matrix

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP110P.CO1	2	-	-	-	-	-	-	-	-	-	2	1	1	1	-	1
BP110P.CO2	2	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
BP110P.CO3	2	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1
BP110P.CO4	3	-	-	-	-	-	-	-	1	1	-	2	-	1	1	1
AVERAGE	2.2	-	-	-	-	-	-	-	1	1	2	1.5	1	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-35)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	5	10	35

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

Programme Name	B. Pharm.	Programme Code	29
Course Code	BP111P	Credit	4
Year/Sem	1/1	L-T-P	0-0-2
Course Name	**Communication Skills - Practical**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. The knowledge of basic unit operations and their importance in day to day running of a pharmaceutical unit is emphasized to the students.
2. This knowledge is further improved in the ensuing pharm. Engineering and pharmaceutics subjects.

Practical to be conducted:-

1. Meeting People
2. Asking Questions
3. Making Friends
4. What did you do?
5. Do‘s and Dont‘s
6. Pronunciation (Consonant Sounds)
7. Pronunciation and Nouns
8. Pronunciation (Vowel Sounds)
9. Advanced Learning
10. Figures of Speech
11. Effective Communication
12. Writing Skills
13. Effective Writing
14. Interview Handling Skills
15. E-Mail etiquette
16. Presentation Skills
17. Just a minute session-Extempore

Course Outcomes (CO)

BP111P. CO1 To develop linguistic competence through accuracy in grammar, pronunciation & vocabulary.

BP111P. CO2 To develop communication skills leading to effective and productive interaction in the areas of pharmaceutical operation.

BP111P. CO3 To enhance competence in both spoken & written language using a wide range of communication strategies.

BP111P.CO4 To be able to listen and comprehend Spoken English and respond appropriately in different socio-cultural and professional contexts.

BP111P. CO5 To effectively use English Language and sharpen public speaking skills.

BP111P. CO6 To enhance the confidence of the students to face interviews, competitive examinations and day-to-day formal & informal communication situations.

References:

1. Andreja. J. Ruther Ford, Basic communication skills for Technology, 2nd Edition, Pearson Education, 2011.
2. Sanjay Kumar, Pushpalata, 1st Edition, Communication skills, Oxford Press, 2011
3. Stephen P. Robbins, 1stEdition, Organizational Behaviour, Pearson, 2013 Brilliant- Communication skills, Gill Hasson, 1stEdition, Pearson Life, 2011
4. GopalaSwamy Ramesh, The Ace of Soft Skills: Attitude, Communication and Etiquette for success, 5th Edition, Pearson, 2013
5. Deborah Dalley, Lois Burton, Developing your influencing skills, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010

CO/PO Articulated Matrix

PO/PSO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP111.CO.1	3	1	1	1	–	–	–	–	2	3	–	2	1	–	2	1
BP111.CO2	3	1	1	–	–	–	–	–	2	3	–	2	1	1	1	–
BP111.CO3	3	–	1	–	–	–	–	–	2	3	–	2	1	1	1	–
BP111.CO4	3	–	1	–	–	–	–	–	2	3	–	2	1	1	1	1
BP111.CO.5	3	–	1		1	–	-	–	2	3	–	2	1	–	–	–
BP111.CO.6	3	–	1	–	1	1	–	–	2	3	–	2	1	1	2	1
AVERAGE	3	1	1	1	1	1	–	–	2	3	–	2	1	1	1.4	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-10)			**External (MM-25)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	5	5	15

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

UTTARANCHAL UNIVERSITY

(Established vide Uttaranchal University Act, 2012, UGC Approved)
(Uttarakhand Act No. 11 of 2013)
Arcadia Grant, P.O. Chandanwari, Premnagar, Dehradun, Uttarakhand

Programme Name	B. Pharm.	Programme Code	29
Course Code	BP112RBP	Credit	1
Year/Sem	1/1	L-T-P	0-0-4
Course Name	**Remidial Biology Practical**		

Objectives of the Course:

Practical to be conducted:-(Total Hours- 2hr per week)

1. Introduction to experiments in biology
   a) Study of Microscope
   b) Section cutting techniques
   c) Mounting and staining
   d) Permanent slide preparation
2. Study of cell and its inclusions
3. Study of Stem, Root, Leaf, seed, fruit, flower and their modifications
4. Detailed study of frog by using computer models
5. Microscopic study and identification of tissues pertinent to Stem, Root, Leaf, seed, fruit and flower
6. Identification of bones
7. Determination of blood group
8. Determination of blood pressure
9. Determination of tidal volume
10. Structure of parasites and insects infecting human as mentioned in the theory

Course Outcomes (CO)

BP112P. CO1 Identify the various blood parameters for estimation.
BP112P. CO2 Compare the morphology of various parts of plants
BP112P. CO3 Demonstrate the various techniques like section cutting, mounting, staining and preparation of permanent slides.
BP112P. CO4 Demonstrate the practicals by using computer models.

References:

1. Kale S.R., Kale R.R., Practical human anatomy and physiology.
2. Gokhale S.B., Kokate C.K., Shriwastava S.P., A Manual of pharmaceutical biology practical

CO/PO Articulated Matrix

PO CO	PO1	P02	PO3	PO4	PO5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PS O4
BP112RBP.CO1	2	-	-	-	-	2	-	-	-	-	-	2	1	1	1	1
BP112RBP.CO2	2	-	-	-	-	2	-	-	-	-	-	2	1	-	-	-
BP112RBP.CO3	2	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-
BP112RBP.CO4	2	-	-	-	3	-	-	-	1	-	-	2	1	1	1	-
AVERAGE	2	-	-	-	3	2	-	-	1	-	-	2	1	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-10)			**External (MM-15)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	5	5	15

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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SEMESTER –II

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP201T	Credit	4
Year/Sem	1/2	L-T-P	3-1-0
Course Name	**Human Anatomy and Physiology-II**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Explain the gross morphology, structure and functions of various organs of the human body.
2. Describe the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of human body.
4. Perform the hematological tests like blood cell counts, hemoglobin estimation, bleeding/clotting time etc and also record blood pressure, heart rate, pulse and respiratory volume.
5. Appreciate coordinated working pattern of different organs of each system
6. Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body.

UNIT I (Total Hours-10)

Nervous system: Organization of nervous system, neuron, neuroglia, classification and properties of nerve fibre, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters. Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. Structure and functions of brain (cerebrum, brain stem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts,reflex activity

UNIT II (Total Hours-06)

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 intestineand 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.

UNIT- III(Total Hours-10)

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

UNIT-IV (Total Hours-10)

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.

UNIT-V (Total Hours-9)

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

Course Outcomes (CO)

BP201T. CO1 Understand the morphology, structure and functions of various organs of human body
BP201T. CO2 Attain knowledge the various homeostatic mechanisms and their types in human body
BP201T. CO3 Understand the various organ systems of human body
BP201T. CO4 Detailed knowledge about hematological factors of human body
BP201T. CO5 Known the coordination between various organs and organ systems

References:

1. Sembulingam K., Sembulingam P., Essentials of Medical Physiology, Jaypee Brothers Medical Publishers, New Delhi.
2. Kathleen J.W. Wilson, Anatomy and Physiology in Health and Illness by, Churchill Livingstone, New York
3. Best , Tailor., Physiological basis of Medical Practice, Williams & Wilkins Co,Riverview,MI USA

CO/PO Articulated Matrix

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP201T. CO 1	2	1	-	-	-	-	-	-	-	1	-	1	2	2	2	2
BP201T. CO 2	2	1	-	-	-	-	-	-	-	1	-	1	2	2	1	2
BP201T. CO 3	2	1	-	-	-	-	-	-	-	1	-	1	2	2	1	2
BP201T. CO 4	2	1	-	-	-	-	-	-	-	-	1	1	3	1	1	-
BP201T. CO 5	2	1	-	-	-	-	-	-	-	1	-	1	3	1	-	2
AVERAGE	2	1	-	-	-	-	-	-	-	1	1	1	2.4	1.6	1.25	2

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP202T	Credit	4
Year/Sem	1/2	L-T-P	3-1-0
Course Name	**Pharmaceutical Organic Chemistry –I**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Write the structure, name and the type of isomerism of the organic compound
2. Write the reaction, name the reaction and orientation of reactions
3. Account for reactivity/stability of compounds,
4 Identify/confirm the identification of organic compound

UNIT I (Total Hours- 7)

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 isomerisms in organic compounds

UNIT II (Total Hours-10)

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

UNIT- III(Total Hours-10)

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 ethylchloride, 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

UNIT-IV (Total Hours-10)

Carbonyl compounds (Aldehydes and ketones)

Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanilin, Cinnamaldehyde.

UNIT-V (Total Hours-8)

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, Ethylenediamine, Amphetamine

Course Outcomes (CO)

BP202T. CO1 Interpret the IUPAC Nomenclature for organic compounds.
BP202T. CO2 Propose the reactivity and stability of organic compounds.
BP202T. CO3 Understand the orientation of reactions and naming of reactions.
BP202T. CO4 Classify the alcohols and their uses.
BP202T. CO5 Appraise the chemistry of aliphatic amines.
BP202T. CO6 Understand the carbonyl compounds and chemistry of various naming reactions.

CO/PO Articulated Matrix

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP202T. CO 1	2	1	-	-	-	-	-	-	1	-	1	1	3	2	2	3
BP202T. CO 2	2	-	-	-	-	-	-	-	-	-	-	1	3	2	1	2
BP202T. CO 3	2	-	-	-	-	-	-	-	-	-	-	-	2	2	1	2
BP202T. CO 4	3	-	-	-	-	-	-	-	-	-	-	-	3	1	1	-
BP202T. CO 5	2	-	2	-	-	-	-	-	-	-	-	1	3	1	-	1
BP202T. CO 6	2	-	-	-	-	-	-	-	-	-	-	1	2	-	-	1
AVERAGE	2.1	1	2	-	-	-	-	-	1	-	1	1	2.6	1.6	1.25	1.8

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

Programme Name	B. Pharm.	Programme Code	29
Course Code	BP203T	Credit	4
Year/Sem	1/2	L-T-P	3-1-0
Course Name	**Biochemistry**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
2. Understand the metabolism of nutrient molecules in physiological and pathological conditions
3. Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

UNIT I (Total Hours- 8)

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 ,cyclic AMP

UNIT II (Total Hours-10)

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 level phosphorylation Inhibitors ETC and oxidative phosphorylation/Uncouplers

UNIT- III(Total Hours-10)

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

UNIT-IV (Total Hours-10)

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

UNIT-V (Total Hours-7)

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

References:

1.Satyanarayan D., Chakrapani U., Essentials of biochemistry Books and Allied Ltd.
2. Rao R., Textbook of Biochemistry UBS Publishers distributors pvt. Ltd.
3. Gupta R.C., Bhargavan S., Practical Biochemistry CBS Publishers.
4.P.K Sharma P.K., Dandiya P.C., Pharmaceutical Biochemistry Theory and practicals 2nd edition Vallabh Prakashan.
5. Malhotra V.K., Biochemistry for Students 12th edition, Jaypee publishers pvt. Ltd.

CO/PO Articulated Matrix

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP203T. CO 1	3	-	-	-	-	-	-	-	-	-	-	2	3	3	2	3
BP203T. CO 2	3	-	-	-	-	-	-	-	-	2	-	-	3	3	2	2
BP203T. C0 3	3	-	-	-	-	-	-	-	-	-	-	-	3	2	1	2
BP203T. CO 4	3	2	-	-	-	-	-	-	-	-	-	-	3	2	1	1
BP203T. CO 5	3	-	2	-	-	-	-	-	-	2	-	2	3	2	1	1
BP203T. CO 6	3	-	-	-	-	-	-	-	-	2	-	2	3	2	1	2
AVERAGE	3	2	2	-	-	-	-	-	-	2	-	2	3	2.3	1.3	1.83

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two Sessional

Programme Name	B.Pharm.	Programme Code	29
Course Code	BP204T	Credit	4
Year/Sem	1/2	L-T-P	3-1-0
Course Name	**Pathophysiology**		

Objectives of the Course:

Upon completion of the subject student shall be able to –

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

UNIT I (Total Hours- 10)

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

UNIT II (Total Hours-10)

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

UNIT III(Total Hours-10)

Haematological Diseases:

Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cell anemia, thalasemia, 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 Ulce

UNIT IV (Total Hours-8)

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

UNIT V (Total Hours-7)

Infectious diseases: Meningitis,Typhoid, Leprosy, TuberculosisUrinary tract infections

Sexually transmitted diseases:AIDS, Syphilis, Gonorrhea

Course Outcomes (CO)

BP204T.CO 1. Compare the etiology and pathogenesis of various diseased state.
BP204T.CO 2. Assess the sign and symptoms of various disease.
BP204T.CO 3. Examine the complication of diseases.
BP204T.CO 4. Recommend the prognosis of diseased conditions.
BP204T.CO 5. Create a bridge between diagnosis and prognosis of disease

Reference

1. Vinay Kumar, Abul K. Abas, Jon C. Aster; Robbins & Cotran Pathologic Basis of Disease; South Asia edition; India; Elsevier; 2014.
2. Harsh Mohan; Text book of Pathology; 6th edition; India; Jaypee Publications; 2010.

Articulated Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP204T.CO 1	3	-	-	-	-	2	2	-	-	2	2	2	1	1	1	1
BP204T.CO 2	3	-	-	-	2	-	-	2	2	2	-	3	1	-	-	-
BP204T.CO 3	2	-	-	-	3	2	3	-	-	-	-	2	1	-	-	-
BP204T.CO 4	3	-	-	-	3	-	-	-	-	-	-	2	1	-	-	-
BP204T.CO 5	-	-	-	-	2	-	2	2	-	2	-	2	1	1	1	1
AVERAGE	2.75	-	-	-	2.5	2	2.33	2	1	2	2	2.2	1	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

Programme Name	B. Pharm.	Programme Code	29
Course Code	BP205T	Credit	4
Year/Sem	1/2	L-T-P	2-0-0
Course Name	**Computer Applications in Pharmacy Theory**		

Objectives of the Course:

1. Know the various types of application of computers in pharmacy
2. Know the various types of databases
3. Know the various applications of databases in pharmacy

UNIT I (Total Hours- 06)

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

UNIT II (Total Hours-6)

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

UNIT- III (Total Hours-6)

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

UNIT-IV (Total Hours-06)

Bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery

UNIT-V (Total Hours-06)

Computers as data analysis in Preclinical development: Chromatographic dada analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMS)
Concepts of flowcharting and algorithm development

Course Outcomes (CO)

BP205T. CO1 Test and examine different kinds of software for different medicines.
BP205T. CO2 Create a database for pharmacy using Laboratory Information management
BP205T. CO3 Estimate the Impact of Bioinformatics in Vaccine Discovery.
BP205T. CO4 Create a website using CSS to demonstrate different diseases and medicine.
BP205T. CO5 Create Electronic Prescribing and discharge (EP) systems for patient

References:

1. William E.Fassett -Lea and Febiger, Computer Application in Pharmacy - 600 South Washington Square, USA, (215) 922-1330.
2. Sean Ekins - Wiley-Interscience, Computer Application in Pharmaceutical Research and Development -A John Willey and Sons, INC., Publication, USA
3. S.C.Rastogi- Bioinformatics (Concept, Skills and Applications) - CBS Publishers and Distributors, New Delhi - 110 002(INDIA)

CO/PO Articulated Matrix

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
BP205.CO.1	3	2	1	–	1	–	–	–	2	–	–	1	1	–	–	1
BP205.CO.2	3	2	1	–	1	–	–	–	2	1	–	1	1	–	1	1
BP205.CO.3	3	2	1	–	1	–	–	–	2	–	–	1	1	–	–	1
BP205.CO4	3	2	1	–	1	–	–	–	2	–	–	1	1	–	–	1
BP205.CO.5	3	2	1	–	1	–	–	–	2	–	–	1	1	–	–	1
Average	3	2	1	–	1	–	–	–	2	1	–	1	1	–	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-50)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	50

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

Program Name	B. Pharm.	Program Code	29
Course Code	BP206T	Credit	3
Year/Sem	I/II	L-T-P	3-0-0
Course Name	**Environmental Sciences**		

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

1. Create the awareness about environmental problems among learners.
2. Impart basic knowledge about the environment and its allied problems.
3. Develop an attitude of concern for the environment.
4. Motivate learner to participate in environment protection and environment improvement.
5. Acquire skills to help the concerned individuals in identifying and solving environmental problems.
6. Strive to attain harmony with Nature.

UNIT I (Total Hours- 10)

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.

UNIT II (Total Hours-10)

Ecosystem

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)

UNIT- III (Total Hours-10)

Environmental Pollution: Air pollution; Water pollution; Soil pollution, Marine pollution, Noise pollution, Thermal pollution g, Nuclear hazards

Course Outcomes (CO)

BP206T. CO1 Describe the concept of environment and environment studies.

BP206T. CO2 Explain about the natural resources problems associated with them and role of an individual in their conservation.

BP206T. CO3 Classify different types of ecosystems, their structure, functions and characteristics.

BP206T. CO4 Develop an attitude of concern for the environment.

BP206T. CO5 Create awareness about environment at problems among learners.

References:

1. Singh Y.K., 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,
7. Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p
8. De A.K., Environmental Chemistry, Wiley Eastern Ltd.of Earth, Centre for Science and Environment

CO/PO Articulated Matrix

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP206.CO.1	3	_	_	_	_	_	3	_	_	_	_	1	_	_	1	_
BP206.CO.2	3	_	_	_	_	_	2	_	_	_	_	1	1	_	_	_
BP206.CO.3	3	_	_	_	_	_	3	_	_	_	_	1	_	_	_	_
BP206.CO.4	3	2	_	_	_	_	3	_	3	1	_	1	1	1	_	_
BP206.CO5	3	_	2	_	_	_	2	_	3	3	_	2	_	_	_	2
AVERAGE	3	2	2	_	_	_	2.6	_	3	2	_	1.2	1	1	1	2

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-50)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	50

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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Programme Name	B.Pharm.	Programme Code	29
Course Code	BP 207P	Credit	2
Year/Sem	1/2	L-T-P	0-0-4
Course Name	**Human Anatomy and Physiology (Practical)**		

Practical to be conducted(Total Hours- 4hr per week)

1. To study the integumentary and special senses using specimen, models, etc.,
2. To study the nervous system using specimen, models, etc.,
3. To study the endocrine system using specimen, models, etc
4. To demonstrate the general neurological examination
5. To demonstrate the function of olfactory nerve
6. To examine the different types of taste.
7. To demonstrate the visual acuity
8. To demonstrate the reflex activity
9. Recording of body temperature
10. To demonstrate positive and negative feedback mechanism.
11. Determination of tidal volume and vital capacity.
12. Study of digestive, respiratory, cardiovascular systems, urinary and reproductivesystems with the help of models, charts and specimens.
13. Recording of basal mass index .
14. Study of family planning devices and pregnancy diagnosis test.
15. Demonstration of total blood count by cell analyser
16. Permanent slides of vital organs and gonads.

Course Outcomes (CO)

BP207P. CO1 Identify the various tissues and organs of different systems of human body.
BP207P. CO2 Perform the haematological tests like blood cell counts, haemoglobin estimation, bleeding/clotting time etc and also record blood pressure, heart rate, pulse and respiratory volume.
BP207P. CO3 Interlink organs and organ systems of human body
BP207P. CO4 Understand the morphology of various organs of human body
BP207P. CO5 Understand the various blood groups found in humans and their confirmatory tests

References:

1. Singh I., Textbook of Human Histology, Jaypee brothers medical publishers,New Delhi.
2. Ghai C.L., Textbook of Practical Physiology, Jaypee brothers medical publishers, NewDelhi.
3. Srinageswari K., Sharma R., Practical workbook of Human Physiology, Jaypee brother's medical publishers, New Delhi.

CO/PO Articulated Matrix

PO / CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
BP207P. CO 1	2	1	-	-	-	-	-	-	-	-	-	1	1	2	1	1
BP207P.CO 2	2	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1
BP207P.CO 3	2	-	-	-	-	-	-	-	-	-	-	1	2	1	-	1
BP207P. CO 4	2	-	-	-	-	-	-	-	-	-	-	1	2	-	-	1
BP207P. CO 5	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVERAGE	2	1	-	-	-	-	-	-	-	-	-	1	1.5	1.3	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-35)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	5	10	35

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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Programme Name	B.Pharm.	Programme Code	29
Course Code	BP 208P	Credit	2
Year/Sem	1/2	L-T-P	0-0-4
Course Name	**Pharmaceutical Organic Chemistry -I (Practical)**		

Practical to be conducted (Total Hours- 4hr per week)

1. Systematic qualitative analysis of unknown organic compounds like
   i. Preliminary test: Color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc.
   ii. Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test
   iii. Solubility test
   iv. Functional group test like Phenols, Amides/ Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides.
   v. Melting point/Boiling point of organic compounds
   vi. Identification of the unknown compound from the literature using melting point/ boiling point.
   vii. Preparation of the derivatives and confirmation of the unknown compound by melting point/ boiling point.
   viii. Minimum 5 unknown organic compounds to be analysed systematically.
2. Preparation of suitable solid derivatives from organic compounds
3. Construction of molecular models

Course Outcomes (CO)

BP 208PCO.1 Identify the organic compounds.
BP 208P CO.2 Examine the elements present in organic comounds.
BP 208P CO.3 Figure out the functional group present in the sample.
BP 208P CO.4 Synthesise organic compounds in the laboratory.

References:

1. Mann and Saunder, Practical Organic Chemistry, 4th Ed, 2009, Pearsons.
2. Vishnoi N.K., Advanced Practical organic chemistry, 5th Ed, Pearsons
3. Vogel A.I., Tatchell A.R., Furis B.S., Textbook of Practical Organic Chemistry, 1989, Pearson.

CO/PO Articulated Matrix

PO / CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO 8	PO9	PO1 0	PO11	PO12	PSO 1	PSO 2	PSO 3	PS O 4
BP208P. CO 1	2	-	-	-	-	-	-	-	1	-	-	1	3	2	1	3
BP208P.CO 2	2	1	-	-	-	-	-	-	1	-	-	1	3	1	-	2
BP208P.CO 3	2	1	-	-	-	-	-	-	1	-	-	1	2	1	-	1
BP208P. CO 4	3	2	-	-	-	-	-	-	1	1	-	1	2	-	-	1
AVERAGE	2.25	1.3	-	-	-	-	-	-	1	1	-	1	2.5	1.3	1	1. 75

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-35)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	5	10	35

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP209P	Credit	2
Year/Sem	1/2	L-T-P	0-0-4
Course Name	**Biochemistry Practical**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1.Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.

2.Understand the metabolism of nutrient molecules in physiological and pathological conditions.

3..Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

Practical to be Conducted (Total Hours- 4hr per week)

1. To study the common glassware and equipment to be used in Biochemistry laboratory.
2. To perform the identification test for known sample of carbohydrate. (Glucose)
3. To perform the identification test for known sample of carbohydrate(Fructose)
4. To perform the identification test for known sample of carbohydrate(Sucrose)
5. To perform the identification test for unknown sample of carbohydrate.
6. To perform the identification test for the given sample of Protein (Peptone).
7. To perform the identification test for the given sample of Protein (Gelatin).
8. To perform the identification test for the given sample of Lipid (Cholesterol).
9. To analyze the given sample of saliva for salivary amylase on starch.
10. To study the normal inorganic constituents of urine.
11. To analyze given sample of urine for its abnormal constituent
12. To identify the given sample of amino acid by using paper chromatography.
13. To identify the given sample of amino acid by using paper chromatography.
14. To perform the identification test for the given known sample amino acid (Tyrosine)

Course Outcomes (CO)

BP209P. CO 1. Analysis of carbohydrates and proteins in unknown sample
BP209P. CO 2. Knowledge of determination of blood sugar, creatinine and serum cholesterol level
BP209P. CO 3. Determination of salivary amylase activity and effect of temperature on its activity.
BP209P. CO 4. Determine abnormal constituents present in urine sample

References:

1. Satyanarayan D., Chakrapani U., Essentials of biochemistry Books and Allied Ltd.
2. Rao R., Textbook of Biochemistry UBS Publishers distributors pvt. Ltd.
3.Gupta R.C., Bhargavan S., Practical Biochemistry CBS Publishers.
4. SharmaP.K., Dandiya P.C Pharmaceutical Biochemistry Theory and practicals 2nd edition Vallabh Prakashan.
5. Malhotra V.K., Biochemistry for Students 12th edition Jaypee publishers pvt. Ltd.

