Pre Revision

Study & Evaluation Scheme

of

Bachelor of Pharmacy
B. Pharm.
[Applicable w.e.f. Academic Session 2011-12 till revised]

TEERTHANKER MAHAVEER UNIVERSITY
N.H.-24, Delhi Road, Moradabad, Uttar Pradesh-244001
Website: www.tmu.ac.in

TEERTHANKER MAHAVEER UNIVERSITY

(Established under Govt. of U. P. Act No. 30, 2008)
Delhi Road, Bagarpur, Moradabad (U.P)

Study & Evaluation Scheme
of
Bachelor of Pharmacy

SUMMARY

Programme	: B. Pharm.
Duration	: Four years (Eight Semester)
Medium	: English
Minimum Required Attendance	: 75 percent
Credits	
Maximum Credits	: 245
Minimum credits` required for getting degree	: 237

Assessment :

Internal	External	Total
30	70	100

Internal Evaluation (Theory Papers) :

Class Test-I	Class Test-II	Class Test-III	Continuous Evaluation	Total
Best two out of the three			10 Marks	30 Marks
10 Marks	10 Marks	10 Marks		

Internal Evaluation (Pratical Papers) :

Class Test-I	Class Test-II	Class Test-III	Continuous Evaluation	Total
10 Marks	10 Marks	10 Marks	10 Marks	30 Marks

Duration of Examination :

Theory		Practical	
External	Internal	External	Internal
3 hrs.	1.5 hrs.	4 hrs.	4 hrs.

To qualify the course a student is required to secure a minimum 40% marks in aggregate in the end semester examination and teachers continuous evaluation (i.e. both internal and external). A candidate who secures less than 40% (**aggregate**) marks in a course shall be deemed to have failed in that course. The student should have overall 50% marks in a semester to clear the semester. In case a student has more than 40% in each course but less than 50% overall in a semester he/she shall re-appear in one or two course(s) to improve the percentage. There will be three Class Tests in a semester and an average of the marks obtained in best two tests will be computed (cumulatively) for the final result.

The class tests would comprise of five questions. Student shall have to answer three questions out of which one question will be compulsory. Each question would be of five marks.

Question Paper Structure:

1. *The question paper shall consist of eight questions. Out of which first question shall be of short answer type (not exceeding 50 words) and will be compulsory. Question No. 1 shall contain 8 parts representing all units of the syllabus and students shall have to answer any five (weightage 4 marks each).*
2. *Out of the remaining seven questions, student shall be required to attempt any five questions. There will be minimum one and maximum two questions from each unit of the syllabus. The weightage of Question No. 2 to 8 shall be 10 marks each.*

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Study & Evaluation Scheme
Programme: B.Pharm.
Semester I

S. N.	Course Code	Subject	Periods			Credits	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	BPM101 or BPB101	Fundamental Mathematics or Fundamental Biology	3	2	-	4	30	70	100
2	BPH101	Pharmaceutical Analysis - I	3	2	-	4	30	70	100
3	BPH102	Pharmaceutical Inorganic Chemistry	3	2	-	4	30	70	100
4	BPH103	Pharmaceutics-I (G. Pharmacy)	3	2	-	4	30	70	100
5	BPH104	Human Anatomy, Physiology and Pathophysiology - I	3	2	-	4	30	70	100
6	BPH105	Foundation English-I	2	-	2	3	30	70	100
7	BPH151	Pharmaceutical Analysis – I (P)	-	-	4	2	30	70	100
8	BPH152	Pharmaceutical Inorganic Chemistry (P)	-	-	4	2	30	70	100
9	BPH153	Pharmaceutics-I (G. Pharmacy) (P)	-	-	4	2	30	70	100
10	BPH154	Human Anatomy, Physiology and Pathophysiology – I (P)	-	-	4	2	30	70	100
		Total	**17**	**10**	**18**	**31**	**300**	**700**	**1000**

Semester II

S. N.	Course Code	Subject	Periods			Credits	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	BPH201	Pharmaceutical Physical Chemistry	3	2	-	4	30	70	100
2	BPH202	Pharmaceutical Organic Chemistry – I	3	2	-	4	30	70	100
3	BPH203	Human Anatomy, Physiology and Pathophysiology – II	3	2	-	4	30	70	100
4	BPH204	Computer Fundamentals & Programming	3	2	-	4	30	70	100
5	BPH205	Advanced Mathematics	3	2	-	4	30	70	100
6	BPH206	Foundation English-II	2	-	2	3	30	70	100
7	BPH251	Pharmaceutical Physical Chemistry (P)	-	-	4	2	30	70	100
8	BPH252	Pharmaceutical Organic Chemistry – I (P)	-	-	4	2	30	70	100
9	BPH253	Computer Fundamentals & Programming (P)	-	-	4	2	30	70	100
		Total	**17**	**10**	**14**	**29**	**270**	**630**	**900**

Semester III

S. N.	Course Code	Subject	Periods			Credits	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	BPH301	Pharmaceutics – II (Unit Operation – I)	3	2	-	4	30	70	100
2	BPH302	Pharmaceutical Jurisprudence & Ethics	3	-	-	3	30	70	100
3	BPH303	Pharmacognosy – I	3	2	-	4	30	70	100
4	BPH304	Pharmaceutical Organic Chemistry – II	3	2	-	4	30	70	100
5	BPH305	Pharmaceutics – III (Community Pharmacy)	3	2	-	4	30	70	100
6	BPH306	Human Anatomy, Physiology & Pathophysiology – III	3	2	-	4	30	70	100
7	BPH351	Pharmaceutics – II (Unit Operation – I) (P)	-	-	4	2	30	70	100
8	BPH352	Pharmacognosy – I(P)	-	-	4	2	30	70	100
9	BPH353	Pharmaceutical Organic Chemistry – II (P)	-	-	4	2	30	70	100
10	BPH354	Pharmaceutics – III (Community Pharmacy) (P)	-	-	4	2	30	70	100
		Total	**18**	**10**	**16**	**31**	**300**	**700**	**1000**

Semester IV

S. N.	Course Code	Subject	Periods			Credits	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	BPH401	Pharmaceutics – IV (Unit Operation – II)	3	2	-	4	30	70	100
2	BPH402	Pharmaceutical Microbiology	3	2	-	4	30	70	100
3	BPH403	Pharmacognosy – II	3	2	-	4	30	70	100
4	BPH404	Pharmaceutical Analysis – II	3	2	-	4	30	70	100
5	BPH405	Human Anatomy, Physiology & Pathophysiology – IV	3	2	-	4	30	70	100
6	BPH406	Technical Communication	2	-	2	3	30	70	100
7	BPH451	Pharmaceutics – IV (Unit Operation – II (P)	-	-	4	2	30	70	100
8	BPH452	Pharmaceutical Microbiology (P)	-	-	4	2	30	70	100
9	BPH453	Pharmacognosy – II(P)	-	-	4	2	30	70	100
10	BPH454	Pharmaceutical Analysis – II(P)	-	-	4	2	30	70	100
		Total	**17**	**10**	**18**	**31**	**300**	**700**	**1000**

Semester V

S. N.	Course Code	Subject	Periods			Credits	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	BPH501	Pharmaceutical Biochemistry	3	-	-	3	30	70	100
2	BPH502	Pharmaceutics – V (Pharmaceutical Technology-I)	3	-	-	3	30	70	100
3	BPH503	Pharmacology – I	3	2	-	4	30	70	100
4	BPH504	Pharmaceutical Medicinal Chemistry-I	3	2	-	4	30	70	100
5	BPH505	Pharmaceutics – VI (Physical Pharmacy)	3	-	-	3	30	70	100
6	BPH506	Technical Writing	2	-	2	3	30	70	100
7	BPH551	Pharmaceutical Biochemistry (P)	-	-	4	2	30	70	100
8	BPH552	Pharmaceutics – V (Pharmaceutical Technology-I)(P)	-	-	4	2	30	70	100
9	BPH553	Pharmacology – I(P)	-	-	4	2	30	70	100
10	BPH554	Pharmaceutical Medicinal Chemistry-I (P)	-	-	4	2	30	70	100
11	BPH555	Pharmaceutics – VI (Physical Pharmacy) (P)	-	-	4	2	30	70	100
		Total	**17**	**4**	**22**	**30**	**330**	**770**	**1100**

Semester VI

S. N.	Course Code	Subject	Periods			Credits	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	BPH601	Pharmaceutical Medicinal Chemistry-II	3	2	-	4	30	70	100
2	BPH602	Pharmaceutics – VII (Pharmaceutical Technology II)	3	2	-	4	30	70	100
3	BPH603	Pharmacology – II	3	2	-	4	30	70	100
4	BPH604	Pharmacognosy – III	3	2	-	4	30	70	100
6	BPH605	Environment & Ecology	3	-	-	3	30	70	100
5	BPH606	Communication Technique	2	-	2	3	30	70	100
7	BPH651	Pharmaceutical Industrial Training	-	-	-	2	50	50	100
8	BPH652	Pharmaceutical Medicinal Chemistry-II (P)	-	-	4	2	30	70	100
9	BPH653	Pharmaceutics – VII (Pharmaceutical Technology-II(P)	-	-	4	2	30	70	100
10	BPH654	Pharmacology – II(P)	-	-	4	2	30	70	100
11	BPH655	Pharmacognosy – III(P)	-	-	4	2	30	70	100
		Total	**17**	**8**	**18**	**32**	**350**	**750**	**1100**

Semester VII

S. N.	Course Code	Subject	Periods			Credits	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	BPH701	Pharmaceutical Analysis - III	3	2	-	4	30	70	100
2	BPH702	Pharmaceutics – VIII (Bio-pharmaceutics & Pharmacokinetics)	3	2	-	4	30	70	100
3	BPH703	Pharmacology – III	3	2	-	4	30	70	100
4	BPH704	Pharmaceutical Medicinal Chemistry-III	3	2	-	4	30	70	100
5	BPH705	Pharmacognosy – IV	3	2	-	4	30	70	100
6	BPH706	Pharmaceutical Industrial Management	3	-	-	3	30	70	100
	BPH707	Corporate Communication	2	-	2	3	30	70	100
7	BPH751	Pharmaceutical Analysis - III(P)	-	-	4	2	30	70	100
8	BPH752	Pharmaceutics – VIII (Bio-pharmaceutics & Pharmacokinetics) (P)	-	-	4	2	30	70	100
9	BPH753	Pharmacology – III (P)	-	-	4	2	30	70	100
10	BPH754	Pharmacognosy – IV (P)	-	-	4	2	30	70	100
		Total	**20**	**10**	**18**	**34**	**330**	**770**	**1100**

Semester VIII

S. N.	Course Code	Subject	Periods			Credits	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	BPH801	Pharmaceutical Bio-technology	3	2	-	4	30	70	100
2	BPH802	Natural Products	3	2	-	4	30	70	100
3	BPH803	Hospital Pharmacy	3	2	-	4	30	70	100
4	BPH804	Pharmaceutical Research - I	3	2	-	4	30	70	100
5	BPH805	Pharmaceutical Research - II	3	2	-	4	30	70	100
7	BPH851	Project Based on Pharmaceutical Research – I & II(P)		2	8	5	50	50	100
8	BPH852	Natural Products(P)	-	-	4	2	30	70	100
		Total	**15**	**12**	**12**	**27**	**230**	**470**	**700**

Note:

L – Lecture
1L = 1Hr

T- Tutorial
1T= 1 Hr

P- Practical
1P= 1 Hr

C-Credits
1C = 1Hr of Theory Paper
= 2 Hrs of Practical/Tutorial

Study & Evaluation Scheme

Of

Bachelor of Pharmacy

[Applicable w.e.f. Academic Session - 2019-20 till revised]

[Framed under Regulation 6, 7 & 8 of the Bachelor of Pharmacy (B.Pharm) course regulations 2014 given by PCI]

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B.Pharm Curriculum

Semester I

S.N.	Category	Course Code	Course	Periods			Credits	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-1	BPHT101	Human Anatomy and Physiology I	3	1		4	25	75	100
2	CC-2	BPHT102	Pharmaceutical Analysis I	3	1		4	25	75	100
3	CC-3	BPHT103	Pharmaceutics I	3	1		4	25	75	100
4	CC-4	BPHT104	Pharmaceutical Inorganic Chemistry	3	1		4	25	75	100
5	AECC-1	BPHT105/ BPHT305	Communication skills	2	-		2	15	35	50
6	BC-1	BPMT106	Mathematics#	2	1		3	15	35	50
	BC-2	BPBT106	Remedial Biology$	2	-		2	15	35	50
7	SEC-1	BPHP151	Human Anatomy and Physiology I			4	2	15	35	50
8	SEC-2	BPHP152	Pharmaceutical Analysis I			4	2	15	35	50
9	SEC-3	BPHP153	Pharmaceutics I			4	2	15	35	50
10	SEC-4	BPHP154	Pharmaceutical Inorganic Chemistry			4	2	15	35	50
11	AECC-2	BPHP155/ BPHP355	Communication Skills			2	1	10	15	25
12	BC-3	BPBP156	Remedial Biology$			2	1	10	15	25
			Total	**16**	**4**	**20**	**30**	**210**	**540**	**750**

$Applicable to those who opt Remedial Biology
#Applicable to those who opt Remedial Mathematics

Semester - II

S.N.	Category	Course Code	Course	Periods			Credits	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-5	BPHT201	Human Anatomy and Physiology II	3	1		4	25	75	100
2	CC-6	BPHT202	Pharmaceutical Organic Chemistry I	3	1		4	25	75	100
3	CC-7	BPHT203	Biochemistry	3	1		4	25	75	100
4	CC-8	BPHT204	Pathophysiology	3	1		4	25	75	100
5	VAC-1	BPHT205/ BPHT406	Computer Applications in Pharmacy	3	-		3	25	50	75
6	AECC-3	BPHT206	Environmental sciences	3	-		3	25	50	75
7	SEC-5	BPHP251	Human Anatomy and Physiology II			4	2	15	35	50
8	SEC-6	BPHP252	Pharmaceutical Organic Chemistry I			4	2	15	35	50
9	SEC-7	BPHP253	Biochemistry			4	2	15	35	50
10	VAC-2	BPHP254/ BPHP455	Computer Applications in Pharmacy(lab course)			2	1	10	15	25
			Total	**18**	**4**	**14**	**29**	**205**	**520**	**725**

Semester - III

S.N.	Category	Course Code	Course	Periods			Credits	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-9	BPHT301	Pharmaceutical Organic Chemistry II	3	1		4	25	75	100
2	CC-10	BPHT302	Physical Pharmaceutics I	3	1		4	25	75	100
3	CC-11	BPHT303	Pharmaceutical Microbiology	3	1		4	25	75	100
4	CC-12	BPHT304	Pharmaceutical Engineering	3	1		4	25	75	100
5	SEC-8	BPHP351	Pharmaceutical Organic Chemistry II		-	4	2	15	35	50
6	SEC-9	BPHP352	Physical Pharmaceutics I		-	4	2	15	35	50
7	SEC-10	BPHP353	Pharmaceutical Microbiology		-	4	2	15	35	50
8	SEC-11	BPHP354	Pharmaceutical Engineering		-	4	2	15	35	50
			Total	**12**	**4**	**16**	**24**	**160**	**440**	**600**