CO/PO Articulated Matrix

PO / CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP209P. CO 1	3	2	-	-	-	-	-	-	1	-	-	2	3	3	2	3
BP209P. CO 2	3	2	-	-	-	-	-	-	1	-	-	2	3	2	-	2
BP209P. CO 3	3	2	-	-	-	-	-	-	1	-	-	2	2	1	-	1
BP209P. CO 4	3	-	-	-	-	-	-	-	1	1	-	2	2	1	-	-
AVERAGE	3	2	-	-	-	-	-	-	1	1	-	2	2.5	1.75	2	1.5

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

Programme Name	B. Pharm.	Programme Code	29
Course Code	BP210P	Credit	4
Year/Sem	1/2	L-T-P	0-0-2
Course Name	**Computer Applications in Pharmacy - Practical**		

Objectives of the Course:

1. Know the various types of application of computers in pharmacy
2. Know the various types of databases
3. Know the various applications of databases in pharmacy

Practical to be Conducted

1. Design a questionnaire using a word processing package to gather information about a particular disease.
2. Create a HTML web page to show personal information.
3. Retrieve the information of a drug and its adverse effects using online tools
4. Creating mailing labels Using Label Wizard , generating label in MS WORD
5. Create a database in MS Access to store the patient information with the requiredfields Using access
6. Design a form in MS Access to view, add, delete and modify the patient record in the database
7. Generating report and printing the report from patient database
8. Creating invoice table using - MS Access
9. Drug information storage and retrieval using MS Access
10. Creating and working with queries in MS Access
11. Exporting Tables, Queries, Forms and Reports to web pages
12. Exporting Tables, Queries, Forms and Reports to XML pages
13. Finding information in online databases

Course Outcomes (CO)

BP210P. CO1 Apply various types of application of computers in pharmacy.
BP210P. CO2 Demonstrate the various types of databases.
BP210P. CO3 Apply the various applications of databases in pharmacy.
BP210P. CO4 Apply the web based tools for pharmacy practice.

References:

1. William E.Fassett -Lea and Febiger, Computer Application in Pharmacy - 600 South Washington Square, USA, (215) 922-1330.
2. Ekins - Wiley-Interscience, Computer Application in Pharmaceutical Research and Development - Sean A John Willey and Sons, INC., Publication, USA
3. Rastogi S.C., Bioinformatics (Concept, Skills and Applications) - CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi - 110 002(INDIA)

Articulated Matrix

PO / CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP210.CO1	3	1	1	–	1	–	–	–	1	1	–	1	1	–	–	1
BP210.CO2	3	1	–	–	1	–	–	–	1	1	–	1	1	–	–	–
BP210.CO3	3	1	–	–	1	–	–	–	1	1	–	1	1	1	–	1
BP210.CO4	3	1	1	1	1	–	–	–	1	1	–	1	1	1	–	1
Average	3	1	1	1	1	–	–	–	1	1	–	1	1	1	–	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-10)			**External (MM-25)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	5	5	15

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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SEMESTER –III

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP301T	Credit	4
Year/Sem	2/3	L-T	3-1
Course Name	**Pharmaceutical Organic Chemistry-II**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1.Write the structure, name and the type of isomerism of the organic compound
2.Write the reaction, name the reaction and orientation of reactions
3.Account for reactivity/stability of compounds,
4.Prepare organic compounds

UNIT I (Total Hours- 10)

Benzene and its derivatives

Analytical, synthetic and other evidences in the derivation of structure of enzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's ruleReactions of benzene - nitration, sulphonation, halogenation-reactivity, Friedelcrafts alkylation- reactivity, limitations, Friedelcrafts acylation.Substituents, effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction

Structure and uses of DDT, Saccharin, BHC and Chloramine

UNIT II (Total Hours-10)

Phenols* - Acidity of phenols, effect of substituents on acidity, qualitativetests, Structure and uses of phenol, cresols, resorcinol, naphthols

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 andimportant reactions of benzoic acid.

UNIT- III (Total Hours-10)

Fats and Oils

a. Fatty acids – reactions.

Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils.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 (Total Hours-8)

Polynuclear hydrocarbons: Synthesis, reactionsStructure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives

UNIT-V (Total Hours-7)

Cyclo alkanes*Stabilities – Baeyer's strain theory, limitation of Baeyer's strain theory Coulson and Moffitt's modification, Sachse Mohr's theory (Theory of Strainless rings) reactions of cyclopropane and cyclobutane only.

Course Outcomes (CO)

- **BP301TCO 1**. Reactions To produce synthesis with their structure and medicin the general methods of preparation of organic compounds.
- **BP301T.CO 2**. Propose the mechanism and orientation regarding the reactions of some organic compounds.
- **BP301T.CO 3**. Illustrate the reactivity of organic compounds.
- **BP301T.CO 4**. Assess the chemistry of fats and oils.
- **BP301T.CO 5**. Appraise the chemistry of cycloalkanes and polynuclear hydrocarbons.
- **BP301T.CO 6**. Describe the knowledge about the electrophilic and nucleophilic.

References

1.Morrison and Boyd, Organic Chemistry, 7th Ed, Pearson.
2.Finar I.L , Organic Chemistry, Volume-I, 6th Ed, Pearson
3.Bahl B.S., Bahl A, Textbook of Organic Chemistry, S.ChandPublising, 2019.
4.Soni P.L., Organic Chemistry, S.Chand Publising, 2010

CO/PO Articulated Matrix

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP301T. CO 1	2	2	-	1	-	1	1	-	1	1	-	2	1	-	1	-
BP301T. CO 2	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
BP301T. CO 3	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
BP301T. CO 4	3	3	3	1	-	2	1	-	1	1	-	2	2	1	1	1
BP301T. CO 5	1	-	-	-	-	1	-	-	-	-	-	2	1	-	-	-
BP301T. CO 6	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
AVERAGE	1.5	2.5	3	1	-	1.3	1	-	1	1	-	2.3	1.16	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

Name of Department	Department of Pharmacy		
Program Name	B.Pharm.	Program Code	29
Course Code	BP302T	Credit	4
Year/Sem	2/3	L-T-P	3-1-0
Course Name	**Physical Pharmaceutics- I**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Understand various physicochemical properties of drug molecules in designing the dosage forms
2. Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations
3. Demonstrate use of physicochemical properties in the formulation, development and evaluation of dosage forms.

UNIT I (Total Hours- 10)

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

UNIT II (Total Hours-10)

a) **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.

b) **Physicochemical properties of drug molecules:** Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications

UNIT- III(TotalHours-8)

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.

UNIT-IV (Total Hours-8)

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.

UNIT-V (Total Hours-7)

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.

Course Outcomes (CO)

BP302T. CO1 Illustrate the various physicochemical properties of drug molecules.
BP302T. CO2 Explain the principle of different process using various diagrams
BP302T. CO3 Discuss the co-relation between in-situ and biological system.
BP302T. CO4 Assess various physicochemical properties and phenomena's used in pharmaceutical formulation
BP302T. CO5 Co-relate complexation between drug and biological molecules.
BP302T. CO6 Collaborate various solution having different properties with biological system.

References:

1. Subrahmanyam C.V.S. & Vasantharaju, Laboratory Manual of Physical Pharmacy, Second Edition, Vallabh Prakashan
2. Martin A, Physical Pharmacy and Pharmaceutical Sciences, Lippincott Williams & Wilkins
3. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3,Marcel Dekkar Inc
4. Cooper and Gunn, Tutorial pharmacy, Sixth Edition, CBS Publisher and Distributor

CO/PO Articulated Matrix

CO PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP302T. CO 1	3	1	2	-	-	1	-	-	-	-	-	2	2	1	1	1
BP302T. CO 2	3	1	2	-	-	-	-	-	-	1	-	2	1	1	1	1
BP302T. CO 3	3	1	2	1	-	-	-	-	-	1	-	2	1	1	1	2
BP302T. CO 4	3	1	2	-	-	1	-	-	-	1	-	2	1	1	1	2
BP302T. CO 5	3	1	2	-	-	-	-	-	-	1	-	2	1	1	1	2
BP302T. CO 6	3	1	2	-	-	-	-	-	-	1	-	2	1	1	1	2
Average	3	1	2	1	-	1	-	-	-	1	-	2	1.16	1	1	1.66

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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Arcadia Grant, P.O. Chandanwari, Premnagar, Dehradun, Uttarakhand

Program Name	B. Pharm.	Program Code	29
Course Code	BP303T	Credit	4
Year/Sem	2/3	L-T-P	3-1-0
Course Name	**Pharmaceutical Microbiology**		

Objectives of the Course:

Upon completion of the course the student shall 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. Carried out microbiological standardization of Pharmaceuticals.
5. Understand the cell culture technology and its applications in pharmaceutical industries.

UNIT I (Total Hours- 10)

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 fieldmicroscopy and electron microscopy.

UNIT II (TotalHours-10)

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. Equipments employed in large scale sterilization. Sterility indicators.

UNIT- III(Total Hours-10)

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 actionsEvaluation of bactericidal & Bacteriostatic.

Sterility testing of products (solids, liquids, ophthalmic and other sterileproducts) according to IP, BP and USP

UNIT-IV (Total Hours-8)

Designing of aseptic area, laminar flow equipments; 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.

UNIT-V (Total Hours-7)

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

Course Outcomes (CO)

BP303T. CO 1. Describe the cell culture technology and estimate the importance of its application in pharmaceutical industries.

BP303T. CO 2. Examine the sterility testing of pharmaceutical products.

BP303T. CO 3.Figure out the methods of identification, cultivation and preservation of various microorganisms.

BP303T. CO 4. Assess the importance and implementation of sterilization in pharmaceutical processing and industry.

BP303T. CO 5. Verify the microbiological standardization of pharmaceuticals.

References:

1. Pelczar & Kreig C., Microbiology, Tata McGraw Hill edn.
2. Ananthnarayan, Text Book of Microbiology, Orient-Longman, Chennai
3. Jain N. K, Pharmaceutical Microbiology, Vallabh Prakashan, Delhi

CO/PO Articulated Matrix

CO PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4
BP303T. CO 1	3	1	1	-	1	-	-	-	-	-	-	2	1	1	1	1
BP303T. CO 2	3	2	1	-	1	-	-	-	1	-	-	2	1	-	1	1
BP303T. CO 3	3	1	-	-	-	-	-	-	-	-	-	2	1	-	-	1
BP303T. CO 4	3	1	-	-	-	-	1	-	-	-	-	2	1	-	1	1
BP303T. CO 5	3	1	-	-	-	-	-	-	-	-	-	2	1	-	-	1
Average	3	1.2	1	-	1	-	1	-	1	-	-	2	1	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

UTTARANCHAL UNIVERSITY

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP304T	Credit	4
Year/Sem	2/3	L-T-P	3-1-4
Course Name	**Pharmaceutical Engineering (Theory)**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. To know various unit operations used in Pharmaceutical industries.
2. To understand the material handling techniques.
3. To perform various processes involved in pharmaceutical manufacturing process.
4. To carry out various test to prevent environmental pollution.
5. To appreciate and comprehend significance of plant lay out design for optimum use of resources.
6. To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

UNIT I (Total Hours- 10)

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.

UNIT II (Total Hours-10)

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

UNIT- III (Total Hours-10)

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,

UNIT-IV (Total Hours-08)

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.

UNIT-V (Total Hours-07)

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

Course Outcomes (CO)

BP304T. CO1 Describe the mechanism &laws , theories and applications of unit operation in pharmaceutical manufacturing.

BP304T. CO2 Explain the principle ,construction and working of equipments used for handling unit processes in pharmaceutical industries.

BP304T. CO3 Illustrate the factors influencing the operating processes and fix optimum conditions for unit operation.

BP304T. CO4 Analyze the use of correct materials for construction of pharmaceutical plant.

BP304T. CO5 Assess the industrial hazards and safety measures in industry

BP304T. CO6 Formulate, select type of equipment used in unit operation during pharmaceutical manufacturing and logic behind selection.

References:

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

CO/PO Articulated Matrix

PO / CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP304.CO1	3	–	–	–	–	–	–	–	–	–	–	1	1	-	-	-
BP304.CO2	3	–	–	–	–	–	–	–	–	–	–	1	1	-	-	-
BP304.CO3	3	1	–	–	2	–	–	–	–	–	–	1	1	-	-	-
BP304.CO4	3	1	–	–	–	2	–	–	2	1	–	1	1	-	-	1
BP304.CO5	3	1	–	–	–	–	1	–	2	2	–	1	1	-	-	-
BP304.CO6	3	2	2	–	2	1	–	–	2	2	–	1	1	1	1	1
AVERAGE	3	1.25	2	0	2	1.5	1	0	2	1.67	0	1	1	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

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Average of best of two Sessional

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP105T	Credit	4
Year/Sem	1/1	L-T-P	2-0-0
Course Name	**Communication Skills Theory**		

Objectives of the Course:

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

UNIT I (Total Hours- 07)

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

UNIT II (Total Hours-7)

Elements of Communication: Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication

Communication Styles: Introduction, The Communication Styles Matrix with example for each Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style

UNIT- III (Total Hours-7)

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

UNIT-IV (Total Hours-05)

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

UNIT-V (Total Hours-04)

Group Discussion: Introduction, Communication skills in group discussion, Do‘s and Dont‘s of group discussion

Course Outcome (CO)

BP105T. CO1 Understand the meaning and the process of effective communication along with its classification into various types.

BP105T. CO2 Comprehend the different elements and barriers to effective communication and develop ways to overcome the same.

BP105T. CO3 Construct clear concepts of writing, listening and speaking skills in English Communication

BP105T. CO4 Acquire the knowledge of body language and presentation skill to communicate in interviews and professional situations.

BP105T. CO5 Understand the concept of teamwork, leadership and importance of personal development skills

References:
1. Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, Basic communication skills for Technology, 2011
2. Kumar S., Pushpalata, Communication skills 1stEdition, Oxford Press, 2011
3. Stephen P. Robbins, 1stEdition, Pearson, 2013 Brilliant- Communication skills, Gill Hasson, 1st Edition, Pearson Life, 2011 Organizational Behaviour,
4. Gopala Swamy Ramesh, The Ace of Soft Skills: Attitude, Communication and Etiquette for success 5th Edition, Pearson, 2013
5. Deborah Dalley, Lois Burton, Margaret, Green hall, Developing your influencing skills, 1st Edition Universe of Learning LTD, 2010

Articulated Matrix

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP105TLE.CO1	3	–	–	–	–	–	–	–	2	3	–	2	1	2	1	1
BP105 TLE.CO2	3	1	-	–	–	–	–	–	2	3	–	2	1	–	1	1
BP105 TLE.CO.3	3	–	–	–	–	–	–	–	2	3	–	2	1	1	1	1
BP105 TLE.CO.4	3	–	–	–	–	–	–	–	2	3	–	2	1	–	1	1
BP105 TLE.CO.5	3	–	–	1	–	–	–	–	2	3	–	2	1	2	–	1
AVERAGE	3	1	–	1	–	–	–	–	2	3	–	2	1	1.67	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-35)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	5	10	35

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

Programme Name	B. Pharm.	Programme Code	29
Course Code	BP305P	Credit	2
Year/Sem	2/3	L-T-P	0-0-4
Course Name	**Pharmaceutical Organic Chemistry-II (Practical)**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1.write the structure, name and the type of isomerism of the organic compound

2.write the reaction, name the reaction and orientation of reactions

3.account for reactivity/stability of compounds,

4.prepare organic compounds

Practical to be Conducted (Total Hours- 4hr per week)

1. To identify and study the common glass wares and apparatus used in Pharmaceutical Organic Chemistry laboratory
2. To study the Simple Distillation process using distillation unit & recrystallization techniques
3. To synthesize & submit 1-Phenylazo-2-naphthol or Sudan-1.Report its melting point & percentage yield
4. To synthesize & submit Dibenzal acetone. Report its melting point & percentage yield
5. To synthesize & submit 2, 4, 6 Tribromo aniline. Report its melting point & percentage yield
6. To synthesize & submit Phenyl benzoate. Report its melting point & percentage yield
7. To synthesize & submit Benzanilide. Report its melting point & percentage yield
8. To synthesize & submit p-Bromo acetanilide. Report its melting point & percentage yield
9. To synthesize & submit Benzil. Report its melting point & percentage yield
10. To synthesize & submit m-Dinitro benzene. Report its melting point & percentage yield
11. To synthesize & submit Benzoic acid. Report its melting point & percentage yield
12. To synthesize & submit Salicylic acid. Report its melting point & percentage yield
13. To determine the acid value of given oil by proper standardization of reagents
14. To determine the saponification value of given oil by proper standardization of reagents
15. To determine the iodine value of given oil by proper standardization of reagents

Course Outcomes (CO)

BP305P.CO 1. Produce the organic compounds in the lab
BP305P.CO 2. Qualify the purity of organic compounds.
BP305P.CO 3. Assess & examine the standardization of secondary standards.
BP305P.CO 4. Interpret & report the analytical constant of fats and oils.

References:

1. Mann and Saunder, Practical Organic Chemistry, 4thEd, 2009, Pearsons.
2. Vishnoi N.K., Advanced Practical organic chemistry, 5th Ed, Pearsons
3. Vogel A.I., Tatchell A.R., Furis B.S., Textbook of Practical Organic Chemistry, 1989, Pearson.

CO/PO Articulated Matrix

PO / CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
BP305P.CO 1	2	1	-	-	-	-	-	-	1	-	-	2	2	1	1	-
BP305P.CO 2	2	1	-	-	-	-	-	-	1	-	-	-	1	-	1	-
BP305P.CO 3	2	2	-	-	-	-	-	-	1	-	-	-	2	-	1	-
BP305P.CO 4	3	1	1	-	-	-	-	-	1	-	-	2	1	1	1	-
AVERAGE	2.5	1.2	1	-	-	-	-	-	1	-	-	2	1.7	1	1	-

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

UTTARANCHAL UNIVERSITY

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Program Name	B.Pharm.	Program Code	29
Course Code	BP306P	Credit	2
Year/Sem	2/3	L-T-P	0-0-4
Course Name	**Physical Pharmaceutics I**		

Objectives of the Course:

Upon completion of the course the student shall be able to understand
Practical components of the subject to get a better insight into various areas of formulation research and development, and stability studies ofpharmaceutical dosage forms.

Practical to be Conducted (Total Hours- 4hr per week)

1. To study the different glassware and equipments used in physical pharmaceutics laboratory.
2. To determine the density of a given liquid sample at room temperature.
3. To determine the partition co-efficient of benzoic acid in benzene and water
4. To determine the solubility of drug at room temperature
5. To determine the partition co-efficient of iodine in carbon tetrachloride and water
6. To determine pKa value by Half Neutralization/ Henderson Hasselbalch equation
7. To determine percent composition of NaCl in a solution using phenol water system by CST method
8. To determine surface tension of given liquids by drop count method using stalagmometer
9. To determine HLB number of surfactant by saponification method
10. To determine critical micellar concentration of surfactants
11. To study the adsorption behaviour of activated charcoal

Course Outcomes (CO)

BP306P. CO 1. Performing various methods to identify physicochemical properties
BP306P. CO 2. Estimation of Physicochemical properties using different methods
BP306P. CO 3. Determination of various test parameters using different samples
BP306P. CO 4. Interpret the data collected from various test determination

References:

1. Subrahmanyam C.V.S. & Vasantharaju, Laboratory Manual of Physical Pharmacy, Second Edition, Vallabh Prakashan
2. Jain G & Khar R. K., Text book of Physical Phramacy, Elsevier India
3. Martin A, Physical Pharmacy and Pharmaceutical Sciences, Lippincott Williams & Wilkins

CO/PO Articulated Matrix

Course Outcome	PO1	PO 2	PO 3	PO4	PO5	PO6	PO7	PO8	PO 9	PO 10	PO 11	PO12	PSO 1	PSO2	PSO 3	PS O4
BP306P. CO 1	3	2	1	1	1	-	-	-	1	1	-	2	1	1	1	1
BP306P. CO 2	3	2	1	2	1	-	-	-	1	1	-	2	1	1	1	1
BP306P. CO 3	3	2	1	1	1	-	-	-	1	1	-	2	1	1	1	1
BP306P. CO 4	3	2	1	2	1	-	-	-	2	1	-	2	1	1	1	1
Average	3	2	1	1.5	1	-	-	-	1.5	1	-	1.33	1	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-35)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	5	10	35

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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Arcadia Grant, P.O. Chandanwari, Premnagar, Dehradun, Uttarakhand

Program Name	B.Pharm.	Program Code	29
Course Code	BP307P	Credit	2
Year/Sem	2/3	L-T-P	0-0-4
Course Name	**Pharmaceutical Microbiology**		

Objectives of the Course:

Upon completion of the course the student shall be able to understand
Practical components of the subject to get a better insight into methods of identification, cultivation and preservation of various microorganisms and the cell culture technology and its applications in pharmaceutical industries.

Practical to be Conducted (Total Hours- 4hr per week)

1. Introduction and study of different equipments and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.
2. Sterilization of glassware, preparation and sterilization of media.
3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.
4. Staining methods- Simple, Grams staining and acid fast staining
5. Isolation of pure culture of micro-organisms by multiple streak plate technique and othertechniques.
6. Microbiological assay of antibiotics by cup plate method and other methods
7. Motility determination by Hanging drop method.
8. Sterility testing of pharmaceuticals.
9. Bacteriological analysis of water
10. Biochemical test.

Course Outcomes (CO)

BP307P. CO 1. Study the set up of different equipment and media preparation used in experimental microbiology.

BP307P. CO 2. Assess the importance of various staining techniques.

BP307P. CO 3. Examine the sterility testing of pharmaceutical products.

BP307P. CO 4. Find out the various techniques used for culture and isolation.

BP307P. CO 5. Assess the microbiological assays.

References:

1. Pelczar & Kreig C., Microbiology, Tata McGraw Hill edn.
2. Ananthnarayan, Text Book of Microbiology, Orient-Longman, Chennai
3. Jain N. K, Pharmaceutical Microbiology, Vallabh Prakashan, Delhi

CO/PO Articulated Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO 6	PO7	PO8	PO9	PO1 0	PO 11	PO1 2	PSO 1	PSO2	PSO3	PSO4
BP307P. CO 1	3	1	1	1	1	-	-	-	1	1	-	2	1	0	1	1
BP307P. CO 2	3	1	-	1	1	-	-	-	1	-	-	2	1	0	0	0
BP307P. CO 3	3	1	-	-	2	-	-	-	1	-	-	2	1	1	1	1
BP307P. CO 4	3	1	-	2	2	-	-	-	2	-	-	2	1	0	0	0
BP307P. CO 5	3	1	1	-	2	-	-	-	2	-	-	2	1	1	1	1
Average	3	1	1	1.3	1.6	-	-	-	1.4	1	-	2	1	1	0.6	0.6

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-35)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	5	10	35

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

Programme Name	B. Pharm.	Programme Code	29
Course Code	BP308P	Credit	4
Year/Sem	2/3	L-T-P	0-0-8
Course Name	**PHARMACEUTICAL ENGINEERING (Practical)**		

Objectives of the Course:

Upon completion of the course the student shall be able to

The knowledge of basic unit operations and their importance in day to day running of a pharmaceutical unit is emphasized to the students.

This knowledge is further improved in the ensuing pharm. Engineering and pharmaceutics subjects.

Practical to be Conducted (Total Hours- 4hr per week)

1. Determination of radiation constant of brass, iron, unpainted and painted glass.
2. Steam distillation - To calculate the efficiency of steam distillation.
3. To determine the overall heat transfer coefficient by heat exchanger.
4. Construction of drying curves (for calcium carbonate and starch).
5. Determination of moisture content and loss on drying.
6. Determination of humidity of air - i) From wet and dry bulb temperatures -use of Dew point method.
7. Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, de humidifier.
8. Size analysis by sieving - To evaluate size distribution of tablet granulations - Construction of various size frequency curves including arithmetic and logarithmic probability plots.
9. 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.
10. Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such other major equipment.
11. Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration and Thickness/ viscosity
12. To study the effect of time on the Rate of Crystallization.
13. Calculate the uniformity Index for given sample by using Double Cone Blender.