Semester - IV

S.N.	Category	Course Code	Course	Periods			Credits	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-13	BPHT401	Pharmaceutical Organic Chemistry III	3	1		4	25	75	100
2	CC-14	BPHT402	Medicinal Chemistry I	3	1		4	25	75	100
3	CC-15	BPHT403	Physical Pharmaceutics II	3	1		4	25	75	100
4	CC-16	BPHT404	Pharmacology I	3	1		4	25	75	100
5	CC-17	BPHT405	Pharmacognosy and Phytochemistry I	3	1		4	25	75	100
6	SEC-12	BPHP451	Medicinal Chemistry I		-	4	2	15	35	50
7	SEC-13	BPHP452	Physical Pharmaceutics II			4	2	15	35	50
8	SEC-14	BPHP453	Pharmacology I		-	4	2	15	35	50
9	SEC-15	BPHP454	Pharmacognosy and Phytochemistry I		-	4	2	15	35	50
			Total	**15**	**5**	**16**	**28**	**185**	**515**	**700**

Semester - V

S.N.	Category	Course Code	Course	Periods			Credits	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-18	BPHT501	Medicinal Chemistry II	3	1		4	25	75	100
2	CC-19	BPHT502	Industrial Pharmacy I	3	1		4	25	75	100
3	CC-20	BPHT503	Pharmacology II	3	1		4	25	75	100
4	CC-21	BPHT504	Pharmacognosy and Phytochemistry II	3	1		4	25	75	100
5	CC-22	BPHT505	Pharmaceutical Jurisprudence	3	1		4	25	75	100
6	SEC-16	BPHP551	Industrial Pharmacy I		-	4	2	15	35	50
7	SEC-17	BPHP552	Pharmacology II		-	4	2	15	35	50
8	SEC-18	BPHP553	Pharmacognosy and Phytochemistry II		-	4	2	15	35	50
			Total	**15**	**5**	**12**	**26**	**170**	**480**	**650**

Value Added Course (VAC)

S.N.	Category	Course Code	Course/Paper	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
9	VAC-3	TMUGS 501	Managing Self	02	1	-	00	50	50	100

Semester - VI

S.N.	Category	Course Code	Course	Periods			Credits	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-23	BPHT601	Medicinal Chemistry	3	1		4	25	75	100
2	CC-24	BPHT602	Pharmacology III	3	1		4	25	75	100
3	CC-25	BPHT603	Herbal Drug Technology	3	1		4	25	75	100
4	CC-26	BPHT604	Biopharmaceutics and Pharmacokinetics	3	1		4	25	75	100
5	CC-27	BPHT605	Pharmaceutical Biotechnology	3	1		4	25	75	100
6	CC-28	BPHT606	Quality Assurance	3	1		4	25	75	100
7	SEC-19	BPHP651	Medicinal chemistry III			4	2	15	35	50
8	SEC-20	BPHP652	Pharmacology III			4	2	15	35	50
9	SEC-21	BPHP653	Herbal Drug Technology			4	2	15	35	50
			Total	**18**	**6**	**12**	**30**	**195**	**555**	**750**

Value Added Course (VAC)

S.N.	Category	Course Code	Course/Paper	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
10	VAC-4	TMUGS 501	Managing Work and Others	02	1	-	00	50	50	100

Semester - VII

S.N.	Category	Course Code	Course	Periods			Credits	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-29	BPHT701	Instrumental Methods of Analysis	3	1		4	25	75	100
2	CC-30	BPHT702	Industrial Pharmacy II	3	1		4	25	75	100
3	CC-31	BPHT703	Pharmacy Practice	3	1		4	25	75	100
4	CC-32	BPHT704	Novel Drug Delivery System	3	1		4	25	75	100
5	SEC-22	BPHP751	Instrumental Methods of Analysis		-	4	2	15	35	50
6	SEC-23	BPHP752	Practice School/Internship		-	12	6	25	125	150
			Total	**12**	**4**	**16**	**24**	**140**	**460**	**600**

Semester - VIII

S.N.	Category	Course Code	Course	Periods			Credits	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-33	BPHT801	Biostatistics and Research Methodology	3	1		4	25	75	100
2	CC-34	BPHT802	Social and Preventive Pharmacy	3	1		4	25	75	100
3*	DSEC 1 & 2	BPHT803	Pharmaceutical Marketing	3 + 3 =6	1 + 1 =2		4+4= 8	50	150	200
		BPHT804	Pharmaceutical Regulatory Science							
		BPHT805	Pharmacovigilance							
		BPHT806	Quality Control and Standardization of Herbals							
		BPHT807	Computer Aided Drug Design							
		BPHT808	Cell and Molecular Biology							
		BPHT809	Cosmetic Science							
		BPHT810	Pharmacological Screening Methods							
		BPHT811	Advanced Instrumentation Techniques							
		BPHT812	Dietary Supplements and Nutraceuticals							
		BPHT813	Pharmaceutical Product Development							
4	PW	BPHP851	Project Work	-	-	12	6	-	150	150
			Total	**12**	**4**	**16**	**22**	**100**	**450**	**550**

*** Two courses to be opted as electives out of Eleven**

New course Add

Course Code: BPHT 201	Core Course – 5 B.Pharm- Semester-II **HUMAN ANATOMY AND PHYSIOLOGY-II**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding the structure and functions of various organs of the human body.**	
CO2.	**Explaining various homeostatic mechanisms and their imbalances in human body.**	
CO3.	**Identifying the interlinked mechanisms of homeostasis in human body.**	
CO4.	**Analysing the haematological tests and vital signs and symptoms.**	
Course Contents:		
Unit-1:	**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)	**10 hours**
Unit-2:	**Digestive system** Anatomy of GI Tract with special reference to anatomy and functions of stomach, (Acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsin role in protein digestion) small intestine and large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT. **Energetics** Formation and role of ATP, Creatinine Phosphate and BMR.	**06 hours**
Unit-3:	**Respiratory system** Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration Lung Volumes and capacities transport of respiratory gases, 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	**10 hours**

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	disorders of kidney.	
Unit-4:	**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.	**10 hours**
Unit-5:	**Reproductive system** Anatomy of male and female reproductive system, Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition. **Introduction to genetics** Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance.	**09 hours**
Text Books: (Latest Edition)	1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee Brothers medical publishers, New Delhi. 2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York	
Reference Books:	1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA 2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A. 3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje, Academic Publishers Kolkata. 4. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA 5. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A 6. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A. 7. Textbook of Human Histology by Inderbir Singh, Jaypee brothers medical publishers, New Delhi. 8. Textbook of Practical Physiology by C.L. Ghai, Jaypee brothers medical publishers, New Delhi. 9. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.	

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New course Added

Course Code: BPHT 203	Core Course – 7 B.Pharm- Semester-II **BIOCHEMISTRY**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.**	
CO2.	**Describing the metabolism of nutrient molecules in physiological and pathological conditions.**	
CO3.	**Explaining the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.**	
Course Contents:		
Unit-1:	**Biomolecules** Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins. **Bioenergetics** Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential. Energy rich compounds; classification; biological significances of ATP and cyclic AMP.	**08 hours**
Unit-2:	**Carbohydrate metabolism** Glycolysis – Pathway, energetics and significance Citric acid cycle- Pathway, energetics and significance HMP shunt and its significance; Glucose-6-Phosphate dehydrogenase (G6PD) deficiency Glycogen metabolism Pathways and glycogen storage diseases (GSD) Gluconeogenesis- Pathway and its significance 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.	**10 hours**
Unit-3:	**Lipid metabolism** β-Oxidation of saturated fatty acid (Palmitic acid) Formation and utilization of ketone bodies; ketoacidosisDe novo synthesis of fatty acids (Palmitic acid) Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity.	**10 hours**

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	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-4:	**Nucleic acid metabolism and genetic information transfer** Biosynthesis of purine and pyrimidine nucleotides Catabolism of purine nucleotides and Hyperuricemia and Gout disease Organization of mammalian genome Structure of DNA and RNA and their functions DNA replication, (semi conservative model) Transcription or RNA synthesis Genetic code, Translation or Protein synthesis and inhibitors.	**10 hours**
Unit-5:	**Enzymes** Introduction, properties, nomenclature and IUB classification of enzymes Enzyme kinetics (Michaelis plot, Line Weaver Burke plot) Enzyme inhibitors with examples Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation Therapeutic and diagnostic applications of enzymes and isoenzymes Coenzymes –Structure and biochemical functions.	**07 hours**
Text Books: (Latest Edition)	1. Biochemistry by D. Satyanarayan and U. Chakrapani 2. Textbook of Biochemistry by Rama Rao.	
Reference Books:	1. Principles of Biochemistry by Lehninger. 2. Outlines of Biochemistry by Conn and Stumpf 3. Harper's Biochemistry by Robert K. Murry, Daryl K. Granner and Victor W. Rodwell. 4. Biochemistry by Stryer. 5. Textbook of Biochemistry by Deb. 6. Practical Biochemistry by R.C. Gupta and S. Bhargavan. 7. Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition) 8. Practical Biochemistry for Medical students by Rajagopal and Ramakrishna. 9. Practical Biochemistry by Harold Varley.	

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New course Added

Course Code: BPHT 204	Core Course – 8 B.Pharm- Semester-II **PATHOPHYSIOLOGY**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding the etiology and pathogenesis of the selected disease conditions.**	
CO2.	**Understanding concepts, principles of pathophysiology and identifying responses related to pathophysiologic processes results in disease.**	
CO3.	**Analysing the complications of the diseases.**	
Course Contents:		
Unit-1:	**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, Mechanismof 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	**10 hours**
Unit-2:	**Cardiovascular System:** Hypertension, congestive heart failure, ischemic heart disease (angina, myocardial infarction, atherosclerosis and arteriosclerosis) **Respiratory system:** Asthma, Chronic obstructive airways diseases. **Renal system:** Acute and chronic renal failure	**10 hours**
Unit-3:	**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	**10 hours**

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	Nervous system: Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease. **Gastrointestinal system:** Peptic Ulcer	
Unit-4:	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 **Diseases of bones and joints:** Rheumatoid Arthritis, Osteoporosis, Gout **Principles of Cancer:** Classification, etiology and pathogenesis of Cancer	**08 hours**
Unit-5:	**Infectious diseases:** Meningitis, Typhoid, Leprosy, TuberculosisUrinary tract infections **Sexually transmitted diseases:** AIDS, Syphilis, Gonorrhea	**07 hours**
Text Books: (Latest Edition)	1. Vinay Kumar, Abul K. Abas, Jon C. Aster; Robbins &Cotran Pathologic Basis of Disease; South Asia edition; India; Elsevier; 2014. 2. HarshMohan; Text book of Pathology; 6th edition; India; Jaypee Publications; 2010.	
Reference Books:	1. Laurence B, Bruce C, Bjorn K. ; Goodman Gilman's The Pharmacological Basis of Therapeutics; 12th edition; New York; McGraw-Hill; 2011. 2. Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12th ed; United States; William and Wilkins, Baltimore;1991 [1990 printing]. 3. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston;Davidson's Principles and Practice of Medicine; 21st edition; London; ELBS/Churchill Livingstone; 2010. 4. Guyton A, John .E Hall; Textbook of Medical Physiology; 12th edition; WB Saunders Company; 2010. 5. Joseph DiPiro, Robert L. Talbert, Gary Yee, Barbara Wells, L. Michael Posey; Pharmacotherapy: A Pathophysiological Approach; 9th edition; London; McGraw-Hill Medical; 2014. 6. V. Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6th edition; Philadelphia; WB Saunders Company; 1997. 7. Roger Walker, Clive Edwards; Clinical Pharmacy and Therapeutics; 3rd edition; London; Churchill Livingstone publication; 2003.	

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New Course Added

Course Code: BPHP 254 / BPHP455	Value Added Course – 2 B.Pharm- Semester-II **COMPUTER APPLICATION IN PHARMACY (PRACTICAL)**	L-0 T-0 P-2 C-1
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding basic concepts of HTML and its use in creating websites.**	
CO2.	**Demonstrating the information of any drug and its adverse effects using online tools.**	
CO3.	**Deploying MS Office tools to store and retrieve patient information from the Database.**	
CO4.	**Generating and printing report from patient database.**	
Course Contents:		

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

Text Books: (Latest Edition)	1. Computer Application in Pharmacy – William E. Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.	
Reference Books:	1. Bioinformatics (Concept, Skills and Applications) – S.C. Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA) 2. Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley- Interscience, A John Willey and Sons, INC., Publication, USA 3. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N. Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi - 110002.	

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New Course Added

Course Code: BPHT 206	Ability-Enhancement Compulsory Course – 3 B.Pharm- Semester-II **ENVIRONMENTAL SCIENCES**	L-3 T-0 P-0 C-3
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding concepts &sources of environment and its associated problems and measures to control.**	
CO2.	**Describing the ecosystems.**	
CO3.	**Analysing human impacts on the environment.**	
Course Contents:		
Unit-1:	The Multidisciplinary nature of environmental studies Natural Resources Renewable and non-renewable resources: Natural resources and associated problems Forest resources; a) Water resources; b) Mineral resources; c) Food resources; d) Energy resources; e) Land resources: Role of an individual in conservation of natural resources.	**10 hours**
Unit-2:	Ecosystems Concept of an ecosystem. Structure and function of an ecosystem. Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	**10 hours**
Unit-3:	Environmental Pollution: Air pollution; Water pollution; Soil pollution.	**10 hours**
Text Books: (Latest Edition)	1. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers, Bangalore 2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.	
Reference Books:	1. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p 2. Clark R.S., Marine Pollution, Clanderson Press Oxford 3. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p 4. De A.K., Environmental Chemistry, Wiley Eastern Ltd. Down of Earth, Centre for Science and Environment 5. Bharucha Erach, The Biodiversity of India, Mapin Pu blishing Pvt. Ltd., Ahmedabad – 380 013, India,	

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New Course Added

Course Code: BPHP 251	Skill-Enhancement Course – 5 B.Pharm- Semester-II **HUMAN ANATOMY AND PHYSIOLOGY-II (PRACTICAL)**	L-0 T-0 P-4 C-2
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding gross morphology, structure and functions of various organs of the human body.**	
CO2.	**Demonstrating function of various organs and systems of human body with appropriate models**	
CO3.	**Analysing various physiological parameters of body fluids**	
Course Contents:		

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

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

Text Books: (Latest Edition)	1. Textbook of Practical Physiology by C.L. Ghai, Jaypee brothers medical publishers, New Delhi. 2. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.	
Reference Books:	1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA 2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A. 3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje,	

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

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New Course Added

Course Code: BPHP 253	Skill-Enhancement Course – 7 B.Pharm- Semester-II **BIOCHEMISTRY (PRACTICAL)**	L-0 T-0 P-4 C-2
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Determining blood and urine components qualitatively and quantitatively.**	
CO2.	**Identifying and analyzing the contents of different biomolecules in body fluids.**	
Course Contents:		

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

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

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New Course Added

Course Code: BPHT 302	Core Course – 10 B.Pharm- Semester-III **PHYSICAL PHARMACEUTICS-I**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding various physicochemical properties of drug molecules in designing the dosage forms.**	
CO2.	**Identifying various physicochemical properties of a drug molecule.**	
CO3.	**Demonstrating the use of various physicochemical parameters of a drug molecule to develop a stable formulation.**	
Course Contents:		
Unit-1:	**Solubility of drugs:** Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions. Partially miscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications.	**10 hours**
Unit-2:	**States of Matter and properties of matter:** State of matter, changes in the state of matter, latent heats, vapour pressure, sublimation critical point, eutectic mixtures, gases, aerosols - inhalers, relative humidity, liquid complexes, liquid crystals, glassy states, solid-crystalline, amorphous & polymorphism. **Physicochemical properties of drug molecules:** Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications.	**10 hours**
Unit-3:	**Surface and interfacial phenomenon:** Liquid interface, surface & interfacial tensions, surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB Scale, solubilisation, detergency, adsorption at solid interface.	**08 hours**
Unit-4:	**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.	**08 hours**
Unit-5:	**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.	**07 hours**
Text Books: (Latest Edition)	1. Physical Pharmaceutics by C.V.S. Subramanyam 2. Test book of Physical Phramacy, by Gaurav Jain & Roop K. Khar	

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

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New course Added

Course Code: BPHT 303	Core Course – 11 B.Pharm- Semester-III **PHARMACEUTICAL MICROBIOLOGY**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding various methods of identification, cultivation and preservation of microorganisms.**	
CO2.	**Describing various methods of sterilization and sterility testing for pharmaceutical Products.**	
CO3.	**Recognizing concept of cell culture technology and its applications in pharmaceutical industries.**	
CO4.	**Analyzing microbiological standardization of pharmaceuticals.**	
Course Contents:		
Unit-1:	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 constrast microscopy, dark field microscopy and electron microscopy.	**10 hours**
Unit-2:	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.	**10 hours**
Unit-3:	Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses. Classification and mode of action of disinfectants Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions Evaluation of bactericidal & Bacteriostatic. Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.	**10 hours**
Unit-4:	Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification.	**08 hours**

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	Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids. Assessment of a new antibiotic.	
Unit-5:	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.	**07 hours**
Text Books: (Latest Edition)	1. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn. 2. N.K. Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi	
Reference Books:	1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London. 2. Peppler: Microbial Technology. 3. I.P., B.P., U.S.P.- latest editions. 4. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company 5. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology. 6. Rose: Industrial Microbiology. 7. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan 8. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution. 9. Ananthnarayan: Text Book of Microbiology, Orient-Longman, Chennai 10. Edward: Fundamentals of Microbiology. 11. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.	

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New Course Added.

Course Code: BPHT 304	Core Course – 12 B.Pharm- Semester-III **PHARMACEUTICAL ENGINEERING**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding various unit operation and material handling techniques used in pharmaceutical industries.**	
CO2.	**Recognising the appropriate materials for pharmaceutical plant construction.**	
CO3.	**Understanding and demonstrating steps in various processes involved in pharmaceutical manufacturing.**	
CO4.	**Applying various methods for prevention of corrosion of materials used in pharmaceutical plant construction.**	
Course Contents:		
Unit-1:	**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.	**10 hours**
Unit-2:	**Heat Transfer:** Objectives, applications & Heat transfer mechanisms. Fourier'slaw, 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	**10 hours**
Unit-3:	**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.	**08 hours**

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	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-4:	**Filtration:** Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary 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.	**08 hours**
Unit-5:	**Materials of pharmaceutical plant construction, Corrosion and its prevention:** Factors affecting during materials selected for Pharmaceutical plant construction, Theories of corrosion, types of corrosion and there prevention. Ferrous and nonferrous metals, inorganic and organic non-metals, basic of material handling systems	**07 hours**
Text Books: (Latest Edition)	1. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition.	
Reference Books:	1. Solid phase extraction, Principles, techniques and applications by Nigel J.K. Simpson-Latest edition. 2. Remington practice of pharmacy- Martin, Latest edition. Theory and practice of industrial pharmacy by Lachmann., Latest edition. 3. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition. 4. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition. 5. Introduction to chemical engineering – Walter L Badger & Julius Banchero, Latest edition. 6. Unit operation of chemical engineering – Mcabe Smith, Latest edition.	

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New course Added

Course Code: BPHP 352	Skill-Enhancement Course – 9 B.Pharm- Semester-III **PHYSICAL PHARMACEUTICS – I (PRACTICAL)**	L-0 T-0 P-4 C-2
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding various physicochemical properties of a drug molecule.**	
CO2.	**Determining various physicochemical parameters of a drug molecule to be utilized for developing a stable formulation.**	
Course Contents:		

1. Determination the solubility of drug at room temperature
2. Determination of pKa value by Half Neutralization/ Henderson Hasselbalch equation.
3. Determination of Partition co- efficient of benzoic acid in benzene and water
4. Determination of Partition co- efficient of Iodine in CCl_4 and water
5. Determination of % composition of NaCl in a solution using phenol-water system by CST method
6. Determination of surface tension of given liquids by drop count and drop weight method
7. Determination of HLB number of a surfactant by saponification method
8. Determination of Freundlich and Langmuir constants using activated char coal
9. Determination of critical micellar concentration of surfactants
10. Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubility method
11. Determination of stability constant and donor acceptor ratio of Cupric-Glycine complex by pH titration method

Text Books: (Latest Edition)	1. Physical Pharmaceutics by C.V.S. Subramanyam 2. Test book of Physical Pharmacy, by Gaurav Jain & Roop K. Khar	
Reference Books:	1. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc. 2. Liberman H.A, Lachman C, Pharmaceutical Dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc. 3. Experimental Pharmaceutics by Eugene, Parott. 4. Physical Pharmacy by Alfred Martin 5. Tutorial Pharmacy by Cooper and Gunn. 6. Stocklosam J. Pharmaceutical Calculations, Lea &Febiger, Philadelphia. 7. Physical Pharmaceutics by Ramasamy C and ManavalanR. 8. Laboratory Manual of Physical Pharmaceutics, C.V.S. Subramanyam, J. Thimma settee	

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New Course Added

Course Code: BPHP 353	Skill-Enhancement Course – 10 B.Pharm- Semester-III **PHARMACEUTICAL MICROBIOLOGY (PRACTICAL)**	L-0 T-0 P-4 C-2
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Demonstrating operation of various equipment and processes used in experimental microbiology.**	
CO2.	**Practicing various microbiological assays as well as sterility tests for pharmaceuticals.**	
Course Contents:		

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

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

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New Course Added

Course Code: BPHP 354	Skill-Enhancement Course – 11 B.Pharm- Semester-III **PHARMACEUTICAL ENGINEERING (PRACTICAL)**	L-0 T-0 P-4 C-2
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding various unit operation and material handling techniques used in pharmaceutical industries.**	
CO2.	**Demonstrating various processes involved in pharmaceutical manufacturing.**	
CO3.	**Analyzing various parameters of unit operation process.**	
Course Contents:		

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 andlogarithmic 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 othermajor equipment.
11. Factors affecting Rate of Filtration and Evaporation (Surface area, Concentrationand Thickness/ viscosity
12. To study the effect of time on the Rate of Crystallization.
13. To calculate the uniformity Index for given sample by using Double ConeBlender.

Text Books: (Latest Edition)	1. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition. 2. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition.	

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Reference Books:	1. Solid phase extraction, Principles, techniques and applications by Nigel J.K. Simpson-Latest edition. 2. Remington practice of pharmacy- Martin, Latest edition. 3. Theory and practice of industrial pharmacy by Lachmann., Latest edition. 4. Introduction to chemical engineering – Walter L Badger & Julius Banchero, Latest edition. 5. Unit operation of chemical engineering – Mcabe Smith, Latest edition. 6. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition.	

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New course Added

Course Code: BPHT 401	Core Course – 13 B.Pharm- Semester-IV **PHARMACEUTICAL ORGANIC CHEMISTRY –III**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding the methods of preparation and properties of organic compounds.**	
CO2.	**Explaining stereo chemical aspects and reactions of organic compounds.**	
CO3.	**Demonstrating medicinal use and other application of organic compounds.**	
Course Contents:		
	Note: To emphasize on definition, types, mechanisms, examples, uses/applications	
Unit-1:	**Stereo isomerism** Optical isomerism –Optical activity, enantiomerism, diastereo isomerism, 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	**10 hours**
Unit-2:	Geometrical isomerism, Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems) Methods of determination of configuration of geometrical isomers. Conformational isomerism in Ethane, n-Butane and Cyclohexane. Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity. Stereospecific and stereoselective reactions	**10 hours**
Unit-3:	**Heterocyclic compounds:** Nomenclature and classificationSynthesis, reactions and medicinal uses of following compounds/derivatives Pyrrole, Furan, and ThiopheneRelative aromaticity and reactivity of Pyrrole, Furan and Thiophene	**10 hours**
Unit-4:	Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrazole, Imidazole, Oxazole and Thiazole.Pyridine, Quinoline, Isoquinoline, Acridine and Indole. Basicity of pyridine Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives	**08 hours**
Unit-5:	**Reactions of synthetic importance** Metal hydride reduction ($NaBH_4$ and $LiAlH_4$), Clemmensen reduction, Birch reduction, Wolff Kishner reduction. Oppenauer-oxidation and Dakin reaction. Beckmanns rearrangement and Schmidt rearrangement. Claisen-Schmidt condensation	**07 hours**

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

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New Course Added

Course Code: BPHT 402	Core Course – 14 B.Pharm- Semester-IV **MEDICINAL CHEMISTRY – I**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding the chemistry of drugs, their pharmacological activities, metabolic pathways, adverse effect and therapeutic values.**	
CO2.	**Demonstrating the structure activity relationship (SAR) of different classes of drugs.**	
CO3.	**Illustrating the chemical synthesis of some drugs.**	
Course Contents:		
	Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*)	
Unit-1:	**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.	**10 hours**
Unit-2:	**Drugs acting on Autonomic Nervous System** **Adrenergic Neurotransmitters:** Biosynthesis and catabolism of catecholamine. Adrenergic receptors (Alpha & Beta) and their distribution. **Sympathomimetic agents: SAR of Sympathomimetic agents** Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine*, Dopamine, Methyldopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline. Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine, Propylhexedrine.Agents with mixed mechanism: Ephedrine, Metaraminol.	**10 hours**

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	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-3:	**Cholinergic neurotransmitters:** Biosynthesis and catabolism of acetylcholine. Cholinergic receptors (Muscarinic & Nicotinic) and their distribution. **Para-sympathomimetic 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, Hyoscyaminesulphate, Scopolamine hydrobromide, Homatropine hydrobromide, Ipratropium bromide*. **Synthetic cholinergic blocking agents:** Tropicamide, Cyclopentolate hydrochloride, Clidinium bromide, Dicyclomine hydrochloride*, Glycopyrrolate, Methantheline bromide, Propantheline bromide, Benztropine mesylate, Orphenadrine citrate, Biperidine hydrochloride, Procyclidine hydrochloride*, Tridihexethyl chloride, Isopropamide iodide, Ethopropazine hydrochloride.	**10 hours**
Unit-4:	**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, Ethchloryynol.Aldehyde &	**08 hours**

	their derivatives: Triclofos sodium, Paraldehyde. **B. Antipsychotics** **Phenothiazeines:** SAR of Phenothiazeines - Promazine hydrochloride, Chlorpromazinehydrochloride*, Trifluprомazine, Thioridazine hydrochloride, Piperacetazine hydrochloride, Prochlorperazine maleate, Trifluoperazine hydrochloride. **Ring Analogues of Phenothiazeines:** Chlorprothixene, Thiothixene, Loxapine succinate, Clozapine. **Fluro buterophenones:** Haloperidol, Droperidol, Risperidone. **Beta amino ketones:** Molindone hydrochloride. **Benzamides:** Sulpieride. **C. Anticonvulsants:** SAR of Anticonvulsants, mechanism of anticonvulsantaction **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-5:	**Drugs acting on Central Nervous System** **General anesthetics:** **Inhalation anesthetics:** Halothane*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane. **Ultra-short acting barbitutrates:** Methohexital sodium*, Thiamylalsodium, Thiopental sodium. **Dissociative anesthetics:** Ketamine hydrochloride.* **Narcotic and non-narcotic analgesicsMorphine and related drugs:** SAR of Morphine analogues, Morphinesulphate, 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.	**07 hours**

	Anti-inflammatory agents: Sodium salicylate, Aspirin, Mefenamic acid*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepriac, Diclofenac, Ketorolac, Ibuprofen*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.	
Text Books: (Latest Edition)	1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.	
Reference Books:	1. Martindale's extra pharmacopoeia. 2. Indian Pharmacopoeia 3. Foye's Principles of Medicinal Chemistry. 4. Burger's Medicinal Chemistry, Vol I to IV. 5. Introduction to principles of drug design- Smith and Williams. 6. Remington's Pharmaceutical Sciences. 7. Organic Chemistry by I.L. Finar, Vol. II. 8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5. 2. Text book of practical organic chemistry- A.I. Vogel.	

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New Course Added

Course Code: BPHT 403	Core Course – 15 B.Pharm- Semester-IV **PHYSICAL PHARMACEUTICS-II**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding different physiochemical characteristics of drug molecules in dosage form designing.**	
CO2.	**Explaining reaction kinetics in relation to stability of drugs and dosage forms.**	
CO3.	**Demonstrating use of physicochemical properties in the formulation development and evaluation of dosage forms.**	
Course Contents:		
Unit-1:	**Colloidal dispersions:** Classification of dispersed systems & their generalcharacteristics, size & shapes of colloidal particles, classification of colloids & comparative account of their general properties. Optical, kinetic & electrical properties. Effect of electrolytes, coacervation, peptization& protective action.	**07 hours**
Unit-2:	**Rheology:** Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling Sphere, rotational viscometers **Deformation of solids:** Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus.	**10 hours**
Unit-3:	**Coarse dispersion:** Suspension, interfacial properties of suspended particles, settling insuspensions, 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.	**10 hours**
Unit-4:	**Micromeretics:** Particle size and distribution, mean particle size, number and weight distribution, particle number, methods for determining particle size by different methods, counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.	**10 hours**
Unit-5:	**Drug stability:** Reaction kinetics: zero, pseudo-zero, first & second order, units of basicrate 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	**10 hours**

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New course Added

	medicinal agents against common reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention.	
Text Books: (Latest Edition)	1. Physical Pharmaceutics by Ramasamy C, and Manavalan R.	
Reference Books:	1. Experimental pharmaceutics by Eugene, Parott. 2. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc. 3. Physical Pharmacy by Alfred Martin, Sixth edition 4. Tutorial pharmacy by Cooper and Gunn. 5. Stock losam J. Pharmaceutical calculations, Lea & Febiger, Philadelphia.	

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New course Added

Course Code: BPHT 404	Core Course – 16 B.Pharm- Semester-IV **PHARMACOLOGY-I**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding the pharmacological actions of different categories of drugs.**	
CO2.	**Explaining mechanism of drug action at organ/sub-cellular/macromolecular level.**	
CO3.	**Illustrating effect of drugs on animal models.**	
CO4.	**Applying pharmacological knowledge in prevention and treatment of diseases.**	
Course Contents:		
Unit-1:	**General Pharmacology** Introduction to Pharmacology- Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists (competitive and non-competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs Enzyme induction, enzyme inhibition, kinetics of elimination	**08 hours**
Unit-2:	**General Pharmacology** Pharmacodynamics- Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal transduction mechanisms, G- protein–coupled receptors, ion channel receptor, transmembrane enzyme linked receptors, transmembrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action. Adverse drug reactions. Drug interactions (pharmacokinetic and pharmacodynamic) Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.	**12 hours**
Unit-3:	**Pharmacology of drugs acting on peripheral nervous system** a. Organization and function of ANS. b. Neurohumoral transmission,co-transmission and classification of neurotransmitters.	**10 hours**

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	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-4:	**Pharmacology of drugs acting on central nervous system** Neurohumoral transmission in the C.N.S. special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine. General anesthetics and pre- anesthetics. Sedatives, hypnotics and centrally acting muscle relaxants. Anti-epileptics, Alcohols and disulfiram	**08 hours**
Unit-5:	**Pharmacology of drugs acting on central nervous system** Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, anti-manics and hallucinogens. Drugs used in Parkinsons disease and Alzheimer's disease. CNS stimulants and nootropics. Opioid analgesics and antagonists Drug addiction, drug abuse, tolerance and dependence.	**07 hours**
Text Books: (Latest Edition)	1. K.D. Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi. 2. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher	
Reference Books:	1. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw- Hill 2. Goodman and Gilman's, The Pharmacological Basis of Therapeutics 3. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier 4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins 5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology 6. Modern Pharmacology with clinical Applications, by Charles R. Craig & Robert, 7. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata. 8. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan.	