Course Outcomes (CO)

BP308P CO 1. Demonstrate construction and working of available equipment to be used in laboratory.
BP308P CO2. Calculate drying rate of sample slurry
BP308P CO3. Examine various factors affecting rate of evaporation and filtration.
BP308P CO4. Estimate particle size distribution of a given sample

References:

1. Theory and practice of industrial pharmacy by Lachmann., Latest edition.
2. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition.
3. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition.

CO/PO Articulated Matrix

PO/PSO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP308.CO1	2	–	_	_	–	_	_	_	–	–	–	1	1	_	1	_
BP308.CO2	3	1	_	_	1	–	–	_	1	–	–	1	1	_	_	_
BP308.CO3	3	1	_	_	_	–	–	_	1	1	–	1	1	_	_	_
BP308.CO4	3	1	1	1	1	–	_	_	1	1	–	1	1	1	_	1
AVERAGE	2.8	1.0	1.0	1.0	1.0	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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(Uttarakhand Act No. 11 of 2013)
Arcadia Grant, P.O. Chandanwari, Premnagar, Dehradun, Uttarakhand

Programme Name	B. Pharm.	Programme Code	29
Course Code	BP111PLE	Credit	4
Year/Sem	1/1	L-T-P	0-0-2
Course Name	**Communication Skills - Practical**		

Objectives of the Course:

Upon completion of the course the student shall be able to

6. The knowledge of basic unit operations and their importance in day to day running of a pharmaceutical unit is emphasized to the students.
7. This knowledge is further improved in the ensuing pharm. Engineering and pharmaceutics subjects.

Practical to be conducted:-

1. Meeting People
2. Asking Questions
3. Making Friends
4. What did you do?
5. Do‘s and Dont‘s
6. Pronunciation (Consonant Sounds)
7. Pronunciation and Nouns
8. Pronunciation (Vowel Sounds)
9. Advanced Learning
10. Figures of Speech
11. Effective Communication
12. Writing Skills
13. Effective Writing
14. Interview Handling Skills
15. E-Mail etiquette
16. Presentation Skills

Course Outcomes (CO)

BP111PLE. CO1 To develop linguistic competence through accuracy in grammar, pronunciation & vocabulary.

BP111PLE. CO2 To develop communication skills leading to effective and productive interaction in the areas of pharmaceutical operation.

BP111PLE. CO3 To enhance competence in both spoken & written language using a wide range of communication strategies.

BP111PLE.CO4 To be able to listen and comprehend Spoken English and respond appropriately in different socio-cultural and professional contexts.

BP111PLE. CO5 To effectively use English Language and sharpen public speaking skills.

BP111PLE. CO6 To enhance the confidence of the students to face interviews, competitive examinations and day-to-day formal & informal communication situations.

References: Books must be available in the Library / Central Library

1. Andreja. J. Ruther Ford, Basic communication skills for Technology, 2nd Edition, Pearson Education, 2011
2. Kumar S., Pushpalata, 1stEdition, Communication skills, Oxford Press, 2011
3. Stephen .P. Robbins, 1stEdition, Organizational Behaviour, Pearson, 2013 Brilliant- Communication skills, Gill Hasson, 1stEdition, Pearson Life, 2011
4. GopalaSwamy Ramesh, The Ace of Soft Skills: Attitude, Communication and Etiquette for success, 5th Edition, Pearson, 2013
5. Deborah Dalley, Lois Burton, Developing your influencing skills, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010

CO/PO Articulated Matrix

PO/PSO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP111PLE. CO.1	3	1	1	1	–	–	–	–	2	3	–	2	1	–	2	1
BP111PLE. CO2	3	1	1	–	–	–	–	–	2	3	–	2	1	1	1	–
BP111PLE. CO3	3	–	1	–	–	–	–	–	2	3	–	2	1	1	1	–
BP111PLE. CO4	3	–	1	–	–	–	–	–	2	3	–	2	1	1	1	1
BP111PLE. CO.5	3	–	1		1	–	-	–	2	3	–	2	1	–	–	–
BP111PLE. CO.6	3	–	1	–	1	1	–	–	2	3	–	2	1	1	2	1
AVERAGE	3	1	1	1	1	1	–	–	2	3	–	2	1	1	1.4	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-10)			**External (MM-25)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	5	5	15

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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SEMESTER –IV

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Programme Name	B.Pharm.	Programme Code	29
Course Code	BP401T	Credit	4
Year/Sem	2/4	L-T-P	3-1-0
Course Name	**Pharmaceutical Organic Chemistry –III**		

Objectives of the Course:

At the end of the course, the student shall be able to

1. Understand the methods of preparation and properties of organic compounds
2. Explain the stereo chemical aspects of organic compounds and stereo chemical reactions
3. Know the medicinal uses and other applications of organic compounds

UNIT I (Total Hours- 10)

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

UNIT II (Total Hours-10)

Geometrical isomerism

Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems) Methods of determination of configuration of geometrical isomers. Conformational isomerism in Ethane, n-Butane and Cyclohexane.

Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity. Stereospecific and stereoselective reactions

UNIT III(Total Hours-10)

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

UNIT IV (Total Hours-8)

Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrazole, Imidazole, Oxazole and Thiazole. Pyridine, Quinoline, Isoquinoline, Acridine and Indole. Basicity of pyridine Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives

UNIT V (Total Hours-7)

Reactions of synthetic importance

Metal hydride reduction (NaBH4 and LiAlH4), Clemmensen reduction, Birch reduction, Wolff Kishner reduction. Oppenauer-oxidation and Dakin reaction. Beckmanns rearrangement and Schmidt rearrangement.

Claisen-Schmidt condensation.

Course Outcomes (CO)

BP401T.CO1 Understand the methods of preparation and uses of organic compounds.
BP401T.CO2 Propose the mechanism and orientation regarding the reactions of prescribed organic compounds.
BP401T.CO3 Illustrate the reactivity of organic compounds.
BP401T.CO4 Assess the chemistry of Stereo isomerism.
BP401T.CO5 Discuss naming reactions.
BP401T.CO6 Describe the Heterocyclic compounds.

Recommended Books (Latest Edition)

1. I.L. Finar ,Organic chemistry , Volume-I & II.; Pearson education pea.
2. Arun Bahl, B.S. Bahl.;A text book of organic chemistry; S. Chand & Co.ltd India; 2010
3. Morrison and Boyd ;Organic Chemistry ;7th edition; pearson

Articulated Matrix

PO/PSO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP401T. CO 1	3	-	-	-	-	-	-	-	-	-	-	1	3	3	2	3
BP401T. CO 2	3	2	-	-	-	-	-	-	-	-	-	-	3	2	2	2
BP401T. CO 3	2	-	-	-	-	-	-	-	-	-	-	-	2	2	1	2
BP401T. CO 4	3	3	-	-	-	-	-	-	-	-	-	1	3	2	1	2
BP401T. CO 5	2	2	2	-	-	-	-	-	-	-	-	1	2	2	2	1
AVERAGE	2.6	2.3	2	-	-	-	-	-	-	-	-	1	2.6	2.2	1.6	2

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP402T	Credit	4
Year/Sem	2/4	L-T-P	3-1-0
Course Name	**Medicinal Chemistry**		

Objectives of the Course:

Upon completion of the course the student shall be able to

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

UNIT- I (Total Hours-10**)**

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.

UNIT II (Total Hours-10)

Drugs acting on Autonomic Nervous System

Adrenergic Neurotransmitters:

Biosynthesis and catabolism of catecholamine.

Adrenergic receptors (Alpha & Beta) and their distribution.

Sympathomimetic agents: SAR of Sympathomimetic agents

Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine*, Dopamine,Methyldopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline.

- Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine, Propylhexedrine.
- Agents with mixed mechanism: Ephedrine, Metaraminol.

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.

UNIT II (Total Hours-10)

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.

UNIT II (Total Hours-10)

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.

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UNIT-IV (Total Hours-8)

Drugs acting on Central Nervous System

A. Sedatives and Hypnotics:

Benzodiazepines: SAR of Benzodiazepines, Chlordiazepoxide, Diazepam*, Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem

Barbiturtes: SAR of barbiturates, Barbital*, Phenobarbital, Mephobarbital, Amobarbital, Butabarbital, Pentobarbital, Secobarbital

Miscelleneous:

Amides & imides: Glutethmide.

Alcohol & their carbamate derivatives: Meprobomate, Ethchlorvynol.

Aldehyde & their derivatives: Triclofos sodium, Paraldehyde.

B. Antipsychotics

Phenothiazeines: SAR of Phenothiazeines - Promazine hydrochloride, Chlorpromazine ydrochloride*, Triflupromazine, 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 andmonoacylureas: Phenacemide, Carbamazepine*

Benzodiazepines: Clonazepam

Miscellaneous: Primidone, Valproic acid , Gabapentin, Felbamate

UNIT-V (Total Hours-7)

Drugs acting on Central Nervous System

General anesthetics:

Inhalation anesthetics: Halothane*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane.

Ultra short acting barbitutrates: Methohexital sodium*, Thiamylal sodium, Thiopental sodium.

Dissociative anesthetics: Ketamine hydrochloride.*

Narcotic and non-narcotic analgesics

Morphine and related drugs: SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anilerdine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate*, Methadone hydrochloride*, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartarate.

UNIT-V (Total Hours-7)

Drugs acting on Central Nervous System

General anesthetics:

Inhalation anesthetics: Halothane*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane.

Ultra short acting barbitutrates: Methohexital sodium*, Thiamylal sodium, Thiopental sodium.

Dissociative anesthetics: Ketamine hydrochloride.*

Narcotic and non-narcotic analgesics

Morphine and related drugs: SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anilerdine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate*, Methadone hydrochloride*, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartarate.

Narcotic antagonists: Nalorphine hydrochloride, Levallorphan tartarate, Naloxone hydrochloride.

Anti-inflammatory agents: Sodium salicylate, Aspirin, Mefenamic acid*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepriac, Diclofenac, Ketorolac, Ibuprofen*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.

Course Outcomes (CO)

BP402T CO 1 Classify the different classes of drugs with their structure.
BP402T CO 2 Assess the relation between physicochemical properties & biological action of drugs.
BP402T CO 3 Illustrate the structural activity relationship of selective classes of drugs
BP402T CO 4 Appraise the synthesis of selective drugs.
BP402T CO 5 Criticize the mechanism and metabolic pathways of different class of drugs with their adverse effects.

References:

1. Wilson and Giswold, Textbook of Organic medicinal and Pharmaceutical Chemistry, 12th Ed, 1971. Lippincott Williams & Wilkins
2. Foye's Principles of Medicinal Chemistry. Lippincott Williams & Wilkins, 2008
3. Burger's Medicinal Chemistry, Vol I to IV, 2003 Wiley
4. Finar I.L., Organic Chemistry, Vol. II., Pearson Education India.

CO/PO Articulated Matrix

CO PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP402T CO 1	3	–	–	–	–	1	–	–	–	–	–	2	2	1	–	1
BP402T CO 2	1	–	–	–	–	1	–	–	–	–	–	–	1	–	–	–
BP402T CO 3	2	–	1	–	–	–	–	–	–	–	–	–	1	–	–	–
BP402T CO 4	2	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–
BP402T CO 5	2	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–
BP402T CO 6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
AVERAGE	2	–	1	–	–	1	–	–	–	–	–	1.5	1.2	1	–	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus

Average of best of two sessional

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Program Name	B. Pharm.	Program Code	29
Course Code	BP403T	Credit	4
Year/Sem	2/3	L-T-P	3-1-0
Course Name	**Physical Pharmaceutics- II**		

Objectives of the Course:

Upon completion of the course the 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 and determination of expiry date of formulations
3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

UNIT I (Total Hours- 7)

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.

UNIT II (Total Hours-8)

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

UNIT- III(Total Hours-10)

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.

UNIT-IV (Total Hours-10)

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.

UNIT-V (Total Hours-10)

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

Course Outcomes (CO)

CO BP403T.1. Classify dispersed system and explain colloidal and coarse dispersions

CO BP403T.2. Describe rheology and related properties

CO BP403T.3. Evaluate micro meretic properties of drugs and excipients

CO BP403T.4. Assess drug stability of ingredients and formulations

References:

1. Subrahmanyam C.V.S. & Vasantharaju, Laboratory Manual of Physical Pharmacy, Second Edition, Vallabh Prakashan
2. Martin A, Physical Pharmacy and Pharmaceutical Sciences, Lippincott Williams & Wilkins
3. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3,Marcel Dekkar Inc
4. Cooper and Gunn, Tutorial pharmacy, Sixth Edition, CBS Publisher and Distributor

CO/PO Articulated Matrix

CO PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4
CO BP403T.1	3	1	1	-	1	-	-	-	-	1	-	2	3	2	1	2
CO BP403T.2	3	2	-	-	2	-	-	-	-	1	-	2	3	2	1	2
CO BP403T.3	3	2	2	1	1	-	-	-	-	1	-	2	3	2	1	2
CO BP403T.4	3	2	2	2	2	-	-	-	-	1	-	2	3	2	1	2
Average	3	1.7	1.6	1.5	1.5	-	-	-	-	1	-	2	3	2	1	2

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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Program Name	B. Pharm.	Program Code	29
Course Code	BP404T	Credit	4
Year/Sem	2/3	L-T-P	3-1-0
Course Name	**Pharmacology-I**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Understand the pharmacological actions of different categories of drugs
2. Explain the mechanism of drug action at organ system/sub cellular/ macromolecular levels.
3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
4. Observe the effect of drugs on animals by simulated experiments
5. Appreciate correlation of pharmacology with other bio medical sciences

UNIT I (Total Hours- 8)

General Pharmacology

a. 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.

b. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs. Enzyme induction, enzyme inhibition, kinetics of elimination

UNIT II (Total Hours-12)

General Pharmacology

a. 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.

b. Adverse drug reactions.

c. Drug interactions (pharmacokinetic and pharmacodynamic) d. Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.

UNIT- III(Total Hours-10)

Pharmacology of drugs acting on peripheral nervous system

a. Organization and function of ANS.

b.Neurohumoral transmission,co-transmission and classification of neurotransmitters.

c. Parasympathomimetics, Parasympatholytics, Sympathomimetics, sympatholytics.

d. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).

e. Local anesthetic agents.

f. Drugs used in myasthenia gravis and glaucoma

UNIT-IV (Total Hours-8)

Pharmacology of drugs acting on central nervous system

a. Neurohumoral transmission in the C.N.S.special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine.

b. General anesthetics and pre-anesthetics.

c. Sedatives, hypnotics and centrally acting muscle relaxants.

d. Anti-epileptics

e. Alcohols and disulfiram

UNIT-V (Total Hours-7)

Pharmacology of drugs acting on central nervous system

a. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, anti-manics and hallucinogens.

b. Drugs used in Parkinsons disease and Alzheimer's disease.

c. CNS stimulants and nootropics.

d. Opioid analgesics and antagonists

e. Drug addiction, drug abuse, tolerance and dependence.

Articulated Matrix

CO / PO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
BP404.CO1	2	2	-	1	-	-	-	-	-	-	-	-	1	-	-	-
BP404.CO2	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1
BP404.CO3	2	-	-	-	-	-	-	-	-	2	-	2	1	1	1	1
BP404.CO4	2	-	-	-	-	-	-	-	-	-	-	1	1	-	-	1
BP404.CO5	2	-	-	-	-	-	-	-	-	-	-	2	1	-		1
BP404.CO6	2	-	-	-	1	2	-	-	-	2	-	-	1	1	1	-
AVERAGE	2	2	-	1	1	2	-	-	-	2	-	1.66	1	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	**10**	**15**	**75**

*Calculate as per criteria given in PCI syllabus
Average of best of two Sessional

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP405T	Credit	4
Year/Sem	2/4	L-T-P	3-1-0
Course Name	**Pharmacognosy and Phytochemistry-1**		

Objectives of the Course:

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

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. Know the evaluation techniques for the herbal drugs
4. To carry out the microscopic and morphological evaluation of crude drugs

UNIT I (Total Hours- 10)

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.

UNIT II (Total Hours-10)

Cultivation, Collection, Processing and storage of drugs of natural origin:

a) Cultivation and Collection of drugs of natural origin
b) Factors influencing cultivation of medicinal plants.
c) Plant hormones and their applications.
d) Polyploidy, mutation and hybridization with reference to medicinal plants

Conservation of medicinal plants

UNIT- III(Total Hours-7)

Plant tissue culture:

a) Historical development of plant tissue culture, types of cultures, Nutritional requirements, Growth and their maintenance.
b) Applications of plant tissue culture in pharmacognosy. Edible vaccines.

UNIT-IV (Total Hours-10)

Pharmacognosy in various systems of medicine:

a) Role of Pharmacognosy in allopathy and traditional systems of medicine namely, Ayurveda, Unani, Siddha, Homeopathy and Chinese systems of medicine.

Introduction to secondary metabolites:

a) Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins

UNIT-V (Total Hours-8)

Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs-

a) Plant Products:

Fibers - Cotton, Jute, Hemp

Hallucinogens, Teratogens, Natural allergens

b) 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 Primarymetabolites:

CO/PO Articulated Matrix

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP405.CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
BP405.CO2	3	-	-	-	-	-	-	-	-	-	-	-	3	2	-	1
BP405.CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
BP405.CO4	3	1	-	-	1	-	-	-	2	-	-	1	3	-	-	1
AVERAGE	3	1	-	-	1	-	-	-	2	-	-	1	3	2	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	**10**	**15**	**75**

*Calculate as per criteria given in PCI syllabus # Average of best of two Sessional

Programme Name	B.Pharm.	Programme Code	29
Course Code	BP406P	Credit	2
Year/Sem	2/4	L-T-P	0-0-4
Course Name	**Medicinal Chemistry-I**		

Objectives of the Course:

Upon completion of the course the student shall be able to

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

Practical to be Conducted (Total Hours- 4hr per week)

1. To identify and study the glass wares and apparatus used in Pharmaceutical Medicinal Chemistry laboratory.
2. To synthesize and submit Benzocaine. Report its melting point range & percentage yield.
3. To synthesize and submit Benzimidazole. Reports its melting point range & percentage yield.
4. To synthesize and submit 5, 5-Diphenylhydantoin. Reports its melting point range & percentage yield.
5. To synthesize 3-Methyl-1-Phenyl Pyrazole-5-One. Reports its melting point range & percentage yield.
6. To synthesize and submit 2, 3-Diphenyl quinoxaline. Reports its melting point range & percentage yield.
7. To synthesize and submit Benzotriazole. Reports its melting point range & percentage yield.
8. To synthesize and submit Aspirin. Reports its melting point range & percentage yield.
9. To perform assay of Aspirin according to Indian Pharmacopoeia.
10. To perform assay of Ibuprofen according to Indian Pharmacopoeia.

Course Outcomes (CO)

BP406P.CO1. Develop the practical skills
BP406P.CO2. Produce the intermediate and medicinal compounds in the lab
BP406P.CO3. Assess the different physicochemical properties of drugs
BP406P.CO4. Estimate the purity of drugs

References:

1.Smith and Williams; Introduction to principles of drug design, 3rd edition, 1998, ACS publications.
2.Martindale's extra pharmacopoeia ; 38th edition; pharmaceutical press publication; 1883
3.Finar I.L., Organic Chemistry Vol. II.; Pearson education pea.

CO/PO Articulated Matrix

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP406P.CO 1	1	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-
BP406P.CO 2	3	-	-	-	-	-	-	-	1	-	-	-	1	1	-	1
BP406P.CO 3	1	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-
BP406P.CO 4	2	-	-	-	2	-	-	-	1	-	-	2	-	1	-	-
AVERAGE	1.75	-	-	-	2	-	-	-	1	-	-	2	1	1	-	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-35)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	5	10	35

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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Program Name	B.Pharm.	Program Code	29
Course Code	BP407P	Credit	2
Year/Sem	2/4	L-T-P	0-0-4
Course Name	**Physical Pharmaceutics II**		

Objectives of the Course:

Upon completion of the course the student shall be able to understand
Practical components of the subject to get a better insight into various physicochemical properties and evaluation of dosage forms

Practical to be Conducted (Total Hours- 4hr per week)

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

Course Outcomes (CO)

BP407P. CO1. Determination of different physical attributes of ingredients
BP407P. CO2. Conclude different properties of formulations
BP407P. CO3. Practice of various viscometers and rate constants
BP407P. CO4. Assess the stability of formulations

References:

1. Subrahmanyam C.V.S. & Vasantharaju, Laboratory Manual of Physical Pharmacy, Second Edition, Vallabh Prakashan
2. Jain G & Khar R. K., Text book of Physical Phramacy, Elsevier India
3. Martin A, Physical Pharmacy and Pharmaceutical Sciences, Lippincott Williams & Wilkins

Articulated Matrix

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP407P. CO 1	3	1	-	-	1	-	-	-	1	-	-	2	3	2	1	2
BP407P. CO 2	3	2	-	-	1	-	-	-	1	-	-	2	3	2	1	2
BP407P. CO 3	3	2	1	-	2	-	-	-	1	-	-	1	3	2	1	2
BP407P. CO 4	3	3	2	2	2	-	-	-	2	-	-	3	3	2	1	2
verage	3	2	1.5	2	1.5	-	-	-	1.3	-	-	2	3	2	1	2

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-35)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	5	10	35

*Calculate as per criteria given in PCI syllabus
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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP408P	Credit	4
Year/Sem	2/4	L-T-P	0-0-4
Course Name	**Pharmacology-I (Practical)**		

Objectives of the Course:

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

Practical components of the subject to get a better insight into the effect of drugs on animals by simulated experiments and correlation of pharmacology with other bio medical sciences

Practical to be Conducted (Total Hours- 4hr per week)

1. Introduction to experimental pharmacology.
2. Commonly used instruments in experimental pharmacology.
3. Study of common laboratory animals.
4. Maintenance of laboratory animals as per CPCSEA guidelines.
5. Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies.
6. Study of different routes of drugs administration in mice/rats.
7. Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleepingtime in mice.
8. Effect of drugs on ciliary motility of frog oesophagus
9. Effect of drugs on rabbit eye.
10. Effects of skeletal muscle relaxants using rota-rod apparatus.
11. Effect of drugs on locomotor activity using actophotometer.
12. Anticonvulsant effect of drugs by MES and PTZ method.
13. Study of stereotype and anti-catatonic activity of drugs on rats/mice.
14. Study of anxiolytic activity of drugs using rats/mice. 15. Study of local anesthetics by different methods

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

Course Outcomes (CO)

BP408P. CO1 Demonstrate and handling of laboratory animals as per CPCSEA guidelines.
BP408P. CO2 Demonstration of different routes of drugs administration and techniques of blood removal in mice/rats
BP408P. CO3 Study the effect of drugs on organs of experimental animals
BP408P. CO4 Correlate the working of pharmacological equipments with the softwares/videos

References:

1.Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
2. Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert,
3. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
4. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan,

CO/PO Articulated Matrix

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PS O4
BP408P.CO 1	2	-	-	-	3	-	-	1	1	-	-	-	-	-	-	-
BP408P.CO 2	2	-	-	-	3	-	-	-	1	2	-	1	3	1	1	1
BP408P.CO 3	2	-	-	-	3	-	-	-	1	-	-	1	-	1	-	-
BP408P.CO 4	2	-	-	-	3	-	-	-	1	-	-	2	3	-	1	-
BP408P.CO 5	-	-	-	-	-	-	-	-								
BP408P.CO 6	-	-	-	-	-	-	-	-								
AVERAGE	3	-	-	-	-	-	-	-	1	-	-	1	1.5	0.5	0.5	0.2 5

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-35)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	**5**	**10**	**35**

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Average of best of two Sessional

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP409P	Credit	4
Year/Sem	2/4	L-T-P	0-0-4
Course Name	**Pharmacognosy and Phytochemistry-1 (Practical)**		

Objectives of the Course:

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

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. Know the evaluation techniques for the herbal drugs
4. To carry out the microscopic and morphological evaluation of crude drugs

Practical to be Conducted (Total Hours- 4hr per week)

1. Analysis of crude drugs by chemical tests: (i)Tragaccanth (ii) Acacia (iii)Agar (iv) Gelatin (v) starch (vi) Honey (vii) Castor oil
2. Determination of stomatal number and index
3. Determination of vein islet number, vein islet termination and paliside ratio.
4. Determination of size of starch grains, calcium oxalate crystals by eye piecemicrometer
5. Determination of Fiber length and width
6. Determination of number of starch grains by Lycopodium spore method
7. Determination of Ash value
8. Determination of Extractive values of crude drugs
9. Determination of moisture content of crude drugs
10. Determination of swelling index and foaming

Course Outcomes (CO)

BP409P.CO 1. Examine the leaf constants of crude drugs.

BP409P.CO 2. Assess the different chemical tests to analyze the specific crude drugs.

BP409P.CO 3. Estimate various macroscopic parameters.

BP409P.CO 4. Estimate various physico-chemical parameters.

References:

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

2. Kokate C. K., Purohit A. P., Gokhlae S. B.,(2015), 51ST Edition, Nirali Prakashan, Pune.

3. Kalia A. N., (2005), Textbook of Industrial Pharmacognosy, 1st edition, CBS Publishers & Distributors.

4. Wallis T. E., (2014), Practical Pharmacognosy, 4th edition, pharmaMed Press, Hyderabad.

CO/PO Articulated Matrix

PO CO	PO 1	P0 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO 4
BP409P.CO 1	3	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
BP409P.CO 2	3	-	-	-	-	-	-	-	1	-	-	1	3	1	1	1
BP409P.CO 3	3	-	-	-	-	-	-	-	1	-	-	1	-	1	-	-
BP409P.CO 4	3	-	-	-	-	-	-	-	1	-	-	2	3	-	1	-
AVERAGE	3	-	-	-	-	-	-	-	1	-	-	1	3	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-35)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	**5**	**10**	**35**

*Calculate as per criteria given in PCI syllabus
Average of best of two Sessional

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP205TLE	Credit	4
Year/Sem	1/2	L-T-P	2-0-0
Course Name	**Computer Applications In Pharmacy Theory**		

Objectives of the Course:

1. Know the various types of application of computers in pharmacy
2. Know the various types of databases
3. Know the various applications of databases in pharmacy

UNIT I (Total Hours- 06)

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

UNIT II (Total Hours-6)

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

UNIT- III (Total Hours-6)

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

UNIT-IV (Total Hours-06)

Bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery

UNIT-V (Total Hours-06)

Computers as data analysis in Preclinical development: Chromatographic dada analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMS)

Course Outcomes (CO)

BP205TLE. CO1 Test and examine different kinds of software for different medicines.
BP205TLE. CO2 Create a database for pharmacy using Laboratory Information management
BP205TLE. CO3 Estimate the Impact of Bioinformatics in Vaccine Discovery.
BP205TLE. CO4 Create a website using CSS to demonstrate different diseases and medicine.
BP205TLE. CO5 Create Electronic Prescribing and discharge (EP) systems for patient

References:

1. William E.Fassett, Lea and Febiger, Computer Application in Pharmacy, 600 South Washington Square, USA, (215) 922-1330.
2. Sean Ekins - Wiley-Interscience, Computer Application in Pharmaceutical Research and Development A John Willey and Sons, INC., Publication, USA
3. Rastogi S.C., Bioinformatics (Concept, Skills and Applications) - CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi - 110 002(India)

CO/PO Articulated Matrix

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
BP205TLE.CO.1	3	2	1	–	1	–	–	–	2	–	–	1	1	–	–	1
BP205TLE.CO.2	3	2	1	–	1	–	–	–	2	1	–	1	1	–	1	1
BP205TLE.CO.3	3	2	1	–	1	–	–	–	2	–	–	1	1	–	–	1
BP205TLE.CO4	3	2	1	–	1	–	–	–	2	–	–	1	1	–	–	1
BP205TLE.CO.5	3	2	1	–	1	–	–	–	2	–	–	1	1	–	–	1
Average	3	2	1	–	1	–	–	–	2	1	–	1	1	–	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-50)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	50

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP210PLE	Credit	4
Year/Sem	1/2	L-T-P	0-0-2
Course Name	**Computer Applications In Pharmacy - Practical**		

Objectives of the Course:

1. Know the various types of application of computers in pharmacy
2. Know the various types of databases
3. Know the various applications of databases in pharmacy

Practical to be Conducted (Total Hours- 2hr per week)

1. Design a questionnaire using a word processing package to gather information about a particular disease.
2. Create a HTML web page to show personal information.
3. Retrieve the information of a drug and its adverse effects using online tools
4. Creating mailing labels Using Label Wizard , generating label in MS WORD
5. Create a database in MS Access to store the patient information with the required fields Using access.
6. Design a form in MS Access to view, add, delete and modify the patient record in the database
7. Generating report and printing the report from patient database
8. Creating invoice table using - MS Access
9. Drug information storage and retrieval using MS Access
10. Creating and working with queries in MS Access
11. Exporting Tables, Queries, Forms and Reports to web pages
12. Exporting Tables, Queries, Forms and Reports to XML pages

Course Outcomes

BP210PLE. CO1 Apply various types of application of computers in pharmacy.
BP210PLE. CO2 Demonstrate the various types of databases.
BP210PLE. CO3 Apply the various applications of databases in pharmacy.
BP210PLE. CO4 Apply the web based tools for pharmacy practice.

References:

1. William E.Fassett -Lea and Febiger, Computer Application in Pharmacy - 600 South Washington Square, USA, (215) 922-1330.
2. Ekins - Wiley-Interscience, Computer Application in Pharmaceutical Research and Development - Sean A John Willey and Sons, INC., Publication, USA
3. Rastogi S.C., Bioinformatics (Concept, Skills and Applications) - CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi - 110 002(INDIA)

CO/PO Articulated Matrix

PO/PSO / CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP210PLE.CO1	3	1	1	–	1	–	–	–	1	1	–	1	1	–	–	1
BP210PLE.CO2	3	1	–	–	1	–	–	–	1	1	–	1	1	–	–	–
BP210PLE.CO3	3	1	–	–	1	–	–	–	1	1	–	1	1	1	–	1
BP210PLE.CO4	3	1	1	1	1	–	–	–	1	1	–	1	1	1	–	1
Average	3	1	1	1	1	–	–	–	1	1	–	1	1	1	–	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-10)			**External (MM-25)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	5	5	15

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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SEMESTER –V

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Programme Name	B.Pharm.	Programme Code	29
Course Code	BP501T	Credit	4
Year/Sem	3/5	L-T-P	3-1-0
Course Name	**Medicinal Chemistry-Ii**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Understand the chemistry of drugs with respect to their pharmacological activity
2. Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3. Know the Structural Activity Relationship of different class of drugs
4. Study the chemical synthesis of selected drugs

UNIT I (Total Hours- 10)

Antihistaminic agents: Histamine, receptors and their distribution in the humanbody

H1–antagonists: Diphenhydramine hydrochloride*, Dimenhydrinate, Doxylamines cuccinate, Clemastine fumarate, Diphenylphyraline hydrochloride, Tripelenamine hydrochloride, Chlorcyclizine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride*, Phenidamine tartarate, Promethazine hydrochloride*, Trimeprazine tartrate, Cyproheptadine hydrochloride, Azatidine maleate, Astemizole, Loratadine, Cetirizine, Levocetrazine Cromolyn sodium.

H2-antagonists: Cimetidine*, Famotidine, Ranitidin.

Gastric Proton pump inhibitors: Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole

Anti-neoplastic agents:

Alkylating agents: Meclorethamine*, Cyclophosphamide, Melphalan Chlorambucil, Busulfan, Thiotepa

Antimetabolites: Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine

Antibiotics: Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin

Plant products: Etoposide, Vinblastin sulphate, Vincristin sulphate

Miscellaneous: Cisplatin, Mitotane.

UNIT II (Total Hours-10)

Anti-anginal:

Vasodilators: Amyl nitrite, Nitroglycerin*, Pentaerythritol tetranitrate, Isosorbide dinitrite*, Dipyridamole.

Calcium channel blockers: Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine.

Diuretics:

Carbonic anhydrase inhibitors: Acetazolamide*, Methazolamide, Dichlorphenamide.

Thiazides: Chlorthiazide*, Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide,

Loop diuretics: Furosemide*, Bumetanide, Ethacrynic acid.

Potassium sparing Diuretics: Spironolactone, Triamterene, Amiloride.

Osmotic Diuretics: Mannitol

Anti-hypertensive Agents: Timolol, Captopril, Lisinopril, Enalapril, Benazeprilhydrochloride, Quinapril hydrochloride, Methyldopate hydrochloride,* Clonidine hydrochloride, Guanethidine monosulphate, Guanabenz acetate, Sodium nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride.

UNIT- III(Total Hours-10)

Anti-arrhythmic Drugs: Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcainide hydrochloride, Amiodarone, Sotalol.

Anti-hyperlipidemic agents: Clofibrate, Lovastatin, Cholesteramine and Cholestipol

Coagulant & Anticoagulants: Menadione, Acetomenadione, Warfarin*, Anisindione, clopidogrel

Drugs used in Congestive Heart Failure: Digoxin, Digitoxin, Nesiritide, Bosentan, Tezosentan.

UNIT-IV (Total Hours-8)

Drugs acting on Endocrine system

Nomenclature, Stereochemistry and metabolism of steroids

Sex hormones: Testosterone, Nandralone, Progestrones, Oestriol, Oestradiol, Oestrione, Diethyl stilbestrol.

Drugs for erectile dysfunction: Sildenafil, Tadalafil.

Oral contraceptives: Mifepristone, Norgestril, Levonorgestrol

Corticosteroids: Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone **Thyroid and antithyroid drugs:** L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.

UNIT-V (Total Hours-7)
Antidiabetic agents:
Insulin and its preparations
Sulfonyl ureas: Tolbutamide*, Chlorpropamide, Glipizide, Glimepiride.
Biguanides: Metformin.
Thiazolidinediones: Pioglitazone, Rosiglitazone.
Meglitinides: Repaglinide, Nateglinide.
Glucosidase inhibitors: Acrabose, Voglibose.
Local Anesthetics: SAR of Local anesthetics
Benzoic Acid derivatives; Cocaine, Hexylcaine, Meprylcaine, Cyclomethycaine, Piperocaine.
Amino Benzoic acid derivatives: Benzocaine*, Butamben, Procaine*, Butacaine, Propoxycaine, Tetracaine, Benoxinate.
Lidocaine/Anilide derivatives: Lignocaine, Mepivacaine, Prilocaine, Etidocaine.
Miscellaneous: Phenacaine, Diperodon, Dibucaine.

Course Outcomes (CO)

BP501T CO 1. Understand the chemistry of drugs with respect to their pharmacological activity.
BP501T CO 2. Classify and mention the moa of drugs
BP501T CO 3. Recognize important application of drugs for pharmacological action.
BP501T CO 4. Describe the pharmacokinetics of drugs
BP501T CO 5. Asscess the SAR of drugs

References:

1. Wilson and Giswold, Textbook of Organic medicinal and Pharmaceutical Chemistry, 12th Ed, 1971.Lippincott Williams & Wilkins
2. Foye's Principles of Medicinal Chemistry. Lippincott Williams & Wilkins, 2008
3. Burger's Medicinal Chemistry, Vol I to IV, 2003Wiley
4. Finar I.L., Organic Chemistry, Vol. II., Pearson Education India.

CO/PO Articulated Matrix

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
BP501T CO 1	3	–	–	–	–	–	1	–	–	1	–	1	1	1	1	1
BP501T CO 2	2	–	–	–	–	–	–	–	–	–	–	1	–	1	–	–
BP501T CO 3	2	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–
BP501T CO 4	3	–	–	–	–	–	–	–	–	1	–	1	–	–	1	–
BP501T CO 5	2	–	–	–	–	–	–	–	–	–	–	1	–	–	–	1
BP501T CO 6	2	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–
AVERAGE	2.33	–	–	–	–	–	1	–	–	1	–	1	1	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP502T	Credit	4
Year/Sem	3/5	L-T-P	3-1-0
Course Name	**Industrial Pharmacy- I**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms.
8. Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

UNIT I (Total Hours- 7)

Preformulation Studies: Introduction to preformulation, goals and objectives, study of physicochemical characteristics of drug substances.

a) **Physical properties:** Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism.
b) **Chemical Properties**: Hydrolysis, oxidation, reduction, racemisation, polymerization

BCS classification of drugs & its significant

Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms

UNIT II (Total Hours-10)

Tablets:

a) Introduction, ideal characteristics of tablets, classification of tablets. Excipients Formulation of tablets, granulation methods, compression and processing problems. Equipments and tablet tooling.
b) **Tablet coating**: Types of coating, coating materials, 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 (Total Hours-8)

Capsules:

a) **Hard gelatin capsules:** Introduction, Production of hard gelatin capsule shells. Size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. In process and final product quality control tests for capsules.
b) **Soft gelatin capsules:** Nature of shell and capsule content, size of capsules, importance of base adsorption and minim/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules and their applications.

Pellets: Introduction, formulation requirements, pelletization process, equipments for manufacture of pellets

UNIT-IV (Total Hours-10)

Parenteral Products:

a) Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity
b) Production procedure, production facilities and controls, aseptic processing
c) Formulation of injections, sterile powders, large volume parenterals and lyophilized products.
d) Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests of parenteral products.

Ophthalmic Preparations: Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations

UNIT-V (Total Hours-10)

Cosmetics: Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens.

PharmaceuticalAerosols: 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.

Course Outcomes (CO)

BP502T. CO1 Recall the concepts of dosage form design & formulation strategies.
BP502T. CO2 Assess the various factors affecting pharmaceutical dosage forms.
BP502T. CO3 Formulate solid, liquid and semisolid dosage forms.
BP502T. CO4 Explain sterile dosage forms and their Preparation.
BP502T. CO5 Analyze dosage form for various quality parameters.
BP502T. CO6 Illustrate packaging components, their types and specification.

References:

1. Subrahmanyam, C.V.S. Industrial Pharmacy: Selected Topics , Industrial Pharmacy Vallabh Prakashan
2. Ranpise, H. , Industrial Pharmacy-I Industrial Pharmacy,Career Publication
3. Lachman & Liebermans, Khar, R.K., Theory and Practive of Industrial Pharmacy, CBS
4. Lachman, Leon Theory and Practice of Industrial Pharmacy , Industrial Pharmacy Varghese Publication
5. Augsburger, L.L. Pharmaceutical Dosage Forms: Tablets- Manufacture and Process Control Pharmaceutical Dosage Forms Informa Healthcare
6. Augsburger, L.L.Pharmaceutical Dosage Forms: Tablets- Rational Design and Formulation Pharmaceutical Dosage Forms Informa Healthcare
7. Sharma, P.P. Cosmetics-Formulation, Manufacturing and Quality Control Cosmetics Technology Vandana Pub
8. Sharma, Akanksha Text Book of Cosmetics Cosmetics Technology Pragati
9. Nema, S. Pharmaceutical Dosage Forms: Parenteral Medications Vol 1: Formulation and Packaging Pharmaceutical Dosage Forms Informa Healthcare.

CO/PO Articulated Matrix

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP502.CO1	3	—	—	—	—	—	—	—	—	—	—	1	1	1	—	—
BP502.CO2	2	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—
BP502.CO3	2	1	—	—	2	—	—	—	1	1	—	1	1	1	1	—
BP502.CO4	2	1	—	—	—	—	—	—	1	—	—	1	1	—	—	—
BP502.CO5	2	2	2	—	—	—	—	—	1	—	—	1	1	—	—	1
BP502.CO6	3	1	—	—	—	—	—	—	—	—	—	1	1	—	—	—
AVERAGE	2.33	1.25	2	—	2	—	—	—	1	1	—	1	1	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

Programme Name	B. Pharm.	Programme Code	29
Course Code	BP503T	Credit	4
Year/Sem	3/5	L-T-P	3-1-0
Course Name	**Pharmacology-II**		

Objectives of the Course:

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

1. Understand the mechanism of drug action and its relevance in the treatment of different diseases
2. Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments
3. Demonstrate the various receptor actions using isolated tissue preparation
4. Appreciate correlation of pharmacology with related medical sciences

UNIT I (Total Hours- 10)

Pharmacology of drugs acting on cardio vascular system: 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.

UNIT II (Total Hours-10)

Pharmacology of drugs acting on cardio vascular system: Drug used in the therapy of shock., Hematinics, coagulants and anticoagulants, Fibrinolytics and anti-platelet drugs, Plasma volume expanders

Pharmacology of drugs acting on urinary system: Diuretics, Anti-diuretics.

UNIT- III(Total Hours-10)

Autocoids and related drugs: Introduction to autacoids and classification, Histamine, 5-HT and their antagonists, Prostaglandins, Thromboxanes and Leukotrienes, Angiotensin, Bradykinin and Substance P, Non-steroidal anti-inflammatory agents, Anti-gout drugs, Antirheumatic drugs

UNIT-IV (Total Hours-08)

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, Hormones regulating plasma calcium level- Parathormone, Calcitonin and Vitamin-D, Insulin, Oral Hypoglycemic agents and glucagon, ACTH and corticosteroids.

UNIT-V (Total Hours-07)

Pharmacology of drugs acting on endocrine system: Androgens and Anabolic steroids, Estrogens, progesterone and oral contraceptives, Drugs acting on the uterus.

Bioassay: Principles and applications of bioassay, Types of bioassay, Bioassay of insulin, oxytocin, vasopressin, ACTH,d-tubocurarine,digitalis, histamine and 5-HT.

Course Outcomes (CO)

BP503T.CO1. Understand the signs and symptoms of various diseases.

BP503T.CO2. Understand the mechanism of drug action and its relevance in the treatment of different diseases.

BP503T.CO3. Discuss the various receptor actions.

BP503T.CO4. Access the various classes of drugs

BP503T.CO5. Appraise the bio assays of drugs on isolated tissues

CO/PO Articulated Matrix

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP503T.CO1	2	-	-	-	-	2	-	-	-	1	-	1	1	1	1	1
BP503T.CO2	2	-	-	-	-	2	-	-	-	-	-	-	1	1	1	1
BP503T.CO3	2	-	-	-	-	-	-	-	-	-	-	1	1	1	-	1
BP503T.CO4	2	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1
BP503T.CO5	2	1	-	-	-	-	-	-	-	1	-	-	1	1	1	1
BP503T.CO6	-	-	-	-	-	2	-	-	-	-	-	-	1	1	1	1
AVERAGE	2	1	-	-	-	2	-	-	-	1	-	1	1	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

Programme Name	B.Pharm.	Programme Code	29
Course Code	BP504T	Credit	4
Year/Sem.	3/5	L-T-P	3-1-0
Course Name	**Pharmacognosy**		

Objectives of the Course:

Upon completion of the course the student shall be able to know-

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 understand the herbal drug interactions.

4. To carryout isolation and identification of phytoconstituents.

UNIT I (Total Hours- 7)

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.

UNIT II (Total Hours-14)

General introduction, composition, chemistry & chemical classes, biosources, therapeutic uses and commercial applications of following-

secondary metabolites:

a. **Alkaloids:** Vinca, Rauwolfia, Belladonna, Opium,
b. **Phenylpropanoids and Flavonoids:** Lignans, Tea, Ruta
c. **Steroids, Cardiac Glycosides & Triterpenoids**: Liquorice, Dioscorea, Digitalis
d. **Volatile oils**: Mentha, Clove, Cinnamon, Fennel, Coriander,
e. **Tannins:** Catechu, Pterocarpus
f. **Resins:** Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony
g. **Glycosides:** Senna, Aloes, Bitter Almond
h. **Iridoids, Other terpenoids & Naphthaquinones:** Gentian, Artemisia, taxus, carotenoids

UNIT- III (Total Hours- 06)

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

UNIT-IV (Total Hours-10)

Industrial production, estimation and utilization of the following phytoconstituents:
Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastine

UNIT-V (Total Hours-08)

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.

Course Outcomes

BP504T.CO1. Illustrate all pharmacognostical evaluation including general introduction of Secondary metabolites.

BP504T.CO2. Figure out metabolic pathway related to the formation of different secondary metabolites.

BP504T.CO3. Report the isolation, identification, analysis and industrial production of different phytoconstituents.

BP504T.CO4. Appraise the modern methods of extraction and application of latest techniques like spectroscopy, chromatography & electrophoresis in evaluation of crude drugs.

References:

1. Evans W.C., Trease, Pharmacognosy, 16th edition, 2009, W.B. Sounders & Co., London
2. Kokate C. K., Purohit A. P., Gokhlae S. B.,(2015), 51ST Edition, Nirali Prakashan, Pune.
3. Kalia A. N., (), Textbook of Industrial Pharmacognosy, 1st edition, 2005, CBS Publishers & Distributors, New Delhi.
4. Rangari V. D., (2019), Pharmacognosy and Phytochemistry 4th edition, Career Publications, Maharashtra, India.

CO/PO Articulated Matrix

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
BP504T.CO1	3	-	-	-	-	-	-	-	-	-	-	2	-	1	2	-
BP504T.CO2	3	-	-	-	-	-	-	-	-	-	-	1	3	2	-	1
BP504T.CO3	3	-	-	-	-	-	1	-	-	-	-	2	3	-	-	-
BP504T.CO4	3	1	-	-	-	-	1	-	-	-	1	1	-	-	1	1
AVERAGE	3	1	-	-	-	-	1	-	-	-	1	1.5	3	1.5	1.5	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	**10**	**15**	**75**

*Calculate as per criteria given in PCI syllabus
Average of best of two Sessional

Program Name	B.Pharm.	Program Code	29
Course Code	BP505T	Credit	4
Year/Sem	3/5	L-T-P	3-1-0
Course Name	**Pharmaceutical Jurisprudence**		

Objectives of the Course:

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

1. The Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals.
2. Various Indian pharmaceutical Acts and Laws
3. The regulatory authorities and agencies governing the manufacture and sale of Pharmaceuticals
4. The code of ethics during the pharmaceutical practice

UNIT I (Total Hours- 10)

Drugs and Cosmetics Act, 1940 and its rules 1945:

Objectives, Definitions, Legal definitions of schedules to the Act and Rules

Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties**.**

Manufacture of drugs – Prohibition of manufacture and sale of certain drugs, Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.

UNIT II (Total Hours-10)

Drugs and Cosmetics Act, 1940 and its rules 1945.

Detailed study of Schedule G, H, M, N, P,T,U, V, X, Y, Part XII B, Sch F & DMR (OA)

Sale of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties

Labeling & Packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties.

Administration of the Act and Rules – Drugs Technical Advisory Board, Central drugs Laboratory, Drugs Consultative Committee, Government drug analysts, Licensing authorities, controlling authorities, Drugs Inspectors

UNIT- III(Total Hours-10)

a) **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

b) **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.

c) **Narcotic Drugs and Psychotropic substances Act-1985 and Rules**: Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties

UNIT-IV (Total Hours-8)

a) **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

b) **Prevention of Cruelty to animals Act-1960:** Objectives, Definitions, Institutional Animal Ethics Committee, CPCSEA guidelines for Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties

c) **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).

Course Outcomes

BP505T. CO 1. Enumerate pharmaceutical legislations and their implications
BP505T. CO 2. Illustrate various Indian Pharmaceutical Acts, Laws and Schedules
BP505T. CO 3. Understand the regulatory authorities and agencies governing the manufacture and sale of pharmaceutical products
BP505T. CO 4. Discuss code of ethics during the pharmaceutical practice

References

1. Suresh B., Forensic Pharmacy, Birla Publication
2. Mithal B. M., Text book of Forensic Pharmacy, Vallabh Prakashan
3. Jain N. K., A text book of Forensic Pharmacy, Vallabh Prakashan

Articulated Matrix

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
BP505T. CO 1	3	-	-	-	-	1	-	3	-	1	-	2	1	1	1	2
BP505T. CO 2	3	-	-	-	-	1	-	3	-	1	-	2	1	1	1	2
BP505T. CO 3	3	-	-	-	-	1	-	3	-	1	-	2	2	2	2	2
BP505T. CO 4	3	-	-	-	-	2	-	3	-	1	-	2	2	2	2	2
Average	3	-	-	-	-	1.25	-	3	-	1	-	2	1.5	1.5	1.5	2

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP506P	Credit	4
Year/Sem	3/5	L-T-P	0-0-4
Course Name	**Industrial Pharmacy-Practical**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. The knowledge on different pharmaceutical dosage forms are imparted on students. This knowledge comes while handling a pharmacy or a manufacturing unit or in the further courses
2. The information on solid dosage forms like tablets and capsules, their formulation and quality control serves as an important perquisite for dosage form design

Practical to be Conducted (Total Hours- 4hr per week)

1. Preformulation studies on paracetamol/asparin/or any other drug
2. Preparation and evaluation of Paracetamol tablets
3. Preparation and evaluation of Aspirin tablets
4. Coating of tablets- film coating of tables/granules
5. Preparation and evaluation of Tetracycline capsules
6. Preparation of Calcium Gluconate injection
7. Preparation of Ascorbic Acid injection
8. Qulaity control test of (as per IP) marketed tablets and capsules
9. Preparation of Eye drops/ and Eye ointments
10. Preparation of Creams (cold / vanishing cream)
11. Evaluation of Glass containers (as per IP)

Course Outcomes (CO)

BP506.1. Analyze the packaging material used for pharmaceutical packagings.
BP506.2. Assess preformulation concepts and their influence on stability.
BP506.3. Evaluate quality test of prepared formulations.
BP506.4. Formulate solid, liquid and semisolid dosage forms.