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New course Added

Course Code: BPHT 405	Core Course – 17 B.Pharm- Semester-IV **PHARMACOGNOSY AND PHYTOCHEMISTRY - I**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding the techniques in the cultivation and production of crude drugs.**	
CO2.	**Describing the crude drugs, their uses and chemical nature.**	
CO3.	**Illustrating the evaluation techniques for the herbal drugs.**	
CO4.	**Analysing the microscopic and morphological evaluation of crude drugs.**	
Course Contents:		
Unit-1:	**Introduction to Pharmacognosy:** Definition, history, scope and development of Pharmacognosy Sources of Drugs – Plants, Animals, Marine & Tissue culture Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins). **Classification of drugs:** Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs **Quality control of Drugs of Natural Origin:** Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties. Quantitative microscopy of crude drugs including lycopodium spore method, leaf constants, camera lucida and diagrams of microscopic objects to scale with camera lucida.	**10 hours**
Unit-2:	**Cultivation, Collection, Processing and storage of drugs of natural origin:** Cultivation and Collection of drugs of natural origin, Factors influencing cultivation of medicinal plants. Plant hormones and their applications. Polyploidy, mutation and hybridization with reference to medicinal plants **Conservation of medicinal plants**	**10 hours**
Unit-3:	**Plant tissue culture:** Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance. Applications of plant tissue culture in pharmacognosy. Edible vaccines	**07 hours**

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Unit-4:	**Pharmacognosy in various systems of medicine:** Role of Pharmacognosy in allopathy and traditional systems of medicine namely, Ayurveda, Unani, Siddha, Homeopathy and Chinese systems of medicine. **Introduction to secondary metabolites:** Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins	**10 hours**
Unit-5:	Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs **Plant Products:** Fibers - Cotton, Jute, HempHallucinogens, Teratogens, Natural allergens **Primary metabolites:** General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic used and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites: **Carbohydrates:** Acacia, Agar, Tragacanth, Honey **Proteins and Enzymes:** Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin). **Lipids (Waxes, fats, fixed oils):** Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax **Marine Drugs:** Novel medicinal agents from marine sources	**08 hours**
Text Books: (Latest Edition)	1. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, NewDelhi. 2. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi,2007	
Reference Books:	1. W.C. Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009. 2 Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988. 3 Text Book of Pharmacognosy by T.E.Wallis 4 Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, NewDelhi. 5 Herbal drug industry by R.D. Choudhary (1996), IstEdn, Eastern Publisher, NewDelhi. 6 Practical Pharmacognosy: C.K. Kokate, Purohit,Gokhlae 7 Anatomy of Crude Drugs by M.A.Iyengar.	

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New course Added

Course Code: BPHP 451	Skill-Enhancement Course – 12 B.Pharm- Semester-IV **MEDICINAL CHEMISTRY – I (PRACTICAL)**	L-0 T-0 P-4 C-2
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Recognizing various mechanisms for synthesis of drugs or their intermediates.**	
CO2.	**Explaining the principal involved in assay of drugs in dosage forms.**	
CO3.	**Illustrating different physico-chemical properties of various classes of drug.**	
Course Contents:		

I. Preparation of drugs/ intermediates

1,3-pyrazole, 1,3-oxazole, Benzimidazole, Benztriazole, 2,3- diphenyl quinoxaline, Benzocaine, Phenytoin, Phenothiazine, Barbiturate.

II. Assay of drugs

Chlorpromazine, Phenobarbitone, Atropine, Ibuprofen, Aspirin, Furosemide

III. Determination of Partition coefficient for any two drugs

Text Books: (Latest Edition)	1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.	
Reference Books:	1. Martindale's extra pharmacopoeia. 2. Foye's Principles of Medicinal Chemistry. 3. Burger's Medicinal Chemistry, Vol I to IV. 4. Introduction to principles of drug design- Smith and Williams. 5. Remington's Pharmaceutical Sciences. 6. Organic Chemistry by I.L. Finar, Vol. II. 7. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5. 8. Text book of practical organic chemistry- A.I. Vogel. 9. Indian Pharmacopoeia.	

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New course Added

Course Code: BPHP 452	Skill-Enhancement Course – 13 B.Pharm- Semester-IV **PHYSICAL PHARMACEUTICS- II (PRACTICAL)**	L-0 T-0 P-4 C-2
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding role of different physiochemical parameters in dosage form designing.**	
CO2.	**Determining various physiochemical parameters of drug and excipients using various instrumental techniques.**	
Course Contents:		

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

Text Books: (Latest Edition)	1. Physical Pharmaceutics by Ramasamy C, and Manavalan R.	
Reference Books:	1. Experimental pharmaceutics by Eugene, Parott. 2. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc. 3. Physical Pharmacy by Alfred Martin, Sixth edition 4. Tutorial pharmacy by Cooper and Gunn. 5. Stocklosam J. Pharmaceutical calculations, Lea & Febiger, Philadelphia.	

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New course Added

Course Code: BPHP 453	Skill-Enhancement Course – 14 B.Pharm- Semester-IV **PHARMACOLOGY-I (PRACTICAL)**	L-0 T-0 P-4 C-2
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding the use of instruments and techniques in experimental pharmacology.**	
CO2.	**Demonstrating the different routes of drug administration on animal models.**	
CO3.	**Analyzing drug actions using simulated experiments on animal models.**	
Course Contents:		

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

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

Text Books: (Latest Edition)	1. K.D. Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi. 2. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher	
Reference Books:	1. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw- Hill 2. Goodman and Gilman's, The Pharmacological Basis of Therapeutics 3. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier 4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied	

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	Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins 5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology 6. Modern Pharmacology with clinical Applications, by Charles R. Craig & Robert, 7. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata. 8. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan,	

New course Added.

Course Code: BPHP 454	Skill-Enhancement Course – 15 B.Pharm- Semester-IV **PHARMACOGNOSY AND PHYTOCHEMISTRY - I (PRACTICAL)**	L-0 T-0 P-4 C-2
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Illustrating various physic-chemical parameters of crude drugs through chemical tests and microscopical examination.**	
CO2.	**Analysing various physic-chemical parameters of crude drugs for its standardization.**	
Course Contents:		

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 piece micrometer
5. Determination of Fiber length and width
6. Determination of number of starch grains by Lycopodium spore method
7. Determination of Ash value
8. Determination of Extractive values of crude drugs
9. Determination of moisture content of crude drugs
10. Determination of swelling index and foaming

Text Books: (Latest Edition)	1. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi,2007 2. Practical Pharmacognosy: C.K. Kokate, Purohit,Gokhlae Anatomy of Crude Drugs by M.A.Iyengar.	
Reference Books:	1. W.C. Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009. 2. Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988. 3. Text Book of Pharmacognosy by T.E.Wallis 4. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, NewDelhi. 5. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, NewDelhi. 6. Herbal drug industry by R.D. Choudhary (1996), IstEdn, Eastern Publisher, NewDelhi.	

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New course Added

Course Code: BPHT 501	Core Course – 18 B.Pharm- Semester-V **MEDICINAL CHEMISTRY – II**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding the chemistry of drugs with respect to their pharmacological activity.**	
CO2.	**Explaining drug metabolic pathways, adverse effects and therapeutic values of drugs.**	
CO3.	**Describing structural Activity Relationship of different class of drugs.**	
CO4.	**Demonstrating synthesis of selected drugs.**	
Course Contents:		
	Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*)	
Unit-1:	**Antihistaminic agents:** Histamine, receptors and their distribution in the human body **H_1–antagonists:** Diphenhydramine hydrochloride*, Dimenhydrinate, Doxylamines cuccinate, Clemastine fumarate, Diphenylphyraline hydrochloride, Tripelenamine hydrochloride, Chlorcyclizine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidinehydrochloride*, Phenidamine tartarate, Promethazine hydrochloride*, Trimeprazine tartrate, Cyproheptadine hydrochloride, Azatidine maleate, Astemizole, Loratadine, Cetirizine, Levocetrazine Cromolyn sodium **H_2-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	**10 hours**

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	Plant products: Etoposide, Vinblastin sulphate, Vincristin sulphate **Miscellaneous:** Cisplatin, Mitotane.	
Unit-2:	**Anti-anginal:** **Vasodilators:** Amyl nitrite, Nitroglycerin*, Pentaerythritol tetranitrate, Isosorbidedinitrite*, Dipyridamole. **Calcium channel blockers:** Verapamil, Bepridil hydrochloride, Diltiazemhydrochloride, 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.	**10 hours**
Unit-3:	**Anti-arrhythmic Drugs**: Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcainide hydrochloride, Amiodarone, Sotalol. **Anti-hyperlipidemic agents**: Clofibrate, Lovastatin, Cholesteramine andCholestipol **Coagulant & Anticoagulants**: Menadione, Acetomenadione, Warfarin*, Anisindione, clopidogrel **Drugs used in Congestive Heart Failure:** Digoxin, Digitoxin, Nesiritide, Bosentan, ezosentan.	**10 hours**
Unit-4:	**Drugs acting on Endocrine system** Nomenclature, Stereochemistry and metabolism of steroids **Sex hormones**: Testosterone, Nandralone, Progestrones, Oestriol, Oestradiol, Oestrione, Diethyl stilbestrol. **Drugs for erectile dysfunction:** Sildenafil, Tadalafil. **Oral contraceptives:** Mifepristone, Norgestril, Levonorgestrol **Corticosteroids:** Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone	**08 hours**

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	Thyroid and antithyroid drugs: L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole	
Unit-5:	**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.*	**07 hours**
Text Books:	1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.	
Reference Books:	1. Martindale's extra pharmacopoeia. 2. Indian Pharmacopoeia. 3. Burger's Medicinal Chemistry, Vol I to IV. 4. Introduction to principles of drug design- Smith and Williams. 5. Remington's Pharmaceutical Sciences. 6. Organic Chemistry by I.L. Finar, Vol. II. 7. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1to 5. 8. Text book of practical organic chemistry- A.I. Vogel. 9. Foye's Principles of Medicinal Chemistry.	

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New Course Added

Course Code: BPHT 502	Core Course – 19 B.Pharm- Semester-V **INDUSTRIAL PHARMACY - I**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding concepts and factors in development of pharmaceutical dosage forms.**	
CO2.	**Describing various pharmaceutical dosage forms and their manufacturing techniques.**	
CO3.	**Illustrating formulation of solid, liquid and semisolid dosage forms.**	
CO4.	**Evaluating different dosage forms for its quality and stability.**	
Course Contents:		
Unit-1:	**Pre-formulation Studies**: Introduction to preformulation, goals and objectives, study of physicochemical characteristics of drug substances. **Physical properties:** Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism **Chemical Properties:** Hydrolysis, oxidation, reduction, racemisation, polymerization, BCS classification of drugs & its significant, Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.	**07 hours**
Unit-2:	**Tablets:** Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipments and tablet tooling. Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating. 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.	**10 hours**
Unit-3:	***Hard gelatin capsules:*** Introduction, Production of hard gelatin capsule shells. sizeof capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. In process and final product quality control tests for capsules. ***Soft gelatin capsules:*** Nature of shell and capsule content, size ofcapsules, 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	**08 hours**

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	their applications. **Pellets:** Introduction, formulation requirements, pelletization process, equipments for manufacture of pellets	
Unit-4:	**Parenteral Products:** Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity. Production procedure, production facilities and controls, aseptic processing, Formulation of injections, sterile powders, large volume parenterals and lyophilized products. 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 eyedrops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations	**10 hours**
Unit-5:	**Cosmetics:** Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens. **Pharmaceutical Aerosols:** Definition, propellants, containers, valves, types of aerosolsystems; 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.	**10 hours**
Text Books: (Latest Edition)	1. Theory and Practice of Industrial Pharmacy by Liberman & Lachman	
Reference Books:	1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman &J.B. Schwartz 2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman 3. Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman 4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition 5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS) 6. Pharmaceutics- The science of dosage form design by M.E. Aulton, Churchill livingstone, Latest edition 7. Introduction to Pharmaceutical Dosage Forms by H. C. Ansel, Lea &Febiger, Philadelphia, 5 edition, 2005 8. Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.	

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New Course Added

Course Code: BPHT 503	Core Course – 20 B.Pharm- Semester-V **PHARMACOLOGY-II**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding the mechanism of drug actions in relevance to its therapeutic use.**	
CO2.	**Illustrating drug's action in isolated tissues or organs using simulated animal model.**	
CO3.	**Demonstrating various receptor mediated actions using isolated tissue preparations.**	
CO4.	**Analyzing correlation of pharmacology with related medical sciences.**	
Course Contents:		
Unit-1:	**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.	**10 hours**
Unit-2:	**Pharmacology of drugs acting on cardio vascular system** Drug used in the therapy of shock.Hematinics, coagulants and anticoagulants.Fibrinolytics and anti-platelet drugsPlasma volume expanders **Pharmacology of drugs acting on urinary system** Diuretics, Anti-diuretics.	**10 hours**
Unit-3:	**Autocoids and related drugs** Introduction to autacoids and classificationHistamine, 5-HT and their antagonists. Prostaglandins, Thromboxanes and Leukotrienes.Angiotensin, Bradykinin and Substance P.Non-steroidal anti- inflammatory agents, Anti-gout drugs, Antirheumatic drugs.	**10 hours**
Unit-4:	**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.	**08 hours**
Unit-5:	**Pharmacology of drugs acting on endocrine system** Androgens and Anabolic steroids.	**07 hours**

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	Estrogens, progesterone and oral contraceptives. Drugs acting on the uterus. **Bioassay** a. Principles and applications of bioassay. b. Types of bioassay c. Bioassay of insulin, oxytocin, vasopressin, ACTH, d-tubocurarine, digitalis, histamine and 5- HT	
Text Books: (Latest Editions)	1. K.D. Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi. 2. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher	
Reference Books:	1. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw- Hill. 2. Goodman and Gilman's, The Pharmacological Basis of Therapeutics 3. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier 4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins. 5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology. 6. Modern Pharmacology with clinical Applications, by Charles R. Craig& Robert. 7. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata. 8. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.	