References

1. Theory and practice of industrial pharmacy by Lachmann, Latest edition
2. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition.
3. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition.

CO/PO Articulated Matrix

PO / CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP506.1	2	–	_	_	–	_	_	_	–	–	–	1	1	_	1	_
BP506.2	2	1	_	_	_	–	–	_	1	1	–	1	1	_	_	_
BP506.3	2	1	1	_	1	–	–	_	1	–	–	1	1	_	_	_
BP506.4	3	1	1	_	1	–	_	_	1	1	–	1	1	1	1	1
AVERAGE	2.3	1	1	–	1	–	–	–	1	1	–	1	1	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-35)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	**5**	**10**	**35**

*Calculate as per criteria given in PCI syllabus
Average of best of two Sessional

Programme Name	B. Pharm	Programme Code	29
Course Code	BP507P	Credit	2
Year/Sem	3/5	L-T-P	0-0-4
Course Name	**Pharmacology-II**		

Objectives of the Course:

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

1. Understand the mechanism of drug action and its relevance in the treatment of different diseases
2. Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments
3. Demonstrate the various receptor actions using isolated tissue preparation
4. Appreciate correlation of pharmacology with related medical sciences

Practical to be Conducted (Total Hours- 4hr per week)

1. Introduction to *in-vitro* pharmacology and physiological salt solutions.
2. Effect of drugs on isolated frog heart.
3. Effect of drugs on blood pressure and heart rate of dog.
4. Study of diuretic activity of drugs using rats/mice.
5. DRC of acetylcholine using frog rectus abdominis muscle.
6. Effect of physostigmine and atropine on DRC of acetylcholine using frog rectus abdominis muscle and rat ileum respectively.
7. Bioassay of histamine using guinea pig ileum by matching method.
8. Bioassay of oxytocin using rat uterine horn by interpolation method.
9. Bioassay of serotonin using rat fundus strip by three point bioassay.
10. Bioassay of acetylcholine using rat ileum/colon by four point bioassay.
11. Determination of PA2 value of prazosin using rat anococcygeus muscle (by Schilds plot method).
12. Determination of PD2 value using guinea pig ileum.
13. Effect of spasmogens and spasmolytics using rabbit jejunum.
14. Anti-inflammatory activity of drugs using carrageenan induced paw-edemamodel.
15. Analgesic activity of drug using central and peripheral methods

Course Outcomes (CO)

BP507P.CO1. Prepare and learn the composition of various physiological salt solutions
BP507P.CO2. Formulate the different dilutions of test drugs.
BP507P.CO3. Illustrate the action of various drugs on isolated tissues.
BP507P.CO4. Correlate the data and draw the inference

References:

1. Tiwari R.K., Understanding Experimental Pharmacology', CBS Publishers & Distributors Pvt Ltd, Edition 1st, 2019.
2. Kulkarni S.K., 'Handbook of Experimental Pharmacology', Delhi Vallabh Prakashan, Edition 4th, 2015.

CO/PO Articulated Matrix

PO **CO**	PO1	P02	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
BP507P.CO1	2	1	-	-	1	-	-	-	-	-	-	2	1	1	-	1
BP507P.CO2	1	1	-	2	-	1	-	-	-	-	-	-	1	1	1	1
BP507P.CO3	2	-	1	-	-	-	1	2	1	1	1	1	1	1	1	1
BP507P.CO4	2	1	-	-	-	-	-	-	-	-	2	1	1	1	1	1
AVERAGE	1.75	1.5	1	2	1	1	1	2	1	1	1.5	2	1	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-35)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	5	10	35

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

UTTARANCHAL UNIVERSITY

(Established vide Uttaranchal University Act, 2012, UGC Approved)
(Uttarakhand Act No. 11 of 2013)
Arcadia Grant, P.O. Chandanwari, Premnagar, Dehradun, Uttarakhand

Programme Name	B. Pharm.	Programme Code	29
Course Code	BP508P	Credit	4
Year/Sem	3/5	L-T-P	0-0-4
Course Name	**Pharmacognosy and Phytochemistry-II (Practical)**		

Objectives of the Course:

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

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. Know the evaluation techniques for the herbal drugs
4. To carry out the microscopic and morphological evaluation of crude drugs

Practical to be Conducted (Total Hours- 4hr per week)

1. To isolate and detect the active constituent, caffeine present in tea dust.
2. To isolate and detect the active constituent, diosgenin present in dioscoria.
3. Morphology histology and powder charecteristics of senna.
4. To carry out different chemical test to analyze the crude drug of Benzoin.
5. To isolate and detect the active constituent, sennoside present in senna.
6. Paper chrometographic seperation and identification of sugars.
7. Determination of volatile content of crude drugs by steam distillation method oils and detection of phytoconstituents by TLC.
8. Different chemical test to analyze the crude drug of Benzoin.
9. To carry out different chemical test to analyze the crude drug of colophony.
10. Morphology, histology and powder characteristics of clove.

Course Outcomes (CO)

BP508P.CO1. Estimate the isolation and detection of active constituents present in crude drugs.
BP508P.CO2. Assess the morphology, histology and powder characteristics of specific crude drugs.
BP508P.CO3. Examine the different chemical test to analyze the specific crude drugs.
BP508P.CO4. Estimate the various phytoconstituents by using specific separation methods.

References

1. W.C.Evans, (2009), Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London.
2. Kokate C. K., Purohit A. P., Gokhlae S. B.,(2015), 51ST Edition, Nirali Prakashan, Pune.
3. Kalia A. N., (2005), Textbook of Industrial Pharmacognosy, 1st edition, CBS Publishers
4. Wallis T. E., (2014), Practical Pharmacognosy, 4th edition, pharmaMed Press, Hyderabad.

Articulated matrix

PO/PSO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
BP508P.CO1	3	-	-	-	-	-	-	-	1	-	-	1	3	1	-	-
BP508P.CO2	3	-	-	-	-	-	1	-	1	-	-	2	-	-	2	-
BP508P.CO3	3	1	-	-	1	-	1	-	1	-	-	2	-	-	-	-
BP508P.CO4	3	-	-	-	1	-		-	1	-	-	3	3	1	2	1
AVERAGE	3	1	-	-	1	-	1	-	1	-	-	2	3	1	2	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-35)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	**5**	**10**	**35**

*Calculate as per criteria given in PCI syllabus
Average of best of two Sessional

UTTARANCHAL UNIVERSITY

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Arcadia Grant, P.O. Chandanwari, Premnagar, Dehradun, Uttarakhand

SEMESTER –VI

Programme Name	B.Pharm.	Programme Code	29
Course Code	BP601T	Credit	4
Year/Sem	3/6	L-T-P	3-1-0
Course Name	**Medicinal Chemistry – Iii**		

Objectives of the Course:

Upon completion of the course student shall be able to

1. Understand the importance of drug design and different techniques of drug design.
2. Understand the chemistry of drugs with respect to their biological activity.
3. Know the metabolism, adverse effects and therapeutic value of drugs.
4. Know the importance of SAR of drugs.

UNIT I (Total Hours- 10)

Antibiotics

β-Lactam antibiotics: Penicillin, Cepholosporins, β- Lactamase inhibitors, Monobactams

Aminoglycosides: Streptomycin, Neomycin, Kanamycin

Tetracyclines: Tetracycline,Oxytetracycline, Chlortetracycline, Minocycline, Doxycycline

UNIT II (Total Hours-10)

Antibiotics

Macrolide: Erythromycin Clarithromycin, Azithromycin.

Miscellaneous: Chloramphenicol*, Clindamycin.

Prodrugs: Basic concepts and application of prodrugs design.

Antimalarials: Etiology of malaria.

Quinolines: SAR, Quinine sulphate, Chloroquine*, Amodiaquine, Primaquine phosphate, Pamaquine*, Quinacrine hydrochloride, Mefloquine.

Biguanides and dihydro triazines: Cycloguanil pamoate, Proguanil.

Miscellaneous: Pyrimethamine, Artesunete, Artemether, Atovoquone.

UNIT III(Total Hours-10)

Anti-tubercular Agents

Synthetic anti tubercular agents: Isoniozid*, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid.*

Anti tubercular antibiotics: Rifampicin, Rifabutin, Cycloserine Streptomycine, Capreomycin sulphate.

Urinary tract anti-infective agents

Quinolones: SAR of quinolones, Nalidixic Acid,Norfloxacin, Enoxacin, Ciprofloxacin*, Ofloxacin, Lomefloxacin, Sparfloxacin, Gatifloxacin,
Moxifloxacin

Miscellaneous: Furazolidine, Nitrofurantoin*, Methanamine.

Antiviral agents: Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridinetrifluoride, Acyclovir*, Gancyclovir, Zidovudine, Didanosine, Zalcitabine,Lamivudine, Loviride, Delavirding, Ribavirin, Saquinavir, Indinavir,Ritonavir.

UNIT IV (Total Hours-8)

Antifungal agents:

Antifungal antibiotics: Amphotericin-B, Nystatin, Natamycin, Griseofulvin.

Synthetic Antifungal agents: Clotrimazole, Econazole, Butoconazole, Oxiconazole Tioconozole, Miconazole*, Ketoconazole, Terconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate*.

Anti-protozoal Agents: Metronidazole*, Tinidazole, Ornidazole, Diloxanide, Iodoquinol, Pentamidine Isethionate, Atovaquone, Eflornithine.

Anthelmintics: Diethylcarbamazine citrate*, Thiabendazole, Mebendazole*,Albendazole, Niclosamide, Oxamniquine, Praziquantal, Ivermectin.

Sulphonamides and Sulfones

Historical development, chemistry, classification and SAR of Sulfonamides: Sulphamethizole, Sulfisoxazole, Sulphamethizine, Sulfacetamide*,Sulphapyridine, Sulfamethoxaole*, Sulphadiazine, Mefenide acetate, Sulfasalazine.

Folate reductase inhibitors: Trimethoprim*, Cotrimoxazole.

Sulfones: Dapsone*.

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(Uttarakhand Act No. 11 of 2013)
Arcadia Grant, P.O. Chandanwari, Premnagar, Dehradun, Uttarakhand

UNIT V (Total Hours-7)

Introduction to Drug Design

Various approaches used in drug design. Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient, Hammet's electronic parameter, Tafts steric parameter and Hansch analysis. Pharmacophore modeling and docking techniques.

Combinatorial Chemistry: Concept and applications chemistry: solid phase and solution phase synthesis.

Course Outcomes (CO)

BP601T.CO 1. Classify the different classes of drugs with their structure
BP601T.CO 2. Illustrate the structural activity relationship & synthesis of selective classes of drugs.
BP601T.CO 3. Criticize the mechanism and metabolic pathways of different class of drugs with their adverse effects
BP601T.CO 4. Acquire the detail knowledge of communicable disease
BP601T.CO 5. Compose the various approach in drug design

References

1. V.Alagarsamy; A text book of Medicinal Chemistry; 3rd edition; CBS publishers & distributors pvt ltd
2. Sushilee ;suresh; principles of medicinal chemistry; 1st edition 2011; CBS publishers & distributors pvt ltd
3. I.L. Finar, Organic Chemistry Vol. II.; Pearson education pea.

CO/PO Articulated Matrix

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP601T.CO 1	3	-	-	-	1	1	-	-	-	-	-	2	1	-	-	-
BP601T.CO 2	2	-	1	-	1	-	-	-	-	-	-	-	1	-	-	-
BP601T.CO 3	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
BP601T.CO 4	2	-	-	-	-	2	-	-	-	-	-	2	1	-	-	-
BP601T.CO 5	2	-	-	-	2	-	-	-	-	-	-	-	1	1	-	-
AVERAGE	2.2	-	1	--	1.33	1.5	--	-	-	-	-	2	1	1	-	-

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

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Average of best of two sessional

UTTARANCHAL UNIVERSITY

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Arcadia Grant, P.O. Chandanwari, Premnagar, Dehradun, Uttarakhand

Programme Name	B. Pharm.	Programme Code	29
Course Code	BP602T	Credit	4
Year/Sem	3/6	L-T-P	3-1-0
Course Name	**Pharmacology-III**		

Objectives of the Course:

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

1. Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases
2. Comprehend the principles of toxicology and treatment of various poisoning
3. Appreciate correlation of pharmacology with related medical sciences.

UNIT I (Total Hours- 10)

Pharmacology of drugs acting on Respiratory system: Anti -asthmatic drugs, Drugs used in the management of COPD, Expectorants and antitussives, Nasal decongestants, Respiratorystimulants

Pharmacology of drugs acting on the GastrointestinalTract: Antiulcer agents, Drugs for constipation and diarrhea, Appetite stimulants and suppressants, Digestants and carminatives, Emetics and anti-emetics

UNIT II (Total Hours-10)

Chemotherapy: General principles of chemotherapy, Sulfonamides and cotrimoxazole, Antibiotics-Penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides

UNIT- III(Total Hours-10)

Chemotherapy: Antitubercular agents, Antileprotic agents, Antifungal agents, Antiviral drugs Anthelmintics, Antimalarial drugs, Antiamoebic agents

UNIT-IV (Total Hours-08)

Chemotherapy: Urinary tract infections and sexually transmitted diseases, Chemotherapy of malignancy, Immunopharmacology, Immunostimulants, Immunosuppressant, Protein drugs, monoclonal antibodies, target drugs to antigen, biosimilars

UNIT-V (Total Hours-07)

Principles oftoxicology: Definition and basic knowledge of acute, subacute and chronictoxicity, Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity andmutagenicity**,** General principles of treatment of poisoning**,** Clinical symptoms and management of barbiturates, morphine, organophosphosphorus compound and lead, mercury and arsenicpoisoning.

Chronopharmacology: Definition of rhythm andcycles, Biological clock and their significance leading tochronotherapy.

Course Outcomes (CO)

BP602T.CO1. Understand concepts of antiviral agents, anticancer agents, chemotherapy of parasitic diseases, Antifungal, Antimalarial, anthelmintics and chemotherapy of tuberculosis and leprosy.
BP602T.CO2. Explain various drugs used for respiratory and gastrointestinal disorders
BP602T.CO3. Describe the details of anticancer drugs and immunomodulatory drugs
BP602T.CO4. Understand the basic concept in chemotherapy
BP602T.CO5. Understand the toxicity profile of drugs
BP602T.CO6. Development knowledge about the chronopharmacology

References

1. Karen Whalen "Pharmacology'' Lippincott Illustrated Reviews: Pharmacology, Wolters Kluwer, Edition 6th, 2015.
2. Kiran D., Patil, Pralhad K. Kanke, Dr.Md.rageeb, Md. Usman & Atul Kabra, A Text Book of Pharmacology-I'' S. Vikas & Company Medical Publisher, Edition 2019.
3. Tripathi K.D., Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi, Edition 8th, 2018.
4. Kaushik M., A Text Book of Pharmacology-I'' S. Vikas & Company Medical Publisher,

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CO/PO Articulated matrix

PO **CO**	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
BP602T.CO1	3	2	2	2	-	-	-	-	-	1	-	2	1	1	1	1
BP602T.CO2	2	-	-	-	-	-	-	-	-	1	-	2	-	-	1	-
BP602T.CO3	2	-	-	2	-	-	-	1	-	-	-	-	2	1	1	1
BP602T.CO4	3	1	3	-	-	-	-	1	-	1	-	2	-	1	-	1
BP602T.CO5	2	1	-	-	-	1	-	-	-	1	-	2	-	-	1	-
BP602T.CO6	2	-	-	-	-	-	-	-	-	1	-	2	-	1	1	1
AVERAGE	2.3	1	2.5	2	-	1	-	-	-	1	-	2	1.5	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

UTTARANCHAL UNIVERSITY

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(Uttarakhand Act No. 11 of 2013)
Arcadia Grant, P.O. Chandanwari, Premnagar, Dehradun, Uttarakhand

Programme Name	B. Pharm.	Programme Code	29
Course Code	BP603T	Credit	4
Year/Sem	3/6	L-T-P	3-1-0
Course Name	**Herbal Drug Technology**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Understand raw material as source of herbal drugs from cultivation to herbal drug
2. Know the WHO and ICH guidelines for evaluation of herbal drugs product
3. Know the herbal cosmetics, natural sweeteners, and nutraceuticals.
4. Patenting of herbal drugs, GMP.

UNIT I (Total Hours- 11)

Herbs as raw materials

a) Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation
b) Source of Herbs
c) Selection, identification and authentication of herbal materials
d) Processing of herbal raw material
e) Biodynamic Agriculture
f) Good agricultural practices in cultivation of medicinal plants including Organic farming.

Pest and Pest management in medicinal plants:

a) 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 Asawas, Ghutika, Churna, Lehya and Bhasma

UNIT II (Total Hours-7)

Nutraceuticals

a) General aspects, Market, growth, scope and types of products available in the market.
b) Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases.
c) Study of following herbs as health food: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina
d) Herbal-Drug and Herb-Food Interactions: General introduction to interaction and classification.
e) Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra

UNIT- III(Total Hours-10)

Herbal Cosmetics

a) Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.

Herbal excipients:

a) Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes.

Herbal formulations :

a) Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes

UNIT-IV (Total Hours-10)

a) Evaluation of Drugs WHO & ICH guidelines for the assessment of herbal drugs Stability testing of herbal drugs.
b) Patenting and Regulatory requirements of natural products:
c) Definition of the terms: Patent, IPR, Farmers right, Breeder's right, bioprospecting and Biopiracy.
d) Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma Neem.
e) Regulatory Issues - Regulations in India (ASU DTAB, ASU DCC), Regulation of manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs

UNIT-V (Total Hours-7)

a) General Introduction to Herbal Industry
b) Herbal drugs industry: Present scope and future prospects.
c) A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India.
d) Schedule T – Good Manufacturing Practice of Indian systems of medicine
e) Components of GMP (Schedule – T) and its objectives
f) Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records.

Course Outcomes (CO)

BP603T.CO 1. Describe the herbal cosmetics, natural sweeteners and nutraceuticals.
BP603T.CO 2. Appraise various regulatory guidelines for evaluation of herbal drugs.
BP603T.CO 3. Design herbal drug product using plant materials as raw substance.
BP603T.CO 4. Device the patenting of herbal products and good manufacturing practice (GMP).

References

1. Dr. Rangari V. D., (2019), Pharmacognosy and Phytochemistry 4th edition,Career Publications, Maharashtra, India.
2. W.C.Evans, (2009), Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London.
3. Kokate C. K., Purohit A. P., Gokhlae S. B.,(2015), 51ST Edition, Nirali Prakashan, Pune.
4. Kalia A. N., (2005), Textbook of INDYUSTRIAL PHARMACOGNOSY, 1st edition, CBS Publishers & Distributors,New delhi.

CO/PO Articulated Martrix

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
BP603T.CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	2	-	-
BP603T.CO2	3	-	-	-	-	-	-	-	-	-	-	1	3	-	1	-
BP603T.CO3	3	2	-	-	-	-	1	1	1	-	-	1	2	2	-	1
BP603T.CO4	3	-	-	-	-	-	-	-	-	-	-	2	-	-	1	1
AVERAGE	3	2	-	-	-	-	1	1	1	-	-	1	2.6	2	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	**10**	**15**	**75**

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Arcadia Grant, P.O. Chandanwari, Premnagar, Dehradun, Uttarakhand

Program Name	B.Pharm.	Program Code	29
Course Code	BP604T	Credit	4
Year/Sem	3/6	L-T-P	3-1-0
Course Name	**Biopharmaceutics and Pharmacokinetics**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Understand the basic concepts in biopharmaceutics and pharmacokinetics andtheir significance.
2. Use of plasma drug concentration-time data to calculate the pharmacokineticparameters to describe the kinetics of drug absorption, distribution,metabolism, excretion, elimination.
3. To understand the concepts of bioavailability and bioequivalence of drugproducts and their significance.
4. Understand various pharmacokinetic parameters, their significance &applications

UNIT I (Total Hours- 10)

Absorption; Mechanisms of drug absorption through GIT, factors influencing drugabsorption though GIT, absorption of drug from Non per oral extra-vascularroutes,

Distribution Tissue permeability of drugs, binding of drugs, apparent, volumeof drug distribution, plasma and tissue protein binding of drugs, factors affectingprotein-drug binding. Kinetics of protein binding, Clinical significance of proteinbinding of drugs

UNIT II (Total Hours-10)

Elimination: Drug metabolism and basic understanding metabolic pathways renalexcretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non renalroutes of drug excretion of drugs

Bioavailability and Bioequivalence: Definition and Objectives of bioavailability,absolute and relative bioavailability, measurement of bioavailability, *in-vitro* drugdissolution models, *in-vitro-in-vivo* correlations, bioequivalence studies, methods toenhance the dissolution rates and bioavailability of poorly soluble drugs.

UNIT- III(Total Hours-10)

Pharmacokinetics: Definition and introduction to Pharmacokinetics, Compartmentmodels, Non compartment models, physiological models, One compartment openmodel. (a). Intravenous Injection (Bolus) (b). Intravenous infusion and (c) Extravascular administrations. Pharmacokinetics parameters - KE ,t1/2,Vd,AUC,Ka, Clt andCLR- definitions methods of eliminations, understanding of their significance andapplication

UNIT-IV (Total Hours-8)

Multicompartment models: Two compartment open model. IV bolusKinetics of multiple dosing, steady state drug levels, calculation of loading andmainetnance doses and their significance in clinical settings.

UNIT- V(Total Hours-7)

Nonlinear Pharmacokinetics:

a. Introduction,

b. Factors causing Non-linearity.

c. Michaelis-menton method of estimating parameters, Explanation with example ofdrugs.

Course Outcomes (CO)

BP604T.CO1 Understand the concepts of bioavailability and bioequivalence

BP604T.CO2 Illustrate the basic concepts of biopharmaceutics and pharmacokinetics and their significance.

BP604T.CO3 Compare the methods to enhance the dissolution rate and bioavailability of poorly soluble drugs

BP604T.CO4 Calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism and excretion

BP604T.CO5 Discuss non-linear pharmacokinetics with its significance

References

1. Gibaldi M., Biopharmaceutics and Clinical Pharmacokinetics, Fourth Edition, Lea & Febiger
2. Notari R. F., Biopharmaceutics and Pharmacokinetics, Fourth Edition, Marcel Dekker
3. Shargel L. and Andrew B. C Yu, Applied Biopharmaceutics and Pharmacokinetics, Seventh Edition, McGraw Hill Medical
4. Brahmankar D. M and Jaiswal S. B., Bio pharmaceutics and Pharmacokinetics-A Treatise, Vallabh Prakashan Pitampura, Delhi
5. Remington's Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvnia

CO/PO Articulated Matrix

PO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
BP604T. CO 1	3	-	-	-	-	-	-	-	-	-	-	2	1	1	1	1
BP604T. CO 2	3	-	-	-	-	-	-	-	-	-	-	2	1	1	1	1
BP604T. CO 3	3	-	-	-	1	-	-	-	-	-	-	2	1	1	1	1
BP604T. CO 4	3	1	-	-	2	-	-	-	1	-	-	2	1	1	1	1
BP604T. CO 5	3	-	-	-	-	-	-	-	-	-	-	2	1	1	1	-
Average	3	1	-	-	1.5	-	-	-	1	-	-	2	1	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

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Arcadia Grant, P.O. Chandanwari, Premnagar, Dehradun, Uttarakhand

Programme Name	B. Pharm.	Programme Code	29
Course Code	BP605T	Credit	4
Year/Sem	3/6	L-T-P	3-1-0
Course Name	**Pharmaceutical Biotechnology**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Understanding the importance of Immobilized enzymes in Pharmaceutical Industries
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

UNIT I (Total Hours- 10)

a) Brief introduction to Biotechnology with reference to Pharmaceutical Sciences.
b) Enzyme Biotechnology- Methods of enzyme immobilization and applications.
c) Biosensors- Working and applications of biosensors in Pharmaceutical Industries.
d) Brief introduction to Protein Engineering.
e) Use of microbes in industry. Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase.
f) Basic principles of genetic engineering.