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New course Added

Course Code: BPHT 504	Core Course – 21 B.Pharm- Semester-V **PHARMACOGNOSY AND PHYTOCHEMISTRY - II**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding modern extraction techniques, isolation, characterization and identification of the herbal drugs and its phytoconstituents.**	
CO2.	**Demonstrating the preparation and development of herbal formulations.**	
CO3.	**Interpreting herbal drug interactions.**	
CO4.	**Analysing isolated phytoconstituents for its chemical nature and structural Configuration.**	
Course Contents:		
Unit-1:	**Metabolic pathways in higher plants and their determination** Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways- Shikimic acid pathway, Acetate pathways and Amino acid pathway. Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.	**07 hours**
Unit-2:	General introduction, composition, chemistry & chemical classes, biosources, therapeutic uses and commercial applications of following secondary metabolites: **Alkaloids:** Vinca, Rauwolfia, Belladonna, Opium, **Phenylpropanoids and Flavonoids:** Lignans, Tea, Ruta. **Steroids, Cardiac Glycosides & Triterpenoids**: Liquorice, Dioscorea, Digitalis. **Volatile oils**: Mentha, Clove, Cinnamon, Fennel, Coriander, **Tannins:** Catechu, Pterocarpus. **Resins:** Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony. **Glycosides:** Senna, Aloes, Bitter Almond. **Iridoids, Other terpenoids & Naphthaquinones:** Gentian, Artemisia, taxus, carotenoids	**14 hours**
Unit-3:	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	**06 hours**
Unit-4:	Industrial production, estimation and utilization of the following phytoconstituents: Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastine	**10 hours**
Unit-5:	**Basics of Phytochemistry:** Modern methods of extraction, application of latest techniques like Spectroscopy, chromatography and	**08 hours**

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

New course Added

Course Code: BPHT 505	Core Course – 22 B.Pharm- Semester-V **PHARMACEUTICAL JURISPRUDENCE**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding the pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals.**	
CO2.	**Recognizing various regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals.**	
CO3.	**Demonstrating various Acts and Laws pertaining to manufacturing, sale and distribution of drugs and pharmaceuticals in India.**	
CO4.	**Applying the code of ethics during the pharmaceutical practice.**	
Course Contents:		
Unit-1:	**Drugs and Cosmetics Act, 1940 and its rules 1945:** Objectives, Definitions, Legal definitions of schedules to the Act and Rules Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties. Manufacture of drugs – Prohibition of manufacture and sale of certain drugs, Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.	**10 hours**
Unit-2:	**Drugs and Cosmetics Act, 1940 and its rules 1945.** Detailed study of Schedule G, H, M, N, P, T, U, V, X, Y, Part XII B, Sch F & DMR (OA) Sale of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties Labeling & Packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties. Administration of the Act and Rules – Drugs Technical Advisory Board, Central drugs Laboratory, Drugs Consultative Committee, Government drug analysts, Licensing authorities, controlling authorities, Drugs Inspectors	**10 hours**
Unit-3:	**Pharmacy Act –1948**: Objectives, Definitions, Pharmacy Council of India; itsconstitution and functions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of Pharmacists, Offences and Penalties.	**10 hours**

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	Medicinal and Toilet Preparation Act –1955: Objectives, Definitions, Licensing, Manufacture In bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations. Offences and Penalties. **Narcotic Drugs and Psychotropic substances Act-1985 and Rules**: Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties.	
Unit-4:	**Study of Salient Features of Drugs and Magic Remedies Act and its rules:** Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties **Prevention of Cruelty to animals Act-1960:** Objectives, Definitions, Institutional Animal Ethics Committee, CPCSEA guidelines for Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties **National Pharmaceutical Pricing Authority:** Drugs Price Control Order (DPCO)-2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of Essential Medicines (NLEM)	**08 hours**
Unit-5:	**Pharmaceutical Legislations** – A brief review, Introduction, Study of drugs enquirycommittee, Health survey and development committee, Hathi committee and Mudaliar committee **Code of Pharmaceutical ethics** Definition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath **Medical Termination of Pregnancy Act Right to Information Act** **Introduction to Intellectual Property Rights (IPR)**	**07 hours**
Text Books: (Latest Editions)	1. Text book of Forensic Pharmacy by B.M. Mithal 2. A text book of Forensic Pharmacy by N.K. Jain	
Reference Books:	1. Drugs and Cosmetics Act/Rules by Govt. of India publications. 2. Medicinal and Toilet preparations act 1955 by Govt. of	

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	India publications. 3. Narcotic drugs and psychotropic substances act by Govt. of India publications 4. Drugs and Magic Remedies act by Govt. of India publication 3. Bare Acts of the said laws published by Government. Reference books (Theory) 4. Forensic Pharmacy by B. Suresh 5. Hand book of drug law-by M.L. Mehra	

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New Course Added

Course Code: BPHP 551	Skill-Enhancement Course – 16 B.Pharm- Semester-V **INDUSTRIAL PHARMACY - I (PRACTICAL)**	L-0 T-0 P-4 C-2
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding the importance of preformulation and rational behind use of formulation ingredients.**	
CO2.	**Stating the functioning of various equipments used for liquid, solid, and semisolid dosage form formulations.**	
CO3.	**Formulating various dosage forms.**	
CO4.	**Evaluating various dosage forms for its quality and efficacy.**	
Course Contents:		

1. Preformulation studies on paracetamol/aspirin/or any other drug
2. Preparation and evaluation of Paracetamol tablets
3. Preparation and evaluation of Aspirin tablets
4. Coating of tablets- film coating of tables/granules
5. Preparation and evaluation of Tetracycline capsules
6. Preparation of Calcium Gluconate injection
7. Preparation of Ascorbic Acid injection
8. Quality control test of (as per IP) marketed tablets 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)

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

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New course Added

Course Code: BPHP 552	Skill-Enhancement Course – 17 B.Pharm- Semester-V **PHARMACOLOGY-II (PRACTICAL)**	L-0 T-0 P-4 C-2
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Demonstrating drug effects using computer model.**	
CO2.	**Estimating biochemical parameters in body fluids.**	
CO3.	**Experimenting on isolated tissue preparation and *in vivo* studies.**	
CO4.	**Analysing various receptor site interactions using isolated tissue preparations.**	
Course Contents:		

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 PA_2 value of prazosin using rat anococcygeus muscle (by Schilds plot method).
12. Determination of PD_2 value using guinea pig ileum.
13. Effect of spasmogens and spasmolytics using rabbit jejunum.
14. Anti-inflammatory activity of drugs using carrageenan induced paw-edema model.
15. Analgesic activity of drug using central and peripheral methods

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

Text Books: (Latest Edition)	1. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.	
Reference Books:	1. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw- Hill. 2. Goodman and Gilman's, The Pharmacological Basis of Therapeutics 3. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology 4. K.D. Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.	

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New Course Added

Course Code: BPHP 553	Skill-Enhancement Course – 18 B.Pharm- Semester-V **PHARMACOGNOSY AND PHYTOCHEMISTRY-II (PRACTICAL)**	L-0 T-0 P-4 C-2
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Examining phytoconstituents belongs to different chemical groups.**	
CO2.	**Analysing crude drugs by chemical tests.**	
CO3.	**Evaluating and characterizing crude drugs belongs to various chemical class.**	
Course Contents:		

1. Morphology, histology and powder characteristics & extraction & detection of: Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander,
2. Exercise involving isolation & detection of active principles
   Caffeine - from tea dust.
   Diosgenin from Dioscorea
   Atropine from Belladonna
   Sennosides from Senna
3. Separation of sugars by Paper chromatography
4. TLC of herbal extract
5. Distillation of volatile oils and detection of phytoconstitutents by TLC
6. Analysis of crude drugs by chemical tests:
   (i) Asafoetida (ii) Benzoin (iii) Colophony (iv) Aloes (v) Myrrh

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

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New Course Added

Course Code: BPHT 601	Core Course – 23 B.Pharm- Semester-VI **MEDICINAL CHEMISTRY – III**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding the chemistry of drugs with respect to their pharmacological activity.**	
CO2.	**Explaining the importance of drug design and different techniques of drug design.**	
CO3.	**Describing structural Activity Relationship of different classes of drug.**	
CO4.	**Demonstrating the drug metabolic pathways, adverse effect and therapeutic value of drugs.**	
Course Contents:		
	Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted by (*)	
Unit-1:	**Antibiotics** Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes. **β-Lactam antibiotics:** Penicillin, Cepholosporins, β - Lactamase inhibitors, Monobactams **Aminoglycosides:** Streptomycin, Neomycin, Kanamycin **Tetracyclines:** Tetracycline, Oxytetracycline, Chlortetracycline, Minocycline, Doxycycline	**10 hours**
Unit-2:	**Antibiotics** Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes. **Macrolide:** Erythromycin Clarithromycin, Azithromycin. **Miscellaneous:** Chloramphenicol*, Clindamycin. **Prodrugs:** Basic concepts and application of prodrugs design. **Antimalarials:** Etiology of malaria. **Quinolines:** SAR, Quinine sulphate, Chloroquine*, Amodiaquine, Primaquine phosphate, Pamaquine*, Quinacrine hydrochloride,	**10 hours**

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	Mefloquine. **Biguanides and dihydro triazines:** Cycloguanil pamoate, Proguanil. **Miscellaneous:** Pyrimethamine, Artesunete, Artemether, Atovoquone	
Unit-3:	**Anti-tubercular Agents** **Synthetic anti tubercular agents:** Isoniozid*, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid.* **Anti-tubercular antibiotics:** Rifampicin, Rifabutin, Cycloserine, Streptomycine, Capreomycin sulphate. **Urinary tract anti-infective agents -** **Quinolones:** SAR of quinolones, Nalidixic Acid, Norfloxacin, Enoxacin, Ciprofloxacin*, Ofloxacin, Lomefloxacin, Sparfloxacin, Gatifloxacin, Moxifloxacin Miscellaneous: Furazolidine, Nitrofurantoin*, Methanamine. **Antiviral agents:** Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine trifluoride, Acyclovir*, Gancyclovir, Zidovudine, Didanosine, Zalcitabine, Lamivudine, Loviride, Delavirding, Ribavirin, Saquinavir, Indinavir, Ritonavir.	**10 hours**
Unit-4:	**Antifungal agents:** **Antifungal antibiotics:** Amphotericin-B, Nystatin, Natamycin, Griseofulvin. **Synthetic Antifungal agents:** Clotrimazole, Econazole, Butoconazole, Oxiconazole Tioconozole, Miconazole*, Ketoconazole, Terconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate*. **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*.	**08 hours**

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Unit-5:	**Introduction to Drug Design** Various approaches used in drug design. Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient, Hammet's electronic parameter, Tafts steric parameter and Hansch analysis. Pharmacophore modeling and docking techniques. **Combinatorial Chemistry:** Concept and applications of combinatorial chemistry: solid phase and solution phase synthesis.	**07 hours**
Text Books: (Latest Editions)	1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.	
Reference Books:	1. Martindale's extra pharmacopoeia. 2. Indian Pharmacopoeia. 3. Foye's Principles of Medicinal Chemistry. 4. Burger's Medicinal Chemistry, Vol I to IV. 5. Introduction to principles of drug design- Smith and Williams. 6. Remington's Pharmaceutical Sciences. 7. Organic Chemistry by I.L. Finar, Vol. II. 8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5. 9. Text book of practical organic chemistry- A.I. Vogel.	

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New course Added

Course Code: BPHT 602	Core Course – 24 B.Pharm- Semester-VI **PHARMACOLOGY-III**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding the mechanism of drug actions in relevance to its therapeutic use.**	
CO2.	**Recognizing the principles of toxicology and treatment of poisoning.**	
CO3.	**Analyzing correlation of pharmacology with related medical sciences.**	
Course Contents:		
Unit-1:	**Pharmacology of drugs acting on Respiratory system** Anti -asthmatic drugs, Drugs used in the management of COPD, Expectorants and antitussives Nasal decongestants, Respiratory stimulants **Pharmacology of drugs acting on the Gastrointestinal Tract** Antiulcer agents. Drugs for constipation and diarrhoea. Appetite stimulants and suppressants. Digestants and carminatives. Emetics and anti-emetics.	**10 hours**
Unit-2:	**Chemotherapy** General principles of chemotherapy. Sulfonamides and cotrimoxazole. Antibiotics - Penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides	**10 hours**
Unit-3:	**Chemotherapy** Antitubercular agents, Antileprotic agents, Antifungal agents, Antiviral drugs, Anthelmintics, Antimalarial drugs, Antiamoebic agents	**10 hours**
Unit-4:	**Chemotherapy** Urinary tract infections and sexually transmitted diseases. Chemotherapy of malignancy. **Immunopharmacology** Immunostimulants, Immunosuppressant, Protein drugs, monoclonal antibodies, target drugs to antigen, biosimilars	**08 hours**
Unit-5:	**Principles of toxicology** Definition and basic knowledge of acute, subacute and chronic toxicity. Definition and basic knowledge of genotoxicity,	**07 hours**

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	carcinogenicity, teratogenicity and mutagenicity. General principles of treatment of poisoning, Clinical symptoms and management of barbiturates, morphine, organophosphorus compound and lead, mercury and arsenic poisoning. **Chronopharmacology** Definition of rhythm and cycles. Biological clock and their significance leading to chronotherapy	
Text Books: (Latest Editions)	1. K.D. Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi. 2. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher Modern Pharmacology with clinical Applications, by Charles R. Craig& Robert,	
Reference Books:	1. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill 2. Goodman and Gilman's, The Pharmacological Basis of Therapeutics 3. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier 4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs. The Point Lippincott Williams & Wilkins 5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology 6. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata, 7. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan, 8. N. Udupa and P.D. Gupta, Concepts in Chronopharmacology.	

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New course Added

Course Code: BPHT 603	Core Course – 25 B.Pharm- Semester-VI **HERBAL DRUG TECHNOLOGY**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding raw material as source of herbal drugs from cultivation to herbal drug product.**	
CO2.	**Explaining the WHO and ICH guidelines for evaluation of herbal drugs.**	
CO3.	**Recognising the herbal cosmetics, natural sweeteners, nutraceuticals.**	
CO4.	**Illustrating patenting of herbal formulations.**	
Course Contents:		
Unit-1:	**Herbs as raw materials** Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation Source of Herbs Selection, identification and authentication of herbal materials Processing of herbal raw material **Biodynamic Agriculture** Good agricultural practices in cultivation of medicinal plants including Organic farming. Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides. **Indian Systems of Medicine** Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy Preparation and standardization of Ayurvedic formulations viz Aristas and Asawas, Ghutika, Churna, Lehya and Bhasma.	**11 hours**
Unit-2:	**Nutraceuticals** General aspects, Market, growth, scope and types of products available in the market. Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases. Study of following herbs as health food: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina **Herbal-Drug and Herb-Food Interactions:** General introduction to interaction andclassification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra.	**07 hours**

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Unit-3:	**Herbal Cosmetics** Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products. **Herbal excipients:** Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes. **Herbal formulations:** Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes	**10 hours**
Unit-4:	**Evaluation of Drugs** WHO & ICH guidelines for the assessment of herbal drugsStability testing of herbal drugs. **Patenting and Regulatory requirements of natural products:** Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting and Biopiracy Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma & Neem. **Regulatory Issues** - Regulations in India (ASU DTAB, ASU DCC), Regulation ofmanufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs.	**10 hours**
Unit-5:	**General Introduction to Herbal Industry** Herbal drugs industry: Present scope and future prospects. A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India. **Schedule T–Good Manufacturing Practice of Indian systems of medicine** Components of GMP (Schedule – T) and its objectives Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records.	**07 hours**
Text Books: (Latest Editions)	1. Essential of Pharmacognosy by Dr.S.H. Ansari 2. Pharmacognosy & Phytochemistry by V.D. Rangari	

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Reference Books:	1. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy) 2. Zaborsky: Immobilized Enzymes, CRC Press, Degraland, Ohio. 3. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication 4. Textbook of Pharmacognosy by Trease & Evans. 5. Textbook of Pharmacognosy by Tyler, Brady & Robber. 6. Pharmacognosy by Kokate, Purohit and Gokhale 7. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002. 3. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi	

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New Course Added

Course Code: BPHT 604	Core Course – 26 B.Pharm- Semester-VI **BIOPHARMACEUTICS AND PHARMACOKINETICS**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding basic concepts in biopharmaceutics and pharmacokinetics and their significance.**	
CO2.	**Describing the concepts of bioavailability and bioequivalence of drug products and their significance.**	
CO3.	**Applying pharmacokinetic parameters in calculation and fixation of dosage regimen.**	
CO4.	**Analysing plasma drug concentration versus time data to calculate pharmacokinetic parameters and profiles of drug/formulations.**	
Course Contents:		
Unit-1:	**Introduction to Biopharmaceutics** **Absorption**; Mechanisms of drug absorption through GIT, factors influencing drugabsorption though GIT, absorption of drug from Non per oral extra-vascular routes, **Distribution** Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting protein-drug binding. Kinetics of protein binding, Clinical significance of protein binding of drugs	**10 hours**
Unit-2:	**Elimination:** Drug metabolism and basic understanding metabolic pathways renalexcretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non renal routes of drug excretion of drugs **Bioavailability and Bioequivalence:** Definition and Objectives of bioavailability, absolute and relative bioavailability, measurement of bioavailability, *in-vitro* drug dissolution models, *in- vitro-in-vivo* correlations, bioequivalence studies, methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.	**10 hours**
Unit-3:	**Pharmacokinetics:** Definition and introduction to Pharmacokinetics, Compartment models, Non compartment models, physiological models, one compartment open model. (a). Intravenous Injection (Bolus) (b). Intravenous infusion and (c) Extra vascular administrations. Pharmacokinetics parameters - K_E, t1/2, Vd, AUC, Ka, Clt and CL_R- definitions methods of eliminations, understanding of their significance and application.	**10 hours**
Unit-4:	***Multi compartment models:*** Two compartment open model. IV	**08 hours**