UNIT II (Total Hours-10)

a) Study of cloning vectors, restriction endonucleases and DNA ligase.
b) Recombinant DNA technology. Application of genetic engineering in medicine.
c) Application of r DNA technology and genetic engineering in the production of:
i) Interferon ii) Vaccines- hepatitis- B iii) Hormones-Insulin.
d) Brief introduction to PCR

UNIT- III (Total Hours-10)

Types of immunity- humoral immunity, cellular immunity
a) Structure of Immunoglobulins
b) Structure and Function of MHC
c) Hypersensitivity reactions, Immune stimulation and Immune suppressions.
d) General method of the preparation of bacterial vaccines, toxoids, viral 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 (Total Hours-08)

a)Immuno blotting techniques- ELISA, Western blotting, Southern blotting.
b) Genetic organization of Eukaryotes and Prokaryotes
c) Microbial genetics including transformation, transduction, conjugation, plasmids and transposons.
d) Introduction to Microbial biotransformation and applications.
e) Mutation: Types of mutation/mutants.

UNIT-V (Total Hours-07)

a)Fermentation methods and general requirements, study of media, equipment sterilization methods, aeration process, stirring.
b) Large scale production fermenter design and its various controls.
c) Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin,
d) Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substitutes.

Course Outcomes (CO)

BP605.CO1. Demonstrate the importance of biotechnology with reference to pharmaceutical sciences.
BP605.CO2. Explain genetic engineering applications in relation to production of pharmaceuticals.
BP605.CO3. Ilustrate the importance of immobilised enzymes and monoclonal antibodies in industries.
BP605.CO4. Classify immunity and immunoblotting techniques.
BP605.CO5. Create awareness regarding new biological revolutions in diagnostic, prevention and cure of diseases.

References

1. Glick B.R., Pasternak J.J., Molecular Biotechnology: Principles and Applications of Recombinant NA: ASM Press Washington D.C.
2. Walker J.M., E.B. Gingold: Molecular Biology and Biotechnology by Royal Society of Chemistry.
3. Zaborsky: Immobilized Enzymes, CRC Press, Degraland, Ohio.
4. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication.
5. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi

CO/PO Articulated Matrix

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP605.CO1.	2	–	–	–	–	–	–	–	–	–	–	1	1	–	–	1
BP605.CO2	2	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–
BP605.CO3	2	–	–	–	–	–	–	–	–	–	–	1	1	1	–	–
BP605.CO4	2	–	–	–	–	–	–	–	–	–	–	1	1	1	–	1
BP605.CO5	2	1	–	–	1	1	–	–	1	1	–	1	1	1	1	1
AVERAGE	2	1	–	–	1	1	–	–	1	1	–	1	1	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two Sessional

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP606T	Credit	4
Year/Sem	3/6	L-T-P	3-1-0
Course Name	**Pharmaceutical Quality Assurance (Theory)**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Understand the cGMP aspects in a pharmaceutical industry
2. Appreciate the importance of documentation
3. Understand the scope of quality certifications applicable to pharmaceutical industries
4. Understand the responsibilities of QA & QC departments

UNIT I (Total Hours- 10)

Quality Assurance and Quality Management concepts: Definition and concept of Quality control, Quality assurance and GMP

Total Quality Management (TQM): Definition, elements, philosophies

ICH Guidelines: 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 (Total Hours-10)

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.

Equipments and raw materials: Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials.

UNIT- III (Total Hours-10)

Quality Control: Quality control test for containers, rubber closures and secondary packing materials.

Good Laboratory Practices: General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities

UNIT-IV (Total Hours-08)

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.

UNIT-V (Total Hours-07)

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

Course Outcomes (CO)

BP606.CO1. Appraise the cGMP aspects in pharmaceutical industry.
BP606.CO2. Recommend the importance of documentation.
BP606.CO3. Support the scope of quality certification applicable to pharmaceutical industry.
BP606.CO4. Assess the importance of QA & QC departments in pharmaceutical industry.
BP606.CO5. Support the importance of regulatory affairs.

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- Kushik Maitra and Sedhan K Ghosh
5. How to Practice GMP‘s - P P Sharma.
6. ISO 9000 and Total Quality Management - Sadhank G Ghosh

Articulated Matrix

PO CO	PO1	P02	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO1 0	PO1 1	PO12	PSO 1	PSO2	PSO3	PSO4
BP606.CO 1	3	–	–	–	–	–	–	–	1	1	–	1	1	–	–	1
BP606.CO 2	3	1	–	–	–	–	–	–	1	1	–	1	1	–	–	1
BP606.CO 3	3	–	–	–	1	–	–	–	1	1	–	1	1	1	–	1
BP606.CO 4	3	–	–	1	1	1	–	–	1	1	–	1	1	1	–	1
BP606.CO 5	3	1	–	–	1	1	–	–	1	1	–	1	1	1	1	1
Average	3	1	0	1	1	1	0	0	1	1	0	1	1	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

Programme Name	B.Pharm.	Programme Code	29
Course Code	BP607P	Credit	2
Year/Sem	3/6	L-T-P	0-0-4
Course Name	**Medicinal Chemistry – III**		

Objectives of the Course:

Upon completion of the course student shall be able to

1. Understand the importance of drug design and different techniques of drug design.
2. Understand the chemistry of drugs with respect to their biological activity.
3. Know the metabolism, adverse effects and therapeutic value of drugs.
4. Know the importance of SAR of drugs.

Practical to be Conducted (Total Hours- 4 Hour per week)

1. To identify and study the glass wares and apparatus used in Pharmaceutical Medicinal Chemistry lab.
2. To synthesize and submit 7-Hydroxy, 4-methyl coumarin. Report its melting point range & percentage yield.
3. To synthesize and submit Hexamine (Urotropine). Reports its melting point range & percentage yield.
4. To synthesize and submit Chlorobutanol. Reports its melting point range & percentage yield.
5. To synthesize and submit Benzocaine by microwave irradiation techniques. Reports its melting point range & percentage yield.
6. To synthesize and submit 2, 3-Diphenyl quinoxaline by microwave irradiation techniques. Reports its melting point range & percentage yield.
7. To synthesize and submit Benz-imidazole by microwave irradiation techniques. Reports its melting point range & percentage yield.
8. To synthesize and submit Phenytoin by microwave irradiation techniques. Reports its melting point range & percentage yield.
9. To perform assay of Isonicotinic acid hydrazide.
10. To perform assay of Metronidazole.

Course Outcomes (CO)

BP607P.CO 1. Develop the practical skills
BP607P.CO 2. Produce the intermediate and medicinal compounds in the lab by conventional & microwave
BP607P.CO 3. Estimate the purity of drugs
BP607P.CO 4. Produce the chemical structures and reactions by using chemdraw.

Reference

1. Finar I.L., Organic Chemistry Vol. II.; Pearson education pea.
2. Lednicer,The Organic Chemistry of Drug Synthesis, Vol. 1-5; published By Wiley Blackwell
3.Vogel A.I., Text book of practical organic chemistry; 2nd Edition; Pearson Education In South Asia

CO/PO Articulated Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
BP607P.CO 1	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
BP607P.CO 2	3	-	1	-	2	-	-	-	1	-	-	1	1	1	-	-
BP607P.CO 3	1	-	-	-	2	-	-	-	1	-	-	1	1	-	-	-
BP607P.CO 4	2	-	-	-	3	-	-	-	1	-	-	1	2	1	1	1
Average	1.75	-	1	-	2.33	-	-	-	1	-	-	1	1.33	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-35)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	5	10	35

*Calculate as per criteria given in PCI syllabus
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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP608P	Credit	2
Year/Sem	3/6	L-T-P	0-0-4
Course Name	**Pharmacology-III**		

Objectives of the Course:

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

1. Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases.

Practical to be Conducted (Total Hours- 4 Hour per week)

1. Dose calculation in pharmacological experiments.
2. Anti-allergic activity by mast cell stabilization assay.
3. Study of anti-ulcer activity of a drug using pylorus ligand (SHAY) rat model and NSAIDS induced ulcer model.
4. Study of effect of drugs on gastrointestinal motility
5. Effect of agonist and antagonists on guinea pig ileum
6. Estimation of serum biochemical parameters by using semi- auto-analyser
7. Effect of saline purgative on frog intestine
8. Insulin hypoglycemic effect in rabbit
9. Test for pyrogens (rabbit method)
10. Determination of acute oral toxicity (LD50) of a drug from a given data
11. Determination of acute skin irritation / corrosion of a test substance
12. Determination of acute eye irritation / corrosion of a test substance
13. Calculation of pharmacokinetic parameters from a given data
14. Biostatistics methods in experimental pharmacology(student's t test, ANOVA)
15. Biostatistics methods in experimental pharmacology (Chi square test, Wilcoxon Signed Rank test)

Course Outcomes (CO)

BP608P.CO1. Develop practical and software skills in pharmacology lab
BP608P.CO2. Understand the concept and methodology of different bioassays
BP608P.CO3. Understand the concept of toxicology and OECD guidelines
BP608P.CO4. Evaluation Drug absorption and mode of action of various drugs using software

References

1. Tiwari R.K., Understanding Experimental Pharmacology', CBS Publishers & Distributors Pvt Ltd, Edition 1st, 2019.
2. Kulkarni S.K., Handbook of Experimental Pharmacology', Delhi Vallabh Prakashan, Edition 4th, 2015.

Articulated Matrix

PO **CO**	PO1	P02	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
BP608P.CO1	3	-	-	-	-	-	-	-	-	-	-	1	1	-	1	1
BP608P.CO2	2	-	-	-	-	-	-	-	-	-	-	1	1	1	-	-
BP608P.CO3	2	-	-	-	-	-	-	-	-	1	-	2	1	-	-	1
BP608P.CO4	3	-	3	1	2	-	-	-	2	1	-	-	1	-	-	-
Average	2.3	-	3	1	2	-	-	-	2	1	-	2	1	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-35)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	5	10	35

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

Programme Name	B. Pharm.	Programme Code	29
Course Code	BP609P	Credit	2
Year/Sem	3/6	L-T-P	0-0-4
Course Name	**Herbal Drug Technology (Practical)**		

Objectives of the Course:

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

1. Understand raw material as source of herbal drugs from cultivation to herbal drug
2. Know the WHO and ICH guidelines for evaluation of herbal drugsproduct
3. Know the herbal cosmetics, natural sweeteners, nutraceuticals. appreciate
4. Patenting of herbal drugs, GMP.

Practical to be Conducted (Total Hours- 4 Hour per week)

1. To perform preliminary phytochemical screening of crude drugs.
2. Determination of the alcohol content of Asava and Arista
3. Evaluation of excipients of natural origin
4. Incorporation of prepared and standardized extract in cosmetic formulations like creams, lotions and shampoos and their evaluation.
5. Incorporation of prepared and standardized extract in formulations like syrups, mixtures and tablets and their evaluation as per Pharmacopoeial requirements.
6. Monograph analysis of herbal drugs from recent Pharmacopoeias
7. Determination of Aldehyde content
8. Determination of Phenol content
9. Determination of total alkaloids
10. To prepare herbal cold cream.

Course Outcomes (CO)

BP609P.CO 1. Assemble the monograph of herbal drugs for preparations and documentation.
BP609P.CO 2. Estimate the phytochemical screening and standardized the extract used in herbal formulations.
BP609P.CO 3. Formulate herbal pharmaceuticals, cosmetics and their analysis.
BP609P.CO 4. Examine the quantitative evaluations of herbal products.

References

1. W.C.Evans, (2009), Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London.
2. Kokate C. K., Purohit A. P., Gokhlae S. B.,(2015), 51ST Edition, Nirali Prakashan, Pune.
3. Kalia A. N., (2005), Textbook of INDYUSTRIAL PHARMACOGNOSY, 1st edition, CBS Publishers & Distributors,New delhi.
4. Wallis T. E., (2014), Practical Pharmacognosy, 4th edition, pharmaMed Press, Hyderabad.

CO/PO Articulated Matrix

PO **CO**	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP609P.CO1	3	-	-	-	-	-	-	-	-	-	-	-	2	2	-	-
BP609P.CO2	3	1	-	-	1	-	-	-	-	-	-	-	1	1	1	1
BP609P.CO3	3	1	-	-	-	-	-	-	1	-	-	1	-	-	1	-
BP609P.CO4	3	2	-	-	1	-	-	-	1	-	-	1	2	-	-	-
Average	3	1.3	-	-	1	-	-	-	1	-	-	1	1.6	1.5	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-35)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	**5**	**10**	**35**

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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SEMESTER –VII

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP701T	Credit	4
Year/Sem	4/7	L-T-P	3-1-0
Course Name	**Instrumental Methods Of Analysis**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Understand the interaction of matter with electromagnetic radiations and itsapplications in drug analysis.
2. Understand the chromatographic separation and analysis of drugs.
3. Perform quantitative & qualitative analysis of drugs using various analyticalinstruments.

UNIT I (Total Hours- 10)

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 componentanalysis

Fluorimetry

Theory, Concepts of singlet, doublet and triplet electronic states, internal and externalconversions, factors affecting fluorescence, quenching, instrumentation andapplications

UNIT II (Total Hours-10)

IR spectroscopy

Introduction, fundamental modes of vibrations in poly atomic molecules, samplehandling, factors affecting vibrations Instrumentation - Sources of radiation, wavelength selectors, detectors - Golay cell,Bolometer, Thermocouple, Thermister, Pyroelectric detector and applications

Flame Photometry-Principle, interferences, instrumentation and applications

Atomic absorption spectroscopy- Principle, interferences, instrumentation and applications

Nepheloturbidometry- Principle, instrumentation and applications

UNIT- III(Total Hours-10)

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

UNIT-IV (Total Hours-8)

Gas chromatography - Introduction, theory, instrumentation, derivatization, temperature programming, advantages, disadvantages and applications

High performance liquid chromatography (HPLC)-Introduction, theory, instrumentation, advantages and applications.

UNIT-V (Total Hours-7)

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

Course Outcomes (CO)

BP701T CO 1. Assess the existing knowledge, concepts, techniques, and methodology appropriate to the drug analysis

BP701T CO 2. Perform quantitative & qualitative analysis of drugs using various analytical instruments

BP701T CO 3. Appraise the interaction of matter with electromagnetic spectrum.

BP701T CO 4. Device the handling of sophisticated instruments/equipments.

References:

1. Sharma B.K., Instrumental Methods of Chemical Analysis, 1981, Goel Publishing House.
2. Sharma Y.R., Organic spectroscopy, S. Chand
3. Silverstein, Spectrophotometric Identification of Organic Compounds
4. Chatwal G.S., Anand S.K., Instrumental, Methods of Chemical Analysis, Himalaya Publishing House.
5. Connors Kenneth A., Text book of Pharmaceutical Analysis, Wiley.

CO/PO Articulated Matrix

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP701T CO 1	3	–	–	–	–	–	1	–	–	–	–	–	1	–	–	–
BP701T CO 2	3	1	1	1	–	–	–	–	1	–	–	2	1	1	–	–
BP701T CO 3	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
BP701T CO 4	3	–	–	–	–	–	–	–	1	–	–	1	1	1	1	1
Average	2.75	1	1	1	–	–	1	–	1	–	–	1.5	1	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

Programme Name	B. Pharm.	Programme Code	29
Course Code	BP702T	Credit	4
Year/Sem	4/7	L-T-P	3-1-0
Course Name	**Industrial Pharmacy-Ii- Theory**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Know the process of pilot plant and scale up of pharmaceutical dosage forms
2. Understand the process of technology transfer from lab scale to commercial batch
3. Know different Laws and Acts that regulate pharmaceutical industry
4. Understand the approval process and regulatory requirements for drug products quality

UNIT I (Total Hours- 10)

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

UNIT II (Total Hours-10)

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 equipments, 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

UNIT- III (Total Hours-10)

Regulatory affairs: Introduction, Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professional 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

UNIT-IV (Total Hours-08)

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

UNIT-V (Total Hours-07)

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.

Course Outcomes (CO)

BP702T. CO1 Describe the concept of pilot plant, the approval process and regulatory requirement for drug products.
BP702T. CO2 Discuss the current good manufacturing practices and Quality management system.
BP702T. CO3 Illustrate the process of technology transfer from lab to commercial scale.
BP702T. CO4 Prepare& arrange the check list of licensing documentation.

References

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

CO/PO Articulated Matrix

PO / CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP702.CO1	3	—	_	_	_	_	_	_	_	_	_	2	2	_	1	1
BP702.CO2	3	2	_	_	_	_	_	2	_	_	_	2	2	1	_	1
BP702.CO3	3	3	_	2	_	_	_	_	_	_	_	2	2	1	1	1
BP702.CO4	2	_	2	_	2	_	_	_	1	1	_	2	1	_	_	_
Average	2.75	2.5	2	2	2	—	—	2	1	1	—	2	1.75	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

Programme Name	B. Pharm.	Programme Code	29
Course Code	BP703T	Credit	4
Year/Sem	4/7	L-T-P	3-1-0
Course Name	**Pharmacy Practice**		

Objectives of the Course:

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

1. Know various drug distribution methods in a hospital
2. Appreciate the pharmacy stores management and inventory control
3. Monitor drug therapy of patient through medication chart review and clinical review
4. Obtain medication history interview and counsel the patients
5. Identify drug related problems
6. Detect and assess adverse drug reactions
7. Interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states
8. Know pharmaceutical care services
9. Do patient counseling in community pharmacy;
10. Appreciate the concept of Rational drug therapy.

UNIT I (Total Hours- 10)

Hospital and it's organization: Definition, Classification of hospital- Primary, Secondary and Tertiary hospitals, Classification based on clinical and non- clinical basis, Organization Structure of a Hospital, and Medical staffs involved in the hospital and their function.

Hospital pharmacy and its organization: Definition, functions of hospital pharmacy, Organization structure, Location, Layout and staff requirements, and Responsibilities and functions of hospital pharmacists.

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.

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 (Total Hours-10)

Drug distribution system in ahospital: 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.

Hospitalformulary: Definition, contents of hospital formulary, Differentiation of hospital formulary and Drug list, preparation and revision, and addition and deletion of drug from hospital formulary.

Therapeutic drugmonitoring: Need for Therapeutic Drug Monitoring, Factors to be considered during the Therapeutic Drug Monitoring, and Indian scenario for Therapeutic Drug Monitoring.

Medicationadherence: Causes of medication non-adherence, pharmacist role in the medication adherence, and monitoring of patient medication adherence.

Patient medication history interview: Need for the patient medication history interview, medication interview forms.

Community pharmacymanagement: Financial, materials, staff, and infrastructure requirements

UNIT- III (Total Hours-10)

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.

Drug matioinforn services: Drug and Poison information centre, Sources of drug information, Computerised services, and storage and retrieval of information.

Patient counseling: Definition of patient counseling; steps involved in patient counseling, and Special cases that require the pharmacist

Education and training program in thehospital: 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.

Prescribed medication order and communicationskills: Prescribed medication order- interpretation and legal requirements, and Communication skills- communication with prescribers and patients.

UNIT-IV (Total Hours-08)

Budget Preparation and implementation: Budget preparation and implementation

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.

Over the counter (OTC)sales: Introduction and sale of over the counter, and Rational use of common over the counter medications.

UNIT-V (Total Hours-07)

Drug store management and inventorycontrol: 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

Investigational use of drugs Description, principles involved, classification, control, identification, role of hospital pharmacist, advisory committee.

Interpretation of Clinical Laboratory Tests: Blood chemistry, hematology, and urinalysis

Course Outcomes (CO)

BP703T.CO1. survey the organization of hospital and hospital
BP703T.CO2. identify and report ADR and drug interaction
BP703T.CO3. Appraise the therapy of patient through medication and clinical review
BP703T.CO4. verify the patient condition by interviewing the medical history of patient
BP703T.CO5. identify and report the disease state by interpreting the laboratory results
BP703T.CO6. predict the dosing regimen by focusing on pharmacokinectics

References

1. Merchant S.H. and Dr. J.S.Quadry. A textbook of hospital pharmacy, 4th ed. Ahmadabad: B.S. Shah Prakakshan; 2001.
2. Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. A textbook of Clinical Pharmacy Practice- essential concepts and skills, 1st ed. Chennai: Orient Longman Private Limited; 2004.
3. William E. Hassan. Hospital pharmacy, 5th ed. Philadelphia: Lea & Febiger; 1986.

CO/PO Articulated Matrix

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP703T.CO1	2	1	-	-	-	3	-	1	1	-	-	1	1	2	1	1
BP703T.CO2	2	-	-	1	1	2	-	2	-	-	-	2	1	2	-	-
BP703T.CO3	2	-	-	-	-	1	-	1	-	-	-	2	1	-	-	-
BP703T.CO4	2	-	-	-	-	2	-	1	-	-	-	-	-	-	1	1
BP703T.CO5	2	2	-	1	-	1	-	1	-	2	-	2	-	1	2	2
BP703T.CO6	2	1	1	-	-	2	-	1	-	-	-	2	-	1	-	-
Average	2	1	1	1	-	1.83	-	1.16	1	2	-	1.8	1	1.5	1.33	1.33

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

Program Name	B.Pharm.	Program Code	29
Course Code	BP704T	Credit	4
Year/Sem	4/7	L-T-P	3-1-0
Course Name	**Novel Drug Delivery System**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. To understand various approaches for development of novel drug delivery systems.
2. To understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, their formulation and evaluation

UNIT I (Total Hours- 10)

Controlled drug delivery systems: Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design controlled release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations

Polymers: Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug delivery systems.

UNIT II (Total Hours-10)

Microencapsulation: Definition, advantages and disadvantages, microspheres /microcapsules, microparticles, methods of microencapsulation, applications

Mucosal Drug Delivery system: Introduction, Principles of bioadhesion / mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems

Implantable Drug Delivery Systems: Introduction, advantages and disadvantages, concept of implants and osmotic pump

UNIT- III(Total Hours-10)

Transdermal Drug Delivery Systems: Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches

Gastroretentive drug delivery systems: Introduction, advantages, disadvantages, approaches for GRDDS – Floating, high density systems, inflatable and gastroadhesive systems and their applications

Nasopulmonary drug delivery system: Introduction to Nasal and Pulmonary routes of drug delivery, Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers

UNIT-IV (Total Hours-8)

Targeted drug Delivery: Concepts and approaches advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications

UNIT-V (Total Hours-7)

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

Course Outcomes (CO)

BP704T. CO 1. Illustrate the principles and technology used in the design of novel drug delivery systems

BP704T. CO 2. Assess the various approaches for development of novel drug delivery systems

BP704T. CO 3. Analyze the criteria for selection of drugs and polymers for development of novel drug delivery systems

BP704T. CO 4. Explain the formulation and characterization of different novel drug delivery systems

References:

1. Chien Y. W, Novel Drug Delivery Systems, 2nd edition, Revised and Expanded, Marcel Dekker, Inc., New York
2. Jain N. K., Controlled and Novel Drug Delivery, First Edition, CBS Publishers & Distributors, New Delhi
3. S.P. Vyas and R.K. Khar, Controlled Drug Delivery -Concepts and Advances, Vallabh Prakashan, New Delhi

CO/PO Articulated Matrix

PO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4
BP704T. CO 1	3	-	-	-	-	-	-	-	-	-	-	2	1	1	1	1
BP704T. CO 2	3	-	-	-	-	-	-	-	-	-	-	2	1	1	1	1
BP704T. CO 3	3	2	-	-	-	-	-	-	1	-	-	2	1	1	1	2
BP704T. CO 4	3	2	2	1	2	-	-	-	2	-	-	2	1	1	1	2
Average	3	2	2	1	2	-	-	-	1.5	-	-	2	1	1	1	1.5

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

Programme Name	B.Pharm.	Programme Code	29
Course Code	BP705P	Credit	2
Year/Sem	4/7	L-T-P	0-0-4
Course Name	**Instrumental Methods of Analysis (Practical)**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Understand the interaction of matter with electromagnetic radiations and itsapplications in drug analysis.
2. Understand the chromatographic separation and analysis of drugs.
3. Perform quantitative & qualitative analysis of drugs using various analytical instruments.