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	bolus Kinetics of multiple dosing, steady state drug levels, calculation of loading and mainetnance doses and their significance in clinical settins.	
Unit-5:	**Nonlinear Pharmacokinetics:** a. Introduction, b. Factors causing Non-linearity. c. Michaelis-menton method of estimating parameters, Explanation with example of drugs.	**07 hours**
Text Books: (Latest Editions)	1. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B. Jaiswal, Vallabh Prakashan Pitampura, Delhi	
Reference Books:	1. Applied biopharmaceutics and pharmacokinetics, Leon Shargel and Andrew B.C.YU 4th edition, Prentice-Hall Inernational edition.USA 2. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company, Pennsylvania 1989. 3. Clinical Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and Thomas, N. Tozen, Lea and Febrger, Philadelphia, 1995. 4. Remington's Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvnia 5. Pharmacokinetics: By Milo Glbaldi Donald, R. Mercel Dekker Inc. 6. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press. 7. Biopharmaceutics; By Swarbrick 8. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Rebort F Notari Marcel Dekker Inn, New York and Basel, 1987. 9. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi. 10. Biopharmaceutics and Pharmacokinetics; By Robert F Notari	

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New Course Added

Course Code: BPHT 605	Core Course – 27 B.Pharm- Semester-VI **PHARMACEUTICAL BIOTECHNOLOGY**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding basic concepts of biotechnology and its application in pharmaceutical industries.**	
CO2.	**Demonstrating genetic engineering applications in relation to production of pharmaceuticals.**	
CO3.	**Explaining the production/processing and storage of some of the antibiotics, vitamins, blood product and plasma substitutes.**	
CO4.	**Employing the use of microorganisms in fermentation technology.**	
Course Contents:		
Unit-1:	Brief introduction to Biotechnology with reference to Pharmaceutical Sciences. Enzyme Biotechnology- Methods of enzyme immobilization and applications. Biosensors- Working and applications of biosensors in Pharmaceutical Industries. Brief introduction to Protein Engineering. Use of microbes in industry. Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase. Basic principles of genetic engineering.	**10 hours**
Unit-2:	Study of cloning vectors, restriction endonucleases and DNA ligase. Recombinant DNA technology. Application of genetic engineering in medicine. Application of r DNA technology and genetic engineering in the production of: a) Interferon b) Vaccines- hepatitis- B c) Hormones - Insulin. Brief introduction to PCR,	**10 hours**
Unit-3:	Types of immunity- humoral immunity, cellular immunity, Structure of Immunoglobulins Structure and Function of MHC, Hypersensitivity reactions, Immune stimulation and Immune suppressions. General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity. Storage conditions and stability of official vaccines, Hybridoma technology- Production, Purification and Applications. Blood products and Plasma Substitutes.	**10 hours**

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Unit-4:	Immuno blotting techniques- ELISA, Western blotting, Southern blotting. Genetic organization of Eukaryotes and Prokaryotes. Microbial genetics including transformation, transduction, conjugation, plasmids and transposons. Introduction to Microbial biotransformation and applications. Mutation: Types of mutation/mutants.	**08 hours**
Unit-5:	Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring. Large scale production fermenter design and its various controls. Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin.	**07 hours**
Text Books: (Latest Editions)	1. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of RecombinantDNA: ASM Press Washington D.C.	
Reference Books:	1. J.W. Goding: Monoclonal Antibodies. 2. J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by Royal Society of Chemistry. 3. RA Goldshy et. al.: Kuby Immunology	

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New Course Added

Course Code: BPHT 606	Core Course – 28 B.Pharm- Semester-VI **PHARMACEUTICAL QUALITY ASSURANCE**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding the cGMP aspects, scope of quality certifications applicable to pharmaceutical industries.**	
CO2.	**Explaining the responsibilities of QA & QC departments and regulatory aspects of pharmaceuticals.**	
Course Contents:		
Unit-1:	**Quality Assurance and Quality Management concepts:** Definition and concept of Quality control, Quality assurance and GMP **Total Quality Management (TQM):** Definition, elements, philosophies **ICH Guidelines**: 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	**10 hours**
Unit-2:	**Organization and personnel:** Personnel responsibilities, training, hygiene and personal records. **Premises:** Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination. **Equipments and raw materials:** Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials.	**10 hours**
Unit-3:	**Quality Control:** Quality control test for containers, rubber closures and secondary packing materials. **Good Laboratory Practices:** General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities	**10 hours**
Unit-4:	**Complaints:** Complaints and evaluation of complaints, Handling	**08 hours**

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	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-5:	**Calibration and Validation:** Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation. **Warehousing:** Good warehousing practice, materials management	**07 hours**
Text Books: (Latest Editions)	1. A guide to Total Quality Management- Kushik Maitra and Sedhan K Ghosh	
Reference Books:	1. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69. 2. The International Pharmacopoeia – Vol I, II, III, IV- General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excipients and Dosage forms 3. Good laboratory Practices – Marcel Deckker Series 4. Quality Assurance Guide by organization of Pharmaceutical Products of India. 5. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Related materials Vol I WHO Publications. 6. How to Practice GMP's – P P Sharma. 7. ISO 9000 and Total Quality Management – Sadhank G Ghosh 8. ICH guidelines, ISO 9000 and 14000 guidelines	

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New course Added

Course Code: BPHP 651	Skill-Enhancement Course – 19 B.Pharm- Semester-VI **MEDICINAL CHEMISTRY- III (PRACTICAL)**	L-0 T-0 P-4 C-2
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Illustrating structures and its activity using chem draw®.**	
CO2.	**Determining physiochemical properties of drugs using drug design software**	
CO3.	**Analysing drugs and their intermediates through assay.**	
CO4.	**Synthesizing drugs and their intermediates.**	
Course Contents:		

I **Preparation of drugs and intermediates**

Sulphanilamide, 7-Hydroxy, 4-methyl coumarin, Chlorobutanol, Triphenyl imidazole, Tolbutamide, Hexamine

II **Assay of drugs**

Isonicotinic acid hydrazide, Chloroquine, Metronidazole, Dapsone, Chlorpheniramine maleate, Benzyl penicillin

III Preparation of medicinally important compounds or intermediates by Microwave irradiation technique

IV Drawing structures and reactions using chem draw®

V Determination of physicochemical properties such as logP, clogP, MR, Molecular weight, Hydrogen bond donors and acceptors for class of drugs course content using drug design software Drug likeliness screening (Lipinskies RO5)

Text Books: (Latest Edition)	1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.	
Reference Books:	1. Martindale's extra pharmacopoeia. 2. Foye's Principles of Medicinal Chemistry. 3. Burger's Medicinal Chemistry, Vol I to IV. 4. Introduction to principles of drug design- Smith and Williams. 5. Remington's Pharmaceutical Sciences. 6. Organic Chemistry by I.L. Finar, Vol. II. 7. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5. 8. Text book of practical organic chemistry- A.I. Vogel. 9. Indian Pharmacopoeia.	

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New course added

Course Code: BPHP 652	**Skill-Enhancement Course – 20** **B.Pharm- Semester-VI** **PHARMACOLOGY-III (PRACTICAL)**	**L-0** **T-0** **P-4** **C-2**
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Interpreting the relationship between dosage calculation and activity of the drug.**	
CO2.	**Applying the biostatistical methods in experimental pharmacology.**	
CO3.	**Analysing drugs through bioassays.**	
CO4.	**Evaluating the toxic effects of drug on animal tissues.**	
Course Contents:		

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- autoanalyser
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)

**Experiments are demonstrated by simulated experiments/videos*

Text Books: (Latest Edition)	1. K.D. Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.	
Reference Books:	1. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill 2. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier 3. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs. The Point Lippincott Williams & Wilkins 4. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's	

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	Illustrated Reviews-Pharmacology 5. Goodman and Gilman's, The Pharmacological Basis of Therapeutics 6. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher Modern Pharmacology with clinical Applications, by Charles R. Craig& Robert, 7. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata, 8. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan. 9. N. Udupa and P.D. Gupta, Concepts in Chronopharmacology.	

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New course added.

Course Code: BPHP 653	Skill-Enhancement Course – 21 B.Pharm- Semester-VI **HERBAL DRUG TECHNOLOGY (PRACTICAL)**	L-0 T-0 P-4 C-2
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Demonstrating toxicity studies of herbal drugs on animal models.**	
CO2.	**Analyzing herbal formulations to comply pharmacopoeial standard.**	
CO3.	**Formulating different herbal solid, semisolid and liquid dosages forms.**	
Course Contents:		

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

Text Books: (Latest Edition)	1. Essential of Pharmacognosy by Dr.S.H. Ansari 2. Pharmacognosy & Phytochemistry by V.D. Rangari	
Reference Books:	1. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy) 2. Zaborsky: Immobilized Enzymes, CRC Press, Degraland, Ohio. 3. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication. 4. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers New Delhi, India, 2002. 5. Textbook of Pharmacognosy by Trease & Evans. 6. Textbook of Pharmacognosy by Tyler, Brady & Robber. 7. Pharmacognosy by Kokate, Purohit and Gokhale 8. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi	

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New course added.

Course Code: BPHT 701	Core Course – 29 B.Pharm- Semester-VII **INSTRUMENTAL METHODS OF ANALYSIS**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding the interaction of matters with electromagnetic radiations and its application in drug analysis.**	
CO2.	**Understanding the chromatographic separation and analysis of drugs.**	
CO3.	**Performing quantitative & qualitative analysis of drugs using various analytical instruments.**	
Course Contents:		
Unit-1:	**UV Visible spectroscopy** Electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra, Beer and Lambert's law, Derivation and deviations. Instrumentation - Sources of radiation, wavelength selectors, sample cells, detectors-Photo tube, Photomultiplier tube, Photo voltaic cell, Silicon Photodiode.Applications - Spectrophotometric titrations, Single component and multi component analysis. **Fluorimetry** Theory, Concepts of singlet, doublet and triplet electronic states, internal and external conversions, factors affecting fluorescence, quenching, instrumentation and applications	**10 hours**
Unit-2:	**IR spectroscopy** Introduction, fundamental modes of vibrations in poly atomic molecules, sample handling, factors affecting vibrationsInstrumentation - Sources of radiation, wavelength selectors, detectors - Golay cell, Bolometer, Thermocouple, Thermister, Pyroelectric detector and applications **Flame Photometry-**Principle, interferences, instrumentation and applications **Atomic absorption spectroscopy-** Principle, interferences, instrumentation andapplications **Nepheloturbidometry-** Principle, instrumentation and applications	**10 hours**
Unit-3:	**Introduction to chromatography** **Adsorption and partition column chromatography-** Methodology, advantages, disadvantages and applications.	**10 hours**

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	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-4:	**Gas chromatography -** Introduction, theory, instrumentation, derivatization, temperature programming, advantages, disadvantages and applications **High performance liquid chromatography (HPLC)-** Introduction, theory, instrumentation, advantages and applications.	**08 hours**
Unit-5:	**Ion exchange chromatography-** Introduction, classification, ion exchange resins, properties, mechanism of ion exchange process, factors affecting ion exchange, methodology and applications **Gel chromatography-** Introduction, theory, instrumentation and applications **Affinity chromatography-** Introduction, theory, instrumentation and applications	**07 hours**
Text Books: (Latest Editions)	1. Instrumental Methods of Chemical Analysis by B.K Sharma	
Reference Books:	1. Organic spectroscopy by William Kemp 2. Quantitative Analysis of Drugs by D. C. Garrett 3. Spectrophotometric identification of Organic Compounds by Silverstein. 4. Text book of Pharmaceutical Analysis by Kenneth A. Connors 5. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel 6. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake 7. Organic spectroscopy by Y.R Sharma 8. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi Organic Chemistry by I. L. Finar	

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New course Added

Course Code: BPHT 702	Core Course – 30 B.Pharm- Semester-VII **INDUSTRIAL PHARMACY-II**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding the process of pilot plant and scale up techniques for pharmaceutical dosage forms.**	
CO2.	**Describing the process of technology transfer from lab scale to commercial batch.**	
CO3.	**Demonstrating regulatory requirements for drug approval and clinical studies.**	
Course Contents:		
Unit-1:	**Pilot plant scale up techniques:** General considerations - including significance of personnel requirements, space requirements, raw materials, Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation, SUPAC guidelines, Introduction to platform technology	**10 hours**
Unit-2:	**Technology development and transfer:** WHO guidelines for Technology Transfer (TT): Terminology, Technology transfer protocol, Quality risk management, Transfer from R D to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packaging materials) Documentation, Premises and 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	**10 hours**
Unit-3:	**Regulatory affairs:** Introduction, Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals **Regulatory requirements for drug approval:** Drug Development Teams, Non-Clinical Drug Development, Pharmacology, Drug Metabolism and Toxicology, General considerations of Investigational New Drug (IND) Application, Investigator's Brochure (IB) and New Drug Application (NDA), Clinical research / BE studies, Clinical Research Protocols, Biostatistics in Pharmaceutical Product Development, Data Presentation for FDA Submissions, Management of Clinical Studies.	**10 hours**
Unit-4:	**Quality management systems:** Quality management & Certifications: Concept of Quality, Total Quality Management, Quality by Design (QbD), Six Sigma concept, Out of Specifications (OOS), Change control,	**08 hours**

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	Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP.	
Unit-5:	**Indian Regulatory Requirements:** Central Drug Standard Control Organization (CDSCO) and State Licensing Authority: Organization, Responsibilities, Certificate of Pharmaceutical Product (COPP), Regulatory requirements and approval procedures for New Drugs.	**07 hours**
Text Books: (Latest Editions)	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.	
Reference Books:	1. Regulatory Affairs from Wikipedia, the free encyclopedia modified on 7th April available at http,//en.wikipedia.org/wiki/Regulatory_Affairs. 2. Regulatory Affairs brought by learning plus, inc. available at http.//www.cgmp.com/ra.htm 3. Quality asuurance And Quality management in pharmaceutical Industry By Y. Anjaneyulu, R. Marayya, Pharma Book syndicate, Page no:-209-218 4. Provisional Guideline ON the inspection of the pharmaceutical manufacturers in: WHO Expert committee on specification for Pharmaceutical Preparations: 32nd report, Geneva, WHO, 1992; Annex-2 (Who technical report seried. No:-823. 5. ICH–Organization of the Common Technical Document for Registration of Pharmaceuticals for Human Use M4, Rev. 4 (Brussels, Belgium, Nov. 2005)International Regulatory Affairs Updates, 2005. available at http://www.iraup.com/about.php 6. Indian Pharmacopoeia, British Pharmacopoeia and United States Pharmacopoeia, Latest Edition 7. http://www.ich.org 8. http://pharma.about.com/od/D/g/Drug-Master-File-Dmf.htm 9. http://www.fda.gov/Drugs/GuidanceCompliance RegulatoryInformation/Guidances/	