Practical to be Conducted (Total Hours- 4hr per week)

1. Determination of absorption maxima and effect of solvents on absorption maxima of organic compounds.
2. Estimation of API (sulfanilamide) by colorimetry.
3. Simultaneous estimation of ibuprofen and paracetamol by UV spectroscopy.
4. Assay of paracetamol by UV- Spectrophotometry.
5. Estimation of quinine sulfate by fluorimetry.
6. Study of quenching of fluorescence.
7. Determination of sodium by flame photometry.
8. Determination of potassium by flame photometry.
9. Separation of amino acids by paper chromatography.
10. Separation of sugars by thin layer chromatography.
11. Demonstration experiment on HPLC.
12. Demonstration experiment on Gas Chromatography

Course Outcomes (CO)

BP705P CO 1. Interpret the chemical compound present in any sample.
BP705P CO 2. Calculate the Assay of Drugs using spectroscopic techniques
BP705P CO 3. Appraise the Separation of Drugs by chromatographic techniques
BP705P CO 4. Demonstrate the sophisticated equipments and their working

References

1. Beckett A.H., StenlakeJ.B., Practical Pharmaceutical Chemistry, 2nd Ed, 1971, Pearsons.
2. Vogel A.I., Text book of Quantitative Chemical Analysis, 5th Ed, Pearsons
3. Sharma B.K., Instrumental Methods of Chemical Analysis, 1981, Goel Publishing House.
4. Sharma Y.R., Organic spectroscopy, S. Chand
5. Silverstein, Spectrophotometric Identification of Organic Compounds

CO/PO Articulated Matrix

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO BP705P 1	3	2	–	–	–	–	–	–	1	–	–	–	3	1	1	–
CO BP705P 2	2	2	–	–	–	–	–	–	2	–	–	1	2	1	1	1
CO BPP705 3	2	3	–	–	–	–	–	–	2	–	–	1	2	2	1	1
CO BP701T 4	2	–	–	–	1	–	–	–	1	–	–	1	2	1	1	1
Average	2.2	2.3	–	–	1	–	–	–	1.5	–	–	1	2.25	1.25	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-35)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	**5**	**10**	**35**

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

Programme Name	B.Pharm.	Programme Code	29
Course Code	BP706PS	Credit	6
Year/Sem	4/7	L-T-P	0-0-12
Course Name	**Practice School**		

Objectives of the Course:

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

1. Obtain medication history interview and counsel the patients
2. Identify drug related problems
3. Detect and assess adverse drug reactions
4. Interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states
5. Know pharmaceutical care services
6. Do patient counselling in community pharmacy;
7. Appreciate the concept of Rational drug therapy.

Practical to be Conducted (Total Hours- 12 hr per week)

1.Study monograph of a specific drug and adverse drug reactions

2.Monitor drug therapy of patients through medication chart and clinical review

3.Collection and interpretation of data obtained from medication history interview and patient counseling

4.Interpretation of laboratory reports and do patient counseling in community pharmacy

Course Outcomes (CO)

BP706PS.CO1. Study monograph of a specific drug and adverse drug reactions

BP706PS.CO2. Monitor drug therapy of patients through medication chart and clinical review

BP706PS.CO3. Collection and interpretation of data obtained from medication history interview and patient counseling

BP706PS.CO4. Interpretation of laboratory reports and do patient counseling in community pharmacy.

References

1. Merchant S.H. and Dr. J.S.Quadry. A textbook of hospital pharmacy, 4th ed. Ahmadabad: B.S. Shah Prakakshan; 2001.
2. Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. A textbook of Clinical Pharmacy Practice-essential concepts and skills, 1st ed. Chennai: Orient Longman Private Limited; 2004.
3. William E. Hassan. Hospital pharmacy, 5th ed. Philadelphia: Lea & Febiger; 1986.

CO/PO Articulated Matrix

PO **CO**	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP706PS.CO1	3	-	-	-	1	-	-	-	1	-	1	2	1	1	-	2
BP706PS.CO2	3	3	-	-	-	2	-	2	2	-	1	2	-	1	2	-
BP706PS.CO3	3	2	1	1	2	2	1	2	2	1	1	-	2	-	2	1
BP706PS.CO4	3	2	1	1	1	2	1	2	2	1	1	2	1	1	-	-
Average	3	2.3	1	1	1.33	2	1	2	1.75	1	1	2	1.33	1	2	1.5

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-125)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	25	-	125

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SEMESTER –VIII

Programme Name	B. Pharm.	Programme Code	29
Course Code	BP801T	Credit	4
Year/Sem	4/8	L-T-P	3-1-0
Course Name	**Biostatisitcs And Research Methodology (Theory)**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Know the operation of M.S. Excel, SPSS, R and MINITAB®, DoE (Design of Experiment)
2. Know the various statistical techniques to solve statistical problems
3. Appreciate statistical techniques in solving the problems**.**

UNIT I (Total Hours- 10)

Introduction: Statistics, Biostatistics, Frequency distribution

Measures of central tendency: Mean, Median, Mode- Pharmaceutical examples

Measures of dispersion: Dispersion, Range, standard deviation, Pharmaceuticalproblems

Correlation: Definition, Karl Pearson's coefficient of correlation, Multiple correlation -Pharmaceuticals examples

UNIT II (Total Hours-10)

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 – problemsSample, Population, large sample, small sample, Null hypothesis, alternative hypothesis,sampling, essence of sampling, types of sampling, Error-I type, Error-II type, Standarderror of mean (SEM) - Pharmaceutical examples

Parametric test: t-test(Sample, Pooled or Unpaired and Paired) , ANOVA, (One wayand Two way), Least Significance difference

UNIT- III(Total Hours-10)

Non Parametric tests: Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallistest, Friedman Test

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, Reportwriting and presentation of data, Protocol, Cohorts studies, Observational studies,Experimental studies, Designing clinical trial, various phases.

UNIT-IV (Total Hours-8)

Blocking and confounding system for Two-level factorials

Regression modeling: Hypothesis testing in Simple and Multiple regressionmodels

Introduction to Practical components of Industrial and Clinical Trials Problems:

Statistical Analysis Using Excel, SPSS, MINITAB®, DESIGN OF EXPERIMENTS, R -Online Statistical Software's to Industrial and Clinical trial approach

UNIT-V (Total Hours-7)

Design and Analysis of experiments:

Factorial Design: Definition, 22, 23design. Advantage of factorial design

Response Surface methodology: Central composite design, Historical design,Optimization Technique

Course Outcomes (CO)

BP801T CO 1. To understand the basic concepts of biostatistics in pharmacy.

BP801T CO 2. Create and applications of statistical concepts and techniques to perform computations for Pharmaceutical Sciences and research field in pharmacy.

BP801T CO 3. Develop understanding on various kind of research, objectives of doing research, research process, research design and sampling in pharmaceutical sciences.

BP801T CO 4. Have adequate knowledge on measurement, scaling techniques, data analysis and hypothesis testing using suitable test of statistical significance.

BP801T CO 5. Statistical analysis using Excel, SPSS, Design of Experiment, R-software to industrial and clinical trial approach.

References

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

CO/PO Articulated Matrix

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP801T CO 1	3	–	1	–	1	–	–	–	–	–	–	–	–	–	–	–
BP801T CO 2	3	2	3	3	3	–	–	–	–	–	2	1	2	–	–	2
BP801T CO 3	3	3	2	3	2	–	1	–	–	3	2	–	2	1	1	2
BP801T CO 4	3	3	2	2	3	–	1	–	–	1	1	2	2	1	1	2
BP801T CO 5	3	3	2	2	3	–	–	–	–	–	2	2	2	1	1	2
BP801T CO 6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
AVERAGE	3	3.75	2	2.5	2.4	–	1	–	–	2	1.75	1.66	2	1	1	2

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP802T	Credit	4
Year/Sem	4/8	L-T-P	3-1-0
Course Name	**Social And Preventive Pharmacy (Theory)**		

Objectives of the Course:

Upon completion of the course the student shall 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

UNIT I (Total Hours- 10)

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

UNIT II (Total Hours-10)

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

UNIT- III(Total Hours-10)

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.

UNIT-IV (Total Hours-8)

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

UNIT-V (Total Hours-7)

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.

Course Outcomes (CO)

BP802T. CO1 Modifying the health and hygiene for the prevent of diseases

BP802T .CO2 Examining the current issues related to health and pharmaceutical problems with in the country and globally

BP802T .CO3 Finding the alternative modes of thinking based on current healthcare development

BP802T. CO4 Evaluating and comparing ways of solving problem related to health and pharmaceutical issues

BP802 T. CO5 Supporting the national healthcare programs and providing awareness

BP802T . CO6 Design a better healthcare services

References:

1. Prabhakara GN, Short Textbook of Preventive and Social Medicine, , 2nd Edition, 2010, , JAYPEE Publications
2. Mahajan S.N., Gupta S., Textbook of Preventive and Social Medicine, 4th Edition, 2013, JAYPEE Publications
3. Review of Preventive and Social Medicine (Including Biostatistics), Jain Vivek, 6th Edition, 2014, JAYPEE Publications
4.Adepu R., Community Pharmacy Practice, BSP publishers, Hyderabad

CO/PO Articulated Matrix

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP802T CO 1	3	–	–	1	–	2	3	–	1	1	–	3	–	–	–	–
BP802T CO 2	3	1	1	2	–	1	1	–	1	–	–	2	2	–	–	2
BP802T CO 3	2	–	1	1	–	2	–	–	–	2	–	2	2	1	1	2
BP802T CO 4	2	3	–	–	–	1	–	2	1	1	–	2	2	1	1	2
BP802T CO 5	2	–	–	–	–	3	–	–	2	2	–	3	2	1	1	2
BP802T CO 6	1	–	3	–	–	–	–	–	2	–	–	3	1	2	1	2
Average	2.1	2	1	2	–	1.8	2	2	1.4	1.5	–	2.5	1.8	1.25	1	2

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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Programme Name	B.Pharm.	Programme Code	29
Course Code	BP803ET	Credit	4
Year/Sem	4/8	L-T-P	3-1-0
Course Name	**Pharma Marketing Management (Theory)**		

Objectives of the Course:
The course aims to provide an understanding of marketing concepts and techniques and their applications in the pharmaceutical industry.

UNIT I (Total Hours- 10)
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.

UNIT II (Total Hours-10)
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.

UNIT- III(Total Hours-10)
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.

UNIT-IV (Total Hours-8)
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.

UNIT-V (Total Hours-7)
Pricing: Meaning, importance, objectives, determinants of price; pricing methods and strategies,
issues in price management in pharmaceutical industry. An overview of DPCO (Drug Price Control Order)and NPPA (National Pharmaceutical Pricing Authority).
Emerging concepts in marketing: Vertical & Horizontal Marketing; RuralMarketing; Consumerism; Industrial Marketing; Global Marketing.

Course Outcomes (CO)

BP803ET. CO1 Describe the concept of pharmaceutical marketing.
BP803ET. CO2 Discuss the role and responsibility of professional sales representative
BP803ET. CO3 Explain the different pharmaceutical consumer, their buying behavior and consumerism
BP803ET. CO4 Discuss the various details and components of pharmaceutical product and their promotion
BP803ET. CO5 Enumerate the concept of price management and the marketing channels in pharmaceutical industry

References:

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. Kumar Arun, Menakshi N., Marketing Management, Vikas Publishing, India
5. Saxena R., Marketing Management; Tata MC Graw-Hill (India Edition)

CO/PO Articulated Matrix

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP803T CO 1	3	–	–	–	–	–	–	1	–	–	–	3	2	1	1	2
BP803T CO 2	3	–	–	–	–	–	–	–	–	–	–	–	2	–	–	2
BP803T CO 3	3	–	–	2	–	–	–	–	–	–	–	–	2	1	1	2
BP803T CO 4	3	–	–	–	–	–	–	–	–	–	–	–	2	1	1	2
BP803T CO 5	3	1	–	–	2	3	–	–	3	3	–	3	2	1	1	2
Average	3	1	–	2	2	3	1	1	3	3	–	3	2	1	1	2

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP804ET	Credit	4
Year/Sem	4/8	L-T-P	3-1-0
Course Name	**Pharmaceutical Regulatory Science**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Know about the process of drug discovery and development
2. Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
3. Know the regulatory approval process and their registration in Indian and international markets

UNIT I (Total Hours- 10)

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.

UNIT II (Total Hours-10)

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)

UNIT- III(Total Hours-10)

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

UNIT-IV (Total Hours-8)

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

UNIT-V (Total Hours-7)

Regulatory Concepts Basic terminology, guidance, guidelines, regulations, Laws and Acts, Orange book, Federal Register, Code of Federal Regulatory, Purple book

Course Outcomes (CO)

BP804ET.CO1. Describe new drug discovery, clinical studies and generic drug product development.

BP804ET.CO2. Understanding of IND, NDA and ANDA

BP804ET.CO3. Identify various procedures for export of pharmaceutical products

BP804ET.CO4. Prepare clinical trial protocols along with its managing and monitoring.

BP804RT.CO5. Illustrate various laws and acts, use of Orange Book, Purple Book, Federal register

References

1. Itkar, S.,Vyawahare, N. S.., Drug Regulatory Affairs, NiraliPrakashan.
2. Berry I.R., Martin R.P., The Pharmaceutical Regulatory Process,Vol.185. Informa Health care Publishers.
3. Richard A., &Guarino, M.D., New Drug Approval Process: Accelerating Global Registrations,5th edition, Drugs and the Pharmaceutical Sciences,Vol.190.
4. Douglas J., Pisano., David, M.**,**FDA Regulatory Affairs: a guide for prescription drugs, medical devices, and biologics.

CO/PO Articulated Matrix

PO CO	PO 1	PO 2	PO3	PO4	PO 5	PO 6	PO7	PO8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO3	PSO4
BP804ET.CO1	3	-	-	-	-	-	-	-	-	-	-	2	1	2	2	1
BP804ET.CO2	3	-	-	-	-	-	-	-	-	2	-	-	1	2	2	1
BP804ET.CO3	3	-	-	-	-	-	-	-	-	-	-	-	1	2	1	2
BP804ET.CO4	3	2	-	-	-	-	-	-	-	-	-	-	1	2	1	1
BP804ET.CO5	3	-	2	-	-	-	-	-	-	2	-	2	1	2	1	1
AVERAGE	3	2	2	-	-	-	-	-	-	2	-	2	1	2	1.4	1.2

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

Programme Name	B. Pharm.	Programme Code	29
Course Code	BP805ET	Credit	4
Year/Sem	4/8	L-T-P	3-1-0
Course Name	**Pharmacovigilance**		

Objectives of the Course:

Upon completion of the course the student shall be able to (know, do, and appreciate):

1. Why drug safety monitoring is important
2. History and development of pharmacovigilance
3. National and international scenario of Pharmacovigilance
4. Dictionaries, coding and terminologies used in pharmacovigilance
5. Detection of new adverse drug reactions and their assessment
6. International standards for classification of diseases and drugs
7. Adverse drug reaction reporting systems and communication in pharmacovigilance
8. Methods to generate safety data during pre clinical, clinical and post approval phases of drugs' life cycle
9. Drug safety evaluation in paediatrics, geriatrics, pregnancy and lactation
10. Pharmacovigilance Program of India (PvPI) requirement for ADR reporting in India
11. ICH guidelines for ICSR, PSUR, expedited reporting, pharmacovigilance planning
12. CIOMS requirements for ADR reporting
13. Writing case narratives of adverse events and their quality

UNIT I (Total Hours- 10)

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

UNIT II (Total Hours-10)

Drug and disease classification Anatomical, therapeutic and chemical classification of drugs ,International classification of diseases , Daily defined doses, International Non proprietary Names for drugs

Drug dictionaries and coding in pharmacovigilance WHO adverse reaction terminologies, MedDRA and StandardisedMedDRA queries, WHO drug dictionary , Eudravigilance medicinal product dictionary Information resources in pharmacovigilance , Basic drug information resources , Specialised resources for ADRs

Establishing pharmacovigilanceprogramm Establishing in a hospital ,Establishment & operation of drug safety department in industry ,Contract Research Organisations (CROs), Establishing a national programme

UNIT- III (Total Hours-10)

Vaccine safety surveillance Vaccine Pharmacovigilance ,Vaccination failure ,Adverse events following immunization

Pharmacovigilance 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

UNIT-IV (Total Hours-8)

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

UNIT-V (Total Hours-7)

Pharmacogenomics 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 global pharmacovigilance requirements

Course Outcomes (CO)

BP805ET.CO1. Describe the concept of Pharmacovigilance, ADRs detection and reporting and Regulatory terminologies

BP805ET.CO2. Illustrate the drug and disease classification, dictionaries, coding and terminologies used Pharmacovigilance

BP805ET.CO3. Access the Vaccine safety surveillance, Pharmacovigilance methods and importance of communication in pharmacovigilance.

BP805ET.CO4. Discuss the methods for evaluating data of different phases and enumerate ICH guidelines and their significance in Pharmacovigilance

References:

1. Gupta,S.K.,Textbook of Pharmacovigilance, Jaypee Brothers Medical Publishers.
2. Cobert,B., &Biron,P., Practical Drug Safety from A to Z, Jones and Bartlett Publishers.
3. Andrews,E. B.&Nicholas,M.,Mann's Pharmacovigilance, Wiley Publishers.

CO/PO Articulated Matrix

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP805ET.CO1	3	-	-	-	-	-	-	-	-	-	-	2	1	3	2	2
BP805ET.CO2	3	-	-	-	-	-	-	-	-	2	-	-	2	3	2	1
BP805ET.CO3	3	-	-	-	-	-	-	-	-	-	-	-	2	2	1	2
BP805ET.CO4	3	2	-	-	-	-	-	-	-	-	-	-	1	2	1	1
Average	3	2	-	-	-	-	-	-	-	2	-	2	1.5	2.5	1.5	1.5

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus

Average of best of two sessional

UTTARANCHAL UNIVERSITY

(Established vide Uttaranchal University Act, 2012, UGC Approved)
(Uttarakhand Act No. 11 of 2013)
Arcadia Grant, P.O. Chandanwari, Premnagar, Dehradun, Uttarakhand

Programme Name	B.Pharm.	Programme Code	29
Course Code	BP806ET	Credit	4
Year/Sem	4/8	L-T-P	3-1-0
Course Name	**Quality Control And Standardization Of Herbals**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Know WHO guidelines for quality control of herbal drugs
2. Know Quality assurance in herbal drug industry
3. Know the regulatory approval process and their registration in Indian andinternational markets.
4. Appreciate EU and ICH guidelines for quality control of herbal drugs

UNIT I (Total Hours- 10)

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

UNIT II (Total Hours-10)

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.

UNIT- III(Total Hours-10)

EU and ICH guidelines for quality control of herbal drugs.
Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines

UNIT-IV (Total Hours-8)

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.

UNIT-V (Total Hours-7)

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

Course Outcomes (CO)

BP806ET CO 1. Understand WHO guidelines for quality control of herbal drugs

BP806ET CO 2. Illustrate the basic concepts of Quality assurance in herbal drug industry

BP806ET CO 3. Examine the regulatory approval process and their registration in Indian international markets

BP806ET CO 4. Estimate ICH guidelines for quality control of herbal drugs

BP806ET CO 5. Discuss cGMP GAP and GLP in traditional system of medicines

BP806ET CO 6. Understand the preparation and development of herbal formulation

References

1. Trease and Evans, Pharmacognosy, 13th Ed, Elsevier
2. Kokate C.K., Purohit A.P., Gokhale S.B., Pharmacognosy, NiraliPrakashan.
3. Rangari, V.D., Text book of Pharmacognosy and Phytochemistry Vol. I , 2006, Carrier Pub
4. Aggrawal, S.S., Herbal Drug Technology, 2002, Universities Press.
5. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. 2002, Business Horizons Publishers, New Delhi, India.

CO/PO Articulated Matrix

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP806ET CO 1	3	–	–	–	–	–	–	–	–	1	–	1	1	2	1	–
BP806ET CO 2	3	–	–	–	–	1	–	–	–	–	–	1	–	2	–	1
BP806ET CO 3	3	–	–	–	–	–	–	–	–	–	–	1	1	1	–	–
BP806ET CO 4	3	1	–	–	2	–	–	–	1	1	–	1	1	–	1	–
BP806ET CO 5	3	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–
BP806ET CO 6	3	–	–	–	–	–	–	–	–	–	–	1	2	1	–	1
Average	3	1	–	–	2	1	–	–	1	1	–	1	1.2	1.5	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP807ET	Credit	4
Year/Sem	4/8	L-T-P	3-1-0
Course Name	**Computer Aided Drug Design**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Design and discovery of lead molecules
2. The role of drug design in drug discovery process
3. The concept of QSAR and docking
4. Various strategies to develop new drug like molecules.
5. The design of new drug molecules using molecular modeling software

UNIT I (Total Hours- 10)

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

UNIT II (Total Hours-10)

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.

UNIT- III(Total Hours-10)

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.

UNIT-IV (Total Topics -4 and Hrs-8)

Informatics & Methods in drug design Introduction to Bioinformatics, chemoinformatics. ADME databases, chemical, biochemical and pharmaceutical databases.

UNIT-V (Total Hours-7)

Molecular Modeling: Introduction to molecular mechanics and quantum mechanics.Energy Minimization methods and Conformational Analysis, global conformational minima determination**.**

Course Outcomes (CO)

BP807ET.CO1 Describe the basic concepts of structure based rational drug design.
BP807ET.CO2 Understand the QSAR of drug.
BP807ET.CO3 To identify the molecular modeling and virtual screening techniques with molecular docking
BP807ET. CO4 Assess the new developments in computer-aided drug design
BP807ET.CO5 Illustrate molecular mechanics and quantum mechanics.

References:

1. Robert, G.K., Drug Action at the Molecular Level, University Prak Press Baltimore.
2. Delgado, J.N. &Remers,W.A. Wilson &Gisvolds's Text Book of Organic Medicinal & Pharmaceutical Chemistry, Lippincott, New York.
3. Thomas,L.,Victoria,L.&Zito, W.S., Foye'sPrinciples of Medicinal Chemistry Lea &Febiger.
5. Koro,L. A.Burckhalter J.H. Essentials of Medicinal Chemistry, Wiley Interscience.

CO/PO Articulated Matrix

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP807.CO1	3	-	-	-	-	-	-	-	-	-	-	2	3	3	2	3
BP807.CO2	3	-	-	-	-	-	-	-	-	2	-	-	3	3	2	2
BP807.CO3	3	-	-	-	-	-	-	-	-	-	-	-	3	2	1	2
BP807.CO4	3	2	-	-	-	-	-	-	-	-	-	-	3	2	1	1
BP807.CO5	3	-	2	-	-	-	-	-	-	2	-	2	3	2	1	1
Average	3	2	2	-	-	-	-	-	-	2	-	2	3	2.4	1.4	1.8

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

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Average of best of two sessional

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP808ET	Credit	4
Year/Sem	4/8	L-T-P	3-1-0
Course Name	**Cell And Molecular Biology**		

Objectives of the Course:

Upon completion of the course the student shall be able to

4. Summarize cell and molecular biology history.
5. Summarize cellular functioning and composition.
6. Describe the chemical foundations of cell biology.
7. Summarize the DNA properties of cell biology.
8. Describe protein structure and function.
9. Describe cellular membrane structure and function.
10. Describe basic molecular genetic mechanisms.
11. Summarize the Cell Cycle

UNIT I (Total Hours- 10)

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)

UNIT II (Total Hours-10)

DNA and the Flow of Molecular Information, DNA Functioning, DNA and RNA, Types of RNA, Transcription and Translation

UNIT- III(Total Hours-10)

Proteins: Defined and Amino Acids, Protein Structure, Regularities in Protein Pathways, Cellular Processes, Positive Control and significance of Protein Synthesis

UNIT-IV (Total Hours-8)

Science of Genetics, Transgenics and Genomic Analysis, Cell Cycle analysis, Mitosis and Meiosis, Cellular Activities and Checkpoints

UNIT-V (Total Hours-7)

Cell Signals: Introduction, Receptors for Cell Signals, Signaling Pathways: Overview, Misregulation of Signaling Pathways, Protein-Kinases: Functioning

Course Outcomes (CO)

BP808ET.CO1. Describe the Cell and Molecular Biology

BP808ET.CO2. Understand the DNA and flow of molecular information.

BP808ET.CO3. Illustrate protein synthesis pathways and their significance

BP808ET.CO4. Analyze basic molecular genetics mechanisms and Summarize the Cell Cycle and cell signals.

References:

1. Hugo, W.B. andRussel,A.D.Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
3. Pelczar,M. and Chan, K,. Microbiology, Tata McGraw Hill.
4. Malcolm, H., Balliere,T., and Cox, Pharmaceutical Microbiology.
5. Jain, N.K. Pharmaceutical Microbiology, VallabhPrakashan, Delhi

CO/PO Articulated Matrix

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP808ET.CO1	3	-	-	-	-	-	-	-	-	-	-	2	2	3	2	2
BP808ET.CO2	3	-	-	-	-	-	-	-	-	2	-	-	3	1	2	2
BP808ET.CO3	3	-	-	-	-	-	-	-	-	-	-	-	2	2	1	1
BP808ET.CO4	3	2	-	-	-	-	-	-	-	-	-	-	3	2	1	1
Average	3	2	-	-	-	-	-	-	-	2	-	2	2.5	2	1.5	1.5

Evaluation Criteria

Mode of Evaluation			
Internal (MM-15)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP809ET	Credit	4
Year/Sem	4/8	L-T-P	3-1-0
Course Name	**Cosmetic Science**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Know the excipients used in cosmetic formulation
2. Understand stability concern of cosmetic products.
3. Know about the role of herbals in cosmetics
4. Understand the skin and hair related problems

UNIT I (Total Hours- 10)

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.

UNIT II (Total Hours-10)

Principles of formulation and building blocks of skin care products: Face wash, Moisturizing cream, Cold Cream, Vanishing cream and their advantages and disadvantages. Application of these products in formulation of cosmecuticals.

Antiperspants & deodorants- Actives & 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.

UNIT- III (Total Hours-10)

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.

UNIT-IV (Total Hours-08)

Principles of Cosmetic Evaluation:Principles of sebumeter, corneometer. Measurement of TEWL, Skin Color, Hair tensile strength, Hair combing properties Soaps,and syndet bars. Evolution and skin benfits.

UNIT-V (Total Hours-07)

Oily and dry skin, causes leading to dry skin, skin moisturisation. Basic understanding of the terms Comedogenic, dermatitis.

Cosmetic problems associated with Hair and scalp: Dandruff, Hair fall causes

Cosmetic problems associated with skin: blemishes, wrinkles, acne, prickly heat and body odor. Antiperspirants and Deodorants- Actives and mechanism of action

Course Outcomes (CO)

BP809ET. CO1 Understand principles of formulation and building blocks of cosmoceutical products
BP809ET. CO2 Summarize common problems associated with skin, hair and oral cavity.
BP809ET. CO3 Classify cosmetic and cosmoceutical product
BP809ET. CO4 Analysis of individual cosmetic products
BP809ET. CO5 Design and develop various cosmetic and cosmeceutical products

References:

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

CO/PO Articulated Matrix

PO / CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP809ET.CO.1	2	1	_	1	_	_	_	_	_	_	2	_	1	1	1	_
BP809ET.CO.2	2	1	_	_	_	_	_	_	_	_	_	2	1	_	_	1
BP809ET.CO.3	3	_	_	_	_	_	_	_	_	_	_	_	1	_	_	_
BP809ET.CO.4	3	2	1	_	_	_	_	_	_	_	2	_	1	1	1	_
BP809ET.CO5	3	1	2	1	2	_	_	_	2	2	2	1	1	1	1	_
Average	2.6	1.25	1.5	1	2	_	_	_	2	2	2	1.5	1	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP810ET	Credit	4
Year/Sem	4/8	L-T-P	3-1-0
Course Name	**Pharmacological Screening Methods**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Appreciate the applications of various commonly used laboratory animals.
2. Appreciate and demonstrate the various screening methods used in preclinical research
3. Appreciate and demonstrate the importance of biostatistics and research methodology
4. Design and execute a research hypothesis independently

UNIT I (Total Hours- 10)

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.

UNIT II (Total Hours-10)

Preclinical screening models

a. Introduction: Dose selection, calculation and conversions, preparation of drug solution/suspensions, grouping of animals and importance of sham negative and positive control groups. Rationale for selection of animal species and sex for the study.

b. Study of screening animal models for Diuretics, nootropics, anti-Parkinson's,antiasthmatics, **Preclinical screening models**: for CNS activity- analgesic, antipyretic,anti-inflammatory, general anaesthetics, sedative and hypnotics, antipsychotic, antidepressant, antiepileptic, antiparkinsonism, alzheimer's disease

UNIT- III(Total Hours-10)

Preclinical screening models: for ANS activity, sympathomimetics, sympatholytics, parasympathomimetics, parasympatholytics, skeletal muscle relaxants, drugs acting on eye, local anaethetics

UNIT-IV (Total Hours-8)

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 antiasthmatics.

UNIT-V (Total Hours-7)

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

Course Outcomes (CO)

BP810ET.CO1 . Describe the CPCSEA and OECD guidelines for the conduct of experiments on laboratory animals

BP810ET.CO2 . Appraise various the various screening methods used in preclinical research

BP810ET.CO3 . Illustrate the various preclinical screening models.

BP810ET.CO4 . Analyse and interpret experimental data.

References:

1. Ghosh,M.N., Fundamentals of experimental Pharmacology, Scientific Book Agency.
2. Kulkarni,S.K.,Hand book of Experimental Pharmacology,VallabhPrakashan.
3. CPCSEA guidelines for laboratory animal facility.
4. Sundar, P.S.,Rao and Richard, J.,Introduction to biostatistics and research methods,PHI Learning

CO/PO Articulated Matrix

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP810ET.CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	2	-	-
BP810ET.CO2	3	-	-	-	-	-	-	-	-	-	-	1	3	-	1	-
BP810ET.CO3	3	2	-	-	-	-	1	1	1	-	-	1	2	2	-	1
BP810ET.CO4	3	-	-	-	1	-	-	-	-	-	-	2	-	-	1	1
Average	3	2	-	-	1	-	1	1	1	-	-	1.3	2.6	2	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

Programme Name	B. Pharm.	Programme Code	29
Course Code	BP811ET	Credit	4
Year/Sem	4/8	L-T-P	3-1-0
Course Name	**Advanced Instrumentation Techniques**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Understand the advanced instruments used and its applications in drug analysis
2. Understand the chromatographic separation and analysis of drugs.
3. Understand the calibration of various analytical instruments
4. Know analysis of drugs using various analytical instruments.

UNIT I (Total Hours- 10)

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

UNIT II (Total Hours-10)

Thermal Methods of Analysis: Principles, instrumentation and applications of ThermogravimetricAnalysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC)

X-Ray Diffraction Methods: Origin of X-rays, basic aspects of crystals, Xray Crystallography, rotating crystal technique, single crystal diffraction,powder diffraction, structural elucidation and applications.

UNIT- III(Total Hours-10)

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

UNIT-IV (Total Hours-8)

Radio immune assay: Importance, various components, Principle, different methods, Limitation and Applications of Radio immuno assay

Extraction techniques: General principle and procedure involved in the solid phase extraction and liquid-liquid extraction

UNIT-V (Total Hours-7)

Hyphenated techniques-LC-MS/MS, GC-MS/MS, HPTLC-MS.

Course Outcomes (CO)

BP811ET.CO1. Define Principle ,Instrumentation and applications of instruments

BP811ET.CO2. Understand the importance, components, Principle, methods and applications of Radio immuno assay

BP811ET.CO3. Illustrate the Hyphenated techniques like LC-MS/MS, GC-MS/MS, HPTLC-MS.

BP811ET.CO4. Analyse and interpret experimental data.

References:

1. Sharma,B.K. Instrumental Methods of Chemical Analysis:Krishna Prakashan Media.
2. Sharma,Y.R.ElementaryOrganic spectroscopy:S.Chand.
3. Vogel,A.I.,Vogel's Text book of Quantitative Chemical Analysis.
4. Beckett,A., and Stenlake, J.B.Practical Pharmaceutical Chemistry.
5. Organic Chemistry by I. L. Finar

CO/PO Articulated Matrix

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP811ET.CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	2	-	1
BP811ET.CO2	3	-	-	-	-	-	-	-	-	-	-	1	2	-	1	-
BP811ET.CO3	3	2	-	-	-	-	1	1	1	-	-	1	1	1	-	1
BP811ET.CO4	3	-	-	-	1	-	-	-	-	-	-	2	-	-	1	1
Average	3	2	-	-	1	-	1	1	1	-	-	1.3	2	1.5	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP812ET	Credit	4
Year/Sem	4/8	L-T-P	3-1-0
Course Name	**Dietary Supplements and Nutraceuticals**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Understand the need of supplements by the different group of people to maintain healthy life.
2. Understand the outcome of deficiencies in dietary supplements.
3. Appreciate the components in dietary supplements and the application.
4. Appreciate the regulatory and commercial aspects of dietary supplements including health claims.

UNIT I (Total Hours- 07)

a. Definitions of Functional foods, Nutraceuticals and Dietary supplements. Classification of Nutraceuticals, Health problems and diseases that can be prevented or cured by Nutraceuticals i.e. weight control, diabetes, cancer, heart disease, stress, osteoarthritis, hypertension etc.
b. Public health nutrition, maternal and child nutrition, nutrition and ageing, nutrition education in community.
c. Source, Name of marker compounds and their chemical nature, Medicinal uses and health benefits of following used as nutraceuticals/functional foods: Spirulina, Soyabean, Ginseng, Garlic, Broccoli, Gingko, Flaxseeds

UNIT II (Total Hours-15)

Phytochemicals as nutraceuticals: Occurrence and characteristic features (chemical nature medicinal benefits) of following

a) Carotenoids- α and β-Carotene, Lycopene, Xanthophylls, leutin
b) Sulfides: Diallyl sulfides, Allyl trisulfide.
c) Polyphenolics: Reservetrol
d) Flavonoids- Rutin , Naringin, Quercitin, Anthocyanidins, catechins, Flavones
e) Prebiotics / Probiotics.: Fructo oligosaccharides, Lacto bacillum
f) Phyto estrogens : Isoflavones, daidzein, Geebustin, lignans
g) Tocopherols
h) Proteins, vitamins, minerals, cereal, vegetables and beverages as functional foods: oats, wheat bran, rice bran, sea foods, coffee, tea and the like.

UNIT III (Total Hours-07)

a) Introduction to free radicals: Free radicals, reactive oxygen species, production of free radicals in cells, damaging reactions of free radicals on lipids, proteins, Carbohydrates, nucleic acids.
b) Dietary fibres and complex carbohydrates as functional food ingredients.

UNIT IV (Total Hours-10)

a) Free radicals in Diabetes mellitus, Inflammation, Ischemic reperfusion injury, Cancer, Atherosclerosis, Free radicals in brain metabolism and pathology, kidney damage, muscle damage. Free radicals involvement in other disorders. Free radicals theory of ageing.
b) Antioxidants: Endogenous antioxidants - enzymatic and nonenzymatic antioxidant defence, Superoxide dismutase, catalase, Glutathione peroxidase, Glutathione Vitamin C, Vitamin E, α- Lipoic acid, melatonin Synthetic antioxidants: Butylated hydroxy Toluene, Butylated hydroxy Anisole.
c) Functional foods for chronic disease prevention

UNIT V (Total Hours-06)

a) Effect of processing, storage and interactions of various environmental factors on the potential of nutraceuticals.
b) Regulatory Aspects; FSSAI, FDA, FPO, MPO, AGMARK. HACCP and GMPs on Food Safety. Adulteration of foods.
c) Pharmacopoeial Specifications for dietary supplements and nutraceuticals.

Course Outcomes (CO)

BP 812ET .CO1. Understand the need of supplements by the different group of people to maintain healthy life.
BP 812ET .CO2. Understand the outcomes of deficiencies in dietary supplements
BP 812ET .CO3. Appreciate the components in dietary supplements and the application
BP 812ET .CO4. Appreciate the regulatory and commercial aspects of dietary supplements including health claims

References:

1. Role of dietary fibres and neutraceuticals in preventing diseases by K.T Agusti and P.Faizal: BS Publication.
2. Advanced Nutritional Therapies by Cooper. K.A., (1996).
3. The Food Pharmacy by Jean Carper, Simon & Schuster, UK Ltd., (1988).
4. Prescription for Nutritional Healing by James F.Balch and Phyllis A.Balch 2nd Edn., Avery Publishing Group, NY (1997).
5. G. Gibson and C.williams Editors 2000 Functional foods Woodhead Publ.Co.London.
6. Goldberg, I. Functional Foods. 1994. Chapman and Hall, New York.
7. Labuza, T.P. 2000 Functional Foods and Dietary Supplements: Safety, Good Manufacturing Practice (GMPs) and Shelf Life Testing in Essentials of Functional Foods M.K. Sachmidl and T.P. Labuza eds. Aspen Press
8. Handbook of Nutraceuticals and Functional Foods, Third Edition (Modern Nutrition)
9. Shils, ME, Olson, JA, Shike, M. 1994 Modern Nutrition in Health and Disease. Eighth edition. Lea and Febiger

CO/PO Articulated Matrix

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP 812ET .CO1	3	–_	–_	–_	–_	–_	–_	–_	–_	2	–	1	1	1	–	–
BP 812ET .CO2	3	–_	–_	–_	–_	–_	–_	–_	–_	1	–	1	1	1	–	–
BP 812ET .CO3	3	–	–	–	–	–	–	–	–	–	–	1	1	1	–	–
BP 812ET .CO4	3	1	–	–	–	–	–	–	–	1	–	–	–	–	–	–
BP 812ET .CO5	3	1	–	–	–	–	1	–	–	–	1	1	2	1	1	1
Average	3	1	–	–	–	–	1	–	–	1.33	1	1	1.4	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

Programme Name	B. Pharm.	Programme Code	29
Course Code	BP814ET	Credit	4
Year/Sem	4/8	L-T-P	3-1-0
Course Name	**Pharma Production**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Understand the regulatory authorities and government rules and regulations for manufacturing in Life Sciences industry in India and emerging markets (both regulated and semi regulated)need of supplements by the different group of people to maintain healthy life.
2. This program is designed to train the candidates in various aspects of pharmaceuticals production, to work in CGMP Environment and make a great career in pharmaceutical/BioPharmaceutical Production

UNIT I (Total Hours- 04)
Orientation

UNIT II (Total Hours-04)
Managing Environmental Health and Safety Compliance

UNIT III (Total Hours-04)
Application of Chemistry, Quality and Engineering Concepts in Manufacturing of Pharmaceutical Formulations

UNIT IV (Total Hours-02)
cGMP for Production Personnel

UNIT V (Total Hours-02)
Standard Operating procedure - Preparation to Implementation

UNIT VI (Total Hours-02)
Fundamentals of Clean Room Behaviour

UNIT VII (Total Hours-08)
Manufacturing Process of Non Sterile API and Drug Product (Including WPU and Packaging)

UNIT VIII (Total Hours-02)
Manufacturing Batch Record Review

UNIT IX (Total Hours-02)
Developing CAPA Strategy in Pharma Manufacturing

UNIT X (Total Hours-04)
Manufacturing Quality Management

UNIT XI (Total Hours-02)
GDP and Data Integrity (DI) for Production Personnel

UNIT XII (Total Hours-02)
Change Control Process

UNIT XIII (Total Hours-02)
Process Validation for Production Personnel (including cleaning validation)

UNIT XIV (Total Hours-02
Managing waste Disposal

UNIT XV (Total Hours-04)
Audit Preparation for Production Personnel

UNIT XVI (Total Hours-02)
Professional Skills for Production Personnel

Course Outcomes (CO)

BP 814ET .CO1. Understand the Application of concepts of safety including hazards, accidents, safety signs.
BP 814ET .CO2. Understand the Role of API in typical Pharmaceutical Manufacturing and role of API particle size in formulations
BP 814ET .CO3. Understand the Essentials of cGMP and 10 commandants of GMP with their implication of individual performance and overall product quality.
BP 814ET .CO4. Appreciate Concept of Cleanroom design and Controls.

CO/PO Articulated Matrix

PO / CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP 814ET .CO1	3	2	3	–_	_–	–	2	––	_–	–	––	1	1	1	–	1
_BP 814ET .CO2	3	1	–_	_–	–_	_–	–_	_–	–_	_–	2	–_	_–	–_	_–	–
BP 814ET .CO3	3	–	–	–	–	–	1	–	–	–	–	–	1	1	–	–
BP 814ET .CO4	–_	_–	–_	_–	–_	_–	–_	_–	–_	_–	1	–_	_–	–_	_–	–
Average	3	1.5	3	–	–	–	1.5	–	–	–	1.5	1	1	1	–	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP815ET	Credit	4
Year/Sem	4/8	L-T-P	3-1-0
Course Name	**Pharma Production**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Understand the regulatory authorities and government rules and regulations for manufacturing in Life Sciences industry in India and emerging markets (both regulated and semi regulated)need of supplements by the different group of people to maintain healthy life.
2. Understand GMP regulations and begin applying them effectively. Understanding the 'why' of cGMP principles along with valuable insights and examples in every area of responsibility to enable them in their quality decision-making.

UNIT I (Total Hours- 04)
Orientation

UNIT II (Total Hours-04)
Managing Environmental Health and Safety Compliance

UNIT III (Total Hours-04)
Application of Chemistry, Quality and Engineering Concepts in Manufacturing of Pharmaceutical Formulations

UNIT IV (Total Hours-02)
cGLP for Quality Control Personnel

UNIT V (Total Hours-02)
Standard Operating procedure - Preparation to Implementation

UNIT VI (Total Hours-02)
Glassware used in Analysis

UNIT VII (Total Hours-02)
Sample Management

UNIT VIII (Total Hours-08)
Volumetric measurement

UNIT IX (Total Hours-02)
Method Validation

UNIT X (Total Hours-02)
Equipment Qualification

UNIT XI (Total Hours-02)
GDP and GLP

UNIT XII (Total Hours-02)
Weighing and measurement

UNIT XIII (Total Hours-02)
Process Validation for QC Personnel (including cleaning validation)

UNIT XIV (Total Hours-02
Managing waste Disposal

UNIT XV (Total Hours-02)
Audit Preparation for QC Personnel

UNIT XVI (Total Hours-02)
Sample Results

UNIT XVII (Total Hours-02)
Professional Skills for Quality Control Personnel

UNIT XVIII (Total Hours-02)
Laboratory Information Management System (LIMS)

Course Outcomes (CO)

BP 815ET .CO1. Application of the basic pharmaceutical science and basic industrial chemistry fundamentals
BP 815ET .CO2. Application of concepts of safety including hazards, accidents, safety signs
BP 815ET .CO3. Understand the Process of environmental monitoring and hygiene practices.
BP 815ET .CO4. Appreciate Basics concept of Process Validation

CO/PO Articulated Matrix

PO / CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP 815ET .CO1	3	2	1	–	–	1	2	1	–	–	2	1	1	1	1	1
BP 815ET .CO2	–	–	–	–	–	–	2	–	–	–	2	–	–	–	–	–
BP 815ET .CO3	3	–	–	–	–	–	1	–	–	–	–	–	1	1	–	–
BP 815ET .CO4	3	1	1	–	2	–	1	–	–	–	–	–	–	–	–	–
Average	3	1.5	1	–	2	1	1.5	1	–	–	2	1	1	1	1	1

Evaluation Criteria

Mode of Evaluation			
Internal (MM-25)			**External (MM-75)**
Component	**Continuous Mode***	**Sessional #**	**End Semester Examination**
Weightage	10	15	75

*Calculate as per criteria given in PCI syllabus
Average of best of two sessional

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP816ET	Credit	4
Year/Sem	4/8	L-T-P	3-1-0
Course Name	**Pharma Production**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Understand the Basic Planning and Market information and Pharma industry overview.
2. Understand Role of Medical Sales Representative.
3. Understand Pharmacovigilance Process for MSR.

UNIT I (Total Hours- 14)

Basic Planning and Market information

Course objective and Pharma industry overview, Introduction, Pharma industry overview, Career aspiration and success storiesand success stories

Role of Medical Sales Representative, What it takes to be a successful MSR, Interaction with Experienced MSR Skill set required for MSR, - Communication, Patience, Digital knowledge, Product knowledge and therapy knoweldge., Major Stakeholders for MSR, Market knowledge, Retail Chemist Prescription Audit, Planning skill

UNIT II (Total Hours-24)

Selling skills for MSR

Pre call objective, Grooming and etiquettes, Call opening, Need identification, In clinic promotion, presentation and demonstration, Probing skills, Objection handling, Call closing, Post call analysis, Stockist handling, Pharmacovigilance Process for MSR,

UNIT III (Total Hours-04)

Conducting CME programs, CME Programs, Key preparation required for CME program

Course Outcomes (CO)

BP 816ET .CO1. Understand Selling skills for MSR
BP 816ET .CO2. Understand Basic Planning and Market information
BP 816ET .CO3. Conducting CME programs.
BP 816ET .CO4. Objection handling , Call closing and Post call analysis

CO/PO Articulated Matrix

PO / CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP 816ET .CO1	3	2	–	–	–	1	–	–	2	2	–	2	–	–	1	1
BP 816ET .CO2	3	–	–	–	1	1	–	–	1	1	–	–	–	–	–	–
BP 816ET .CO3	3	1	2	1	1	–	–	–	–	3	2	2	1	1	1	–
BP 816ET .CO4	–	–	–	2	1	–	–	–	–	–	–	–	–	–	–	1
Average	3	2	2	1.5	1	1	–	–	1.5	2	2	2	1	1	1	1

Evaluation Criteria

Mode of Evaluation	
Component	**End Semester Examination**
External (MM-150)	

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Programme Name	B. Pharm.	Programme Code	29
Course Code	BP813PW	Credit	4
Year/Sem	4/8	L-T-P	3-1-0
Course Name	**Project Work**		

Objectives of the Course:

Upon completion of the course the student shall be able to

1. Show the evidence of having made accurate description of published work of othersand of having recorded the findings in an impartial manner
2. Understand practical skills of the hyphenated instruments.
3. Develop the students in data collection, analysis and reporting and interpretation skills.

Project work

1. Allow the student to develop data collection and reporting skills in the area of interest (Elective Choosen)
2. A project work shall be carried out under the supervision of a teacher. The project topic must be approved by the Head of the Department or Head of the Institution.
3. Project work shall be presented in a written report and as a seminar at semester end.
4. External and the internal examiners shall do the assessment of the project work.
5. Project work shall comprise of objectives of the work, methodology, results, discussions and conclusions.

Course Outcomes (CO)

BP813PW.CO1	Develops the communication and presentation skill.
BP813PW.CO2	Enhance skills and build confidence.
BP813PW.CO3	Learn to write thesis and research paper.
BP813PW.CO4	Understand about research methodology

CO/PO Articulated Matrix

PO / CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BP 813ET .CO1	3	2	2	2	2	1	–	–	2	2	2	2	1	1	1	1
BP 813ET .CO2	3	1	2	2	1	1	–	–	1	1	1	2	1	1	1	1
BP 813ET .CO3	3	1	2	1	1	–	–	–	2	3	2	2	1	1	1	1
BP 813ET .CO4	3	2	2	2	2	–	–	–	2	1	2	2	2	1	1	1
Average	3	1.5	2	1.75	1.5	1	–	–	1.75	1.75	1.75	2	1.25	1	1	1

Evaluation Criteria

Mode of Evaluation	
Component	**End Semester Examination**
External (MM-150)	