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New course Added

Course Code: BPHT 703	Core Course – 31 B.Pharm- Semester-VII **PHARMACY PRACTICE**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding the management of hospital, hospital pharmacy and community pharmacy, inventory control &drug distribution system.**	
CO2.	**Identifying drug related problems, adverse drug reactions and monitoring drug therapy of patient by interpreting laboratory results and clinical review.**	
CO3.	**Practicing medication history interview, patient counselling and promoting rational drug use.**	
Course Contents:		
Unit-1:	**Hospital and it's organization** Definition, Classification of hospital- Primary, Secondary and Tertiary hospitals, Classification based on clinical and non- clinical basis, Organization Structure of a Hospital, and Medical staffs involved in the hospital and their functions. **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 detectingdrug 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.	**10 hours**
Unit-2:	**Drug distribution system in a hospital** Dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labelling, Dispensing of drugs to ambulatory patients, and Dispensing of controlled drugs. **Hospital formulary** Definition, contents of hospital formulary, Differentiation of hospital formulary and Drug list, preparation and revision, and addition and deletion of drug from hospital formulary.	**10 hours**

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	Therapeutic drug monitoring Need for Therapeutic Drug Monitoring, Factors to be considered during the Therapeutic Drug Monitoring, and Indian scenario for Therapeutic Drug Monitoring. **Medication adherence** 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 pharmacy management** Financial, materials, staff, and infrastructure requirements.	
Unit-3:	**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 information 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 the hospital** Role of pharmacist in the education and training program, Internal and external training program, Services to the nursing homes/clinics, Code of ethics for community pharmacy, and Role of pharmacist in the interdepartmental communication and community health education. **Prescribed medication order and communication skills** Prescribed medication order- interpretation and legal requirements, and Communication skills- communication with prescribers and patients.	**10 hours**
Unit-4:	**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	**08 hours**

	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-5:	**Drug store management and inventory control** Organisation of drug store, types of materials stocked and storage conditions, Purchase and inventory control: principles, purchase procedure, purchase order, procurement and stocking, Economic order quantity, Reorder quantity level, and Methods used for the analysis of the drug expenditure **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	**07 hours**
Text Books: (Latest Editions)	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,* 1 ed. Chennai: Orient Longman Private Limited; 2004.	
Reference Books:	1. William E. Hassan. *Hospital pharmacy*, 5th ed. Philadelphia: Lea & Febiger; 1986. 2. Tipnis Bajaj. *Hospital Pharmacy*, 1 ed. Maharashtra: Career Publications; 2008. 3. Scott LT. *Basic skills in interpreting laboratory data*, 4thed. American Society of Health System Pharmacists Inc; 2009. 4. Parmar N.S. *Health Education and Community Pharmacy,* 18th ed. India: CBS Publishers & Distributers; 2008. **Journals** Therapeutic drug monitoring. ISSN: 0163-4356 Journal of pharmacy practice. ISSN: 0974-8326 American journal of health system pharmacy. ISSN: 1535-2900 (online) Pharmacy times (Monthly magazine)	

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New course Added

Course Code: BPHT 704	Core Course – 32 B.Pharm- Semester-VII **NOVEL DRUG DELIVERY SYSTEMS**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding various approaches in development of novel drug delivery systems.**	
CO2.	**Defining the criteria for selection of drugs and polymers for development of novel drug delivery systems.**	
CO3.	**Formulating various novel drug delivery systems.**	
CO4.	**Evaluating various novel drug delivery systems.**	
Course Contents:		
Unit-1:	**Controlled drug delivery systems**: Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design controlled release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations **Polymers:** Introduction, classification, properties, advantages and application ofpolymers in formulation of controlled release drug delivery systems.	**10 hours**
Unit-2:	**Microencapsulation:** Definition, advantages and disadvantages, microspheres/microcapsules, microparticles, methods of microencapsulation, applications **Mucosal Drug Delivery system:** Introduction, Principles of bioadhesion /mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems **Implantable Drug Delivery Systems:** Introduction, advantages and disadvantages, concept of implants and osmotic pump.	**10 hours**
Unit-3:	**Transdermal Drug Delivery Systems:** Introduction, Permeation through skin, factorsaffecting 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 ofdrug delivery, Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers	**10 hours**
Unit-4:	**Targeted drug Delivery:** Concepts and approaches advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications	**08 hours**

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Unit-5:	**Ocular Drug Delivery Systems:** Introduction, intra ocular barriers and methods toovercome – Preliminary study, ocular formulations and ocuserts **Intrauterine Drug Delivery Systems:** Introduction, advantages and disadvantages, development of intra uterine devices (IUDs) and applications	**07 hours**
Text Books: (Latest Editions)	1. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001). 2. S.P. Vyas and R.K. Khar, Controlled Drug Delivery - concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002.	
Reference Books:	1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992. 2. Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker, Inc., New York, 1992. 3. Encyclopedia of Controlled Delivery. Edith Mathiowitz, Published by Wiley Interscience Publication, John Wiley and Sons, Inc, New York. Chichester/Weinheim 4. S. C. Dinda. Advances in Pharmaceutical Technology. Published by PharmaMed Press, Hyderabad, India. 1st Edn, 2011 **Journals** 5. Indian Journal of Pharmaceutical Sciences (IPA) 6. Indian Drugs (IDMA) 7. Journal of Controlled Release (Elsevier Sciences) 8. Drug Development and Industrial Pharmacy (Marcel & Decker 9. International Journal of Pharmaceutics (Elsevier Sciences)	

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New Course added

Course Code: BPHP 751	Skill-Enhancement Course – 22 B.Pharm- Semester-VII **INSTRUMENTAL METHODS OF ANALYSIS (PRACTICAL)**	L-0 T-0 P-4 C-2
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding operational principles of different analytical instruments**	
CO2.	**Analyzing drugs quantitatively and qualitatively with different instrumental techniques.**	
CO3.	**Assessing drug formulations with reference to pharmacopoeial monograph.**	
Course Contents:		

1. Determination of absorption maxima and effect of solvents on absorption maxima of organic compounds
2. Estimation of dextrose by colorimetry
3. Estimation of sulfanilamide by colorimetry
4. Simultaneous estimation of ibuprofen and paracetamol by UV spectroscopy
5. Assay of paracetamol by UV- Spectrophotometry
6. Estimation of quinine sulfate by fluorimetry
7. Study of quenching of fluorescence
8. Determination of sodium by flame photometry
9. Determination of potassium by flame photometry
10. Determination of chlorides and sulphates by nephelo turbidometry
11. Separation of amino acids by paper chromatography
12. Separation of sugars by thin layer chromatography
13. Separation of plant pigments by column chromatography
14. Demonstration experiment on HPLC
15. Demonstration experiment on Gas Chromatography

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

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New course Added

Course Code: BPHP 752	Skill-Enhancement Course – 23 B.Pharm- Semester-VII **PRACTICE SCHOOL**	L-0 T-0 P-12 C-6
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding the working of any one of the following departments through experiential learning.** • **Pharmaceutical Industry/Hospital** • **Production unit** • **Quality Control department** • **Quality Assurance department** • **Analytical laboratory** • **Chemical manufacturing unit** • **Pharmaceutical R&D** • **Hospital (Clinical Pharmacy)** • **Clinical Research Organization** • **Community Pharmacy**	
Course Contents:		

Every candidate shall undergo practice school for a period of 150 hours spread over and evenly distributed throughout the semester. The student shall opt any one of the domains for practice school declared by the program committee from time to time.

Various domains shall be:

- Pharmaceutical Industry/Hospital.
- Production unit,
- Quality Control department,
- Quality Assurance department,
- Analytical laboratory,
- Chemical manufacturing unit,
- Pharmaceutical R&D,
- Hospital (Clinical Pharmacy),
- Clinical Research Organization,
- Community Pharmacy, etc

Each individual student shall be liable to face seminar of 25 marks in which 15 marks for presentation and 10 marks for question and answers.

The End semester examination shall comprise of evaluation of individual student by the duly constituted program committee/ academic review committee for the total of 125 marks.

At the end of the practice school, every student shall submit a printed report (in triplicate)

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

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New course Added

Course Code: BPHT 801	Core Course – 33 B.Pharm- Semester-VIII **BIOSTATISITCS AND RESEARCH METHODOLOGY**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding various statistical techniques to solve statistical problems**	
CO2.	**Recognizing the operation of M.S. Excel, SPSS, R and MINITAB®, DoE (Design of Experiment).**	
CO3.	**Applying statistical techniques in solving the problems.**	
Course Contents:		
Unit-1:	**Introduction:** Statistics, Biostatistics, Frequency distribution **Measures of central tendency**: Mean, Median, Mode- Pharmaceutical examples **Measures of dispersion**: Dispersion, Range, standard deviation, Pharmaceutical problems **Correlation**: Definition, Karl Pearson's coefficient of correlation, Multiple correlation - Pharmaceuticals examples	**10 hours**
Unit-2:	**Regression:** Curve fitting by the method of least squares, fitting the lines y= a + bx and x= a + by, Multiple regression, standard error of regression– Pharmaceutical Examples **Probability:** Definition of probability, Binomial distribution, Normal distribution, Poisson's distribution, properties - problems Sample, Population, large sample, small sample, Null hypothesis, alternative hypothesis, sampling, essence of sampling, types of sampling, Error-I type, Error-II type, Standard error of mean (SEM) - Pharmaceutical examples **Parametric test**: t-test (Sample, Pooled or Unpaired and Paired), ANOVA, (One way and Two way), Least Significance difference.	**10 hours**
Unit-3:	**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, DoE (Design of Experiments), Experiential Design Technique, plagiarism **Graphs:** Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph **Designing the methodology:** Sample size determination and Power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases.	**10 hours**

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Unit-4:	Blocking and confounding system for Two-level factorials **Regression modeling:** Hypothesis testing in Simple and Multiple regression models **Introduction to Practical components of Industrial and Clinical Trials Problems:** Statistical Analysis Using Excel, SPSS, MINITAB, DESIGN OF EXPERIMENTS, R - Online Statistical Software's to Industrial and Clinical trial approach	**08 hours**
Unit-5:	**Design and Analysis of experiments:** **Factorial Design:** Definition, 2^2, 2^3 design. Advantage of factorial design **Response Surface methodology**: Central composite design, Historical design, Optimization Techniques	**07 hours**
Text Books: (Latest Editions)	1. Fundamental of Statistics – Himalaya Publishing House- S.C. Guptha 2. Design and Analysis of Experiments –PHI Learning Private Limited, R. Pannerselvam,	
Reference Books:	1. Pharmaceutical statistics- Practical and clinical applications, Sanford Bolton, publisher Marcel Dekker Inc. NewYork 2. Design and Analysis of Experiments – Wiley Students Edition, Douglas and C. Montgomery	

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New course Added

Course Code: BPHT 802	Core Course – 34 B.Pharm- Semester-VIII **SOCIAL AND PREVENTIVE PHARMACY**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding current issues related to health and pharmaceutical problems within the country and worldwide.**	
CO2.	**Recognizing current healthcare development programs including national health policies &programmes and role of WHO (World Health Organisation).**	
CO3.	**Demonstrating prevention and control of communicable and non-communicable Diseases.**	
CO4.	**Evaluating alternative ways of solving problems related to health and pharmaceutical issues.**	
Course Contents:		
Unit-1:	**Concept of health and disease:** Definition, concepts and evaluation of public health. Understanding the concept of prevention and control of disease, social causes of diseases and social problems of the sick. **Social and health education:** Food in relation to nutrition and health, Balanced diet, Nutritional deficiencies, Vitamin deficiencies, Malnutrition and its prevention. **Sociology and health:** Socio cultural factors related to health and disease, Impact of urbanization on health and disease, Poverty and health **Hygiene and health:** personal hygiene and health care; avoidable habits	**10 hours**
Unit-2:	**Preventive medicine:** General principles of prevention and control of diseases such ascholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse	**10 hours**
Unit-3:	**National health programs, its objectives, functioning and outcome of the following:** HIV AND AIDS control programme, TB, Integrated disease surveillance program (IDSP), National leprosy control programme, National mental health program, National programme for prevention and control of deafness, Universal immunization programme, National programme for control of blindness, Pulse polio programme.	**10 hours**
Unit-4:	National health intervention programme for mother and child, National family welfare programme, National tobacco control	**08 hours**

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	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-5:	Community services in rural, urban and school health: Functions of PHC, Improvement in rural sanitation, national urban health mission, Health promotion and education in school.	**07 hours**
Text Books: (Latest Editions)	1. Short Textbook of Preventive and Social Medicine, Prabhakara GN, 2nd Edition, 2010, ISBN: 9789380704104, JAYPEE Publications	
Reference Books:	1. Park Textbook of Preventive and Social Medicine, K Park, 21st Edition, 2011, ISBN-14: 9788190128285, BANARSIDAS BHANOT PUBLISHERS. 2. Textbook of Preventive and Social Medicine (Mahajan and Gupta), Edited by Roy 3. Rabindra Nath, Saha Indranil, 4 Edition, 2013, ISBN: 9789350901878, JAYPEE Publications 4. Review of Preventive and Social Medicine (Including Biostatistics), Jain Vivek, 6th Edition, 2014, ISBN: 9789351522331, JAYPEE Publications 5. Essentials of Community Medicine—A Practical Approach, Hiremath Dhananjaya A, 2nd Edition, 2012, ISBN: 9789350250440, JAYPEE Publication 6. Community Pharmacy Practice, Ramesh Adepu, BSP publishers, Hyderabad **Recommended Journals:** Research in Social and Administrative Pharmacy, Elsevier, Ireland Journal of Pharmaceutical Policy and Practice, Biomedcentral	

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New Course Added

Course Code: BPHT 803	Program/Discipline Specific Elective Course – 01 / 02 B.Pharm- Semester-VIII **PHARMACEUTICAL MARKETING**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding marketing concepts and techniques used pharmaceutical industry.**	
CO2.	**Applying marketing concepts and techniques for pharmaceutical product decision, promotion and pricing.**	
Course Contents:		
Unit-1:	**Marketing:** Definition, general concepts and scope of marketing; Distinction between marketing & selling; Marketing environment; Industry and competitive analysis; Analyzing consumer buying behavior; industrial buying behavior. **Pharmaceutical market:** Quantitative and qualitative aspects; size and composition of the market; demographic descriptions and socio-psychological characteristics of the consumer; market segmentation& targeting. Consumer profile; Motivation and prescribing habits of the physician; patients' choice of physician and retail pharmacist. Analyzing the Market; Role of market research.	**10 hours**
Unit-2:	**Product decision:** Classification, product line and product mix decisions, product life cycle, product portfolio analysis; product positioning; New product decisions; Product branding, packaging and labeling decisions, Product management in pharmaceutical industry.	**10 hours**
Unit-3:	**Promotion:** Methods, determinants of promotional mix, promotional budget; An overview of personal selling, advertising, direct mail, journals, sampling, retailing, medical exhibition, public relations, online promotional techniques for OTC Products.	**10 hours**
Unit-4:	**Pharmaceutical marketing channels:** Designing channel, channel members, selecting the appropriate channel, conflict in channels, physical distribution management: Strategic importance, tasks in physical distribution management.	**10 hours**

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	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-5:	**Pricing:** Meaning, importance, objectives, determinants of price; pricing methods and strategies, issues in price management in pharmaceutical industry. An overview of DPCO (Drug Price Control Order) and NPPA (National Pharmaceutical Pricing Authority). **Emerging concepts in marketing:** Vertical & Horizontal Marketing; Rural Marketing; Consumerism; Industrial Marketing; Global Marketing.	**10 hours**
Text Books: (Latest Editions)	1. Subba Rao Changanti, Pharmaceutical Marketing in India (GIFT – Excel series) Excel Publications.	
Reference Books:	1. Philip Kotler and Kevin Lane Keller: Marketing Management, Prentice Hall of India, New Delhi 2. Walker, Boyd and Larreche: Marketing Strategy- Planning and Implementation, Tata MC GrawHill, New Delhi. 3. Dhruv Grewal and Michael Levy: Marketing, Tata MC Graw Hill 4. Arun Kumar and N Menakshi: Marketing Management, Vikas Publishing, India 5. Rajan Saxena: Marketing Management; Tata MC Graw-Hill (India Edition) 6. Ramaswamy, U.S & Nanakamari, S: Marketing Management: Global Perspective, Indian Context, Macmilan India, New Delhi. 7. Shanker, Ravi: Service Marketing, Excell Books, New Delhi	

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New Course Added

Course Code: BPHT 804	Program/Discipline Specific Elective Course – 01 / 02 B.Pharm- Semester-VIII **PHARMACEUTICAL REGULATORY SCIENCE**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding the process of drug discovery and development.**	
CO2.	**Recognizing regulatory authorities and agencies governing the manufacturing, sales and distribution of pharmaceutical products.**	
CO3.	**Demonstrating regulatory approval process their registration in Indian and international markets.**	
Course Contents:		
Unit-1:	**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.	**10 hours**
Unit-2:	**Regulatory Approval Process** Approval processes and timelines involved in Investigational New Drug (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA). Changes to an approved NDA / ANDA. **Regulatory authorities and agencies** Overview of regulatory authorities of India, United States, European Union, Australia, Japan, Canada (Organization structure and types of applications)	**10 hours**
Unit-3:	**Registration of Indian drug product in overseas market** Procedure for export of pharmaceutical products, Technical documentation, Drug Master Files (DMF), Common Technical Document (CTD), electronic Common TechnicalDocument (eCTD), ASEAN Common Technical Document (ACTD)research.	**10 hours**
Unit-4:	**Clinical trials** Developing clinical trial protocols, Institutional Review Board / Independent Ethics committee - formation and working procedures, Informed consent process and procedures, GCP obligations of Investigators, sponsors & Monitors, Managing and Monitoring clinical trials, Pharmacovigilance - safety monitoring in clinical trials	**08 hours**
Unit-5:	**Regulatory Concepts** Basic terminology, guidance, guidelines, regulations, Laws and Acts, Orange book, Federal Register, Code of Federal Regulatory, Purple book	**07 hours**
Text Books: (Latest Editions)	1. New Drug Approval Process: Accelerating Global Registrations By Richard A. Guarino, MD, 5th edition, Drugs and the Pharmaceutical Sciences, Vol.190.	

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

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New Course Added

Course Code: BPHT 805	Program/Discipline Specific Elective Course – 01 / 02 B.Pharm- Semester-VIII **PHARMACOVIGILANCE**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding drug safety concepts, history, development and national / international scenarios of pharmacovigilance.**	
CO2.	**Practicing pharmacovigilance as per ICH guidelines in detection, assessment and reporting of ADRs.**	
CO3.	**Analysing and reporting new adverse drug reactions.**	
CO4.	**Evaluating drug safety in paediatrics, geriatrics, pregnancy and lactating mothers.**	
Course Contents:		
Unit-1:	**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.	**10 hours**
Unit-2:	**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 Standardised MedDRA queries, WHO drug dictionary, Eudravigilance medicinal product dictionary **Information resources in pharmacovigilance,** Basic drug information resources, Specialised resources for ADRs **Establishing pharmacovigilance programme** Establishing in a hospital Establishment & operation of drug safety department in industry Contract Research Organisations (CROs) Establishing a national programme	**10 hours**
Unit-3:	**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,	**10 hours**

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	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-4:	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	**08 hours**
Unit-5:	**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	**07 hours**
Text Books: (Latest Editions)	1. Textbook of Pharmacovigilance: S K Gupta, Jaypee Brothers, Medical Publishers.	
Reference Books:	1. Practical Drug Safety from A to Z By Barton Cobert, Pierre Biron, Jones and Bartlett Publishers. 2. Mann's Pharmacovigilance: Elizabeth B. Andrews, Nicholas, Wiley Publishers. 3. Stephens' Detection of New Adverse Drug Reactions: John Talbot, Patrick Walle, Wiley Publishers. 4. An Introduction to Pharmacovigilance: Patrick Waller, Wiley Publishers. 5. Cobert's Manual of Drug Safety and Pharmacovigilance: Barton Cobert, Jones& Bartlett Publishers. 6. Textbook of Pharmacoepidemiolog edited by Brian L. Strom, Stephen E Kimmel, Sean Hennessy, Wiley Publishers. 7. A Textbook of Clinical Pharmacy Practice -Essential Concepts and Skills: G. Parthasarathi, Karin Nyfort Hansen, Milap C. Nahata 8. National Formulary of India 9. Text Book of Medicine by Yashpal Munjal 10. Text book of Pharmacovigilance: concept and practice by GP Mohanta	

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	and PK Manna 11. http://www.ich.org/ 12. www.who-umc.org 13. http://www.cioms.ch/ 14. http://cdsco.nic.in/ 15. http://www.who.int/vaccine_safety/en/ 16. http://www.ipc.gov.in/PvPI/pv_home.html	

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New Course Added-

Course Code: BPHT 806	Program/Discipline Specific Elective Course – 01 / 02 B.Pharm- Semester-VIII **QUALITY CONTROL AND STANDARDIZATION OF HERBALS**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding WHO, ICH and EU guidelines for quality control of herbal drugs and concept of quality assurance in herbal drug industry.**	
CO2.	**Demonstrating regulatory requirements and approval process for herbal drug registration in Indian and international markets.**	
Course Contents:		
Unit-1:	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	**10 hours**
Unit-2:	**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.	**10 hours**
Unit-3:	EU and ICH guidelines for quality control of herbal drugs. Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines	**10 hours**
Unit-4:	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.	**08 hours**
Unit-5:	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	**07 hours**
Text Books: (Latest Editions)	1. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002. 2. Shinde M.V., Dhalwal K., Potdar K., Mahadik K. Application of quality control principles to herbal drugs. International Journal of Phytomedicine 1(2009); p. 4-8.	

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Reference Books:	1. Pharmacognosy by Trease and Evans 2. Pharmacognosy by Kokate, Purohit and Gokhale 3. Rangari, V.D., Text book of Pharmacognosy and Phytochemistry Vol. I, Carrier Pub., 2006. 4. Aggrawal, S.S., Herbal Drug Technology. Universities Press, 2002. 5. EMEA. Guidelines on Quality of Herbal Medicinal Products/Traditional Medicinal Products, 6. WHO Quality Control Methods for Medicinal Plant Materials, World Health Organization, Geneva, 1998. WHO Guidelines for the Appropriate Use of Herbal Medicines. WHO Regional Publications, Western Pacific Series No 3, WHO Regional office for the Western Pacific, Manila, 1998. 7. WHO The International Pharmacopeia, Vol. 2: Quality Specifications, 3rd edn. World Health Organization, Geneva, 1981. 8. WHO Quality Control Methods for Medicinal Plant Materials. World Health Organization, Geneva, 1999. 9. WHO. WHO Global Atlas of Traditional, Complementary and Alternative Medicine. 2 vol. set. Vol. 1 contains text and Vol. 2, maps. World Health Organization, Geneva, 2005. 10. WHO Guidelines on Good Agricultural and Collection Practices (GACP) for Medicinal Plants. World Health Organization, Geneva, 2004.	

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New course Added

Course Code: BPHT 807	Program/Discipline Specific Elective Course – 01 / 02 B.Pharm- Semester-VIII **COMPUTER AIDED DRUG DESIGN**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding the role of drug design and discovery of lead molecule in drug discovery process.**	
CO2.	**Recognizing the concept of QSAR, molecular docking and various strategies to develop new drug like molecule.**	
CO3.	**Describing the design of new drug molecules using molecular modelling software.**	
Course Contents:		
Unit-1:	**Introduction to Drug Discovery and Development** Stages of drug discovery and development **Lead discovery and Analog Based Drug Design** Rational approaches to lead discovery based on traditional medicine, Random screening, Non-random screening, serendipitous drug discovery, lead discovery based on drug metabolism, lead discovery based on clinical observation. **Analog Based Drug Design:** Bioisosterism, Classification, Bioisosteric replacement. Any three case studies	**10 hours**
Unit-2:	**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 Partitioncoefficient, Hammet's substituent constant and Tafts steric constant. Hansch analysis, Free Wilson analysis, 3D-QSAR approaches like COMFA and COMSIA.	**10 hours**
Unit-3:	**Molecular Modeling and virtual screening techniques** **Virtual Screening techniques:** Drug likeness screening, Concept ofpharmacophore mapping and pharmacophore based Screening, **Molecular docking**: Rigid docking, flexible docking, manual docking, Docking based screening. *De novo* drug design.	**10 hours**
Unit-4:	**Informatics & Methods in drug design:** Introduction to Bioinformatics, chemo-informatics. ADME databases, chemical, biochemical and pharmaceutical databases.	**08 hours**
Unit-5:	**Molecular Modeling:** Introduction to molecular mechanics and quantum mechanics. Energy Minimization methods and Conformational Analysis, global conformational minima determination.	**07 hours**

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

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New Course Added

Course Code: BPHT 808	Program/Discipline Specific Elective Course – 01 / 02 B.Pharm- Semester-VIII **CELL AND MOLECULAR BIOLOGY**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding cell and molecular biology history, cellular structure its functioning, DNA properties and chemical foundation of cell biology.**	
CO2.	**Describing protein structure and its function, cellular membrane structure and function and basic molecular genetic mechanisms.**	
Course Contents:		
Unit-1:	Cell and Molecular Biology: Definitions theory and basics and Applications. Cell and Molecular Biology: History and Summation. Theory of the Cell: Properties of cells and cell membrane. Prokaryotic versus Eukaryotic. Cellular Reproduction. Chemical Foundations – an Introduction and Reactions (Types)	**10 hours**
Unit-2:	DNA and the Flow of Molecular Information, DNA Functioning, DNA and RNA, Types of RNA, Transcription and Translation	**10 hours**
Unit-3:	Proteins: Defined and Amino Acids, Protein Structure, Regularities in Protein Pathways, Cellular Processes, Positive Control and significance of Protein Synthesis	**10 hours**
Unit-4:	Science of Genetics, Transgenics and Genomic Analysis, Cell Cycle analysis, Mitosis and Meiosis, Cellular Activities and Checkpoints	**08 hours**
Unit-5:	Cell Signals: Introduction, Receptors for Cell Signals, Signaling Pathways: Overview. Misregulation of Signaling Pathways. Protein-Kinases: Functioning	**07 hours**
Text Books: (Latest Editions)	1. N.K. Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi	
Reference Books:	1. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company 2. B.R. Glick and J. J. Pasternak: Molecular Biotechnology:	

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	Principles and Applications of Recombinant DNA: ASM Press Washington D.C. 3. RA Goldshy et. al.: Kuby Immunology. 4. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn. 5. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology. 6. Rose: Industrial Microbiology. 7. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan 8. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution. 9. Peppler: Microbial Technology. 10. Edward: Fundamentals of Microbiology.	

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New course Added

Course Code: BPHT 809	Program/Discipline Specific Elective Course – 01 / 02 B.Pharm- Semester-VIII **COSMETIC SCIENCE**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding concepts of cosmetics and cosmeceuticals.**	
CO2.	**Describing basic requirements for formulation and development of skin care, hair care, oral and dental care cosmetic products.**	
CO3.	**Discussing role of herbs in cosmetics analytical methods for shampoo, skin cream and toothpaste.**	
CO4.	**Illustrating principles of cosmetic evaluation.**	
Course Contents:		
Unit-1:	Classification of cosmetic and cosmeceutical products, Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticals from cosmetics, cosmetics as quasi and OTC drugs **Cosmetic excipients:** Surfactants, 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.	**10 hours**
Unit-2:	**Principles of formulation and building blocks of skin care products:** Face wash, Moisturizing cream, Cold Cream, Vanishing cream and their advantages and disadvantages. Application of these products in formulation of cosmecuticals. **Antiperspants & deodorants**- Actives & 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.	**10 hours**
Unit-3:	Sun protection, Classification of Sunscreens and SPF. **Role of herbs in cosmetics:** Skin Care: Aloe and turmeric, Hair care: Henna and amla., Oral care: Neem and clove **Analytical cosmetics:** BIS specification and analytical methods for shampoo, skin-cream and toothpaste.	**10 hours**
Unit-4:	Principles of Cosmetic Evaluation: Principles of sebumeter, corneometer. Measurement of TEWL, Skin Color, Hair tensile strength, Hair combing properties Soaps and syndet bars. Evolution and skin benefits.	**08 hours**

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Unit-5:	Oily and dry skin, causes leading to dry skin, skin moisturisation. Basic understanding of the terms Comedogenic, dermatitis. Cosmetic problems associated with Hair and scalp: Dandruff, Hair fall causes Cosmetic problems associated with skin: blemishes, wrinkles, acne, prickly heat and body odor. Antiperspirants and Deodorants- Actives and mechanism of action.	**07 hours**
Text Books: (Latest Editions)	1. Cosmetics – Formulations, Manufacturing and Quality Control, P.P. Sharma, Vandana Publications Pvt. Ltd., Delhi 2. Text book of cosmeticology by Sanju Nanda & Roop K. Khar, Tata Publishers	
Reference Books:	1. Poucher W.A., 'perfumes, cosmetics and soaps'. 3. Harry's Cosmeticology, Wilkinson, Moore, Seventh Edition, George Godwin. 4. Kapoor V.P. "Herbal Cosmetics for Skin and Hair Care, Natural product Radiance. July 2005. 5. Pharmaceutics II by "R.M. Mehta" Vallabh Prakashan. 2. Textbook of Cosmetics by "M.Vimaladevi", C.B.S. Publication.	

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New Course Added

Course Code: BPHT 810	Program/Discipline Specific Elective Course – 01 / 02 B.Pharm- Semester-VIII **PHARMACOLOGICAL SCREENING METHODS**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Recognising the applications of various commonly used laboratory animals.**	
CO2.	**Demonstrating various screening models used in preclinical research and importance of biostatistics and research methodology.**	
CO3.	**Designing and executing a research hypothesis independently.**	
Course Contents:		
Unit-1:	**Laboratory Animals:** Study of CPCSEA and OECD guidelines for maintenance, breeding and conduct of experiments on laboratory animals, Common lab animals: Description and applications of different species and strains of animals. Popular transgenic and mutant animals. Techniques for collection of blood and common routes of drug administration in laboratory animals, Techniques of blood collection and euthanasia.	**08 hours**
Unit-2:	**Preclinical screening models** **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. Study of screening animal models for Diuretics, nootropics, anti-Parkinson's, anti-asthmatics, **Preclinical screening models:** for CNS activity- analgesic, antipyretic, anti-inflammatory, general anaesthetics, sedative and hypnotics, antipsychotic, antidepressant, antiepileptic, antiparkinsonism, alzheimer's disease	**10 hours**
Unit-3:	**Preclinical screening models:** for ANS activity, sympathomimetics, sympatholytics, parasympathomimetics, parasympatholytics, skeletal muscle relaxants, drugs acting on eye, local anaesthetics.	**10 hours**
Unit-4:	Preclinical screening models: for CVS activity- antihypertensives, diuretics, antiarrhythmic, antidyslepidemic, antiaggregatory, coagulants, and anticoagulants Preclinical screening models for other important drugs like antiulcer, antidiabetic, anticancer and antiasthmatics.	**05 hours**
Unit-5:	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	**05 hours**

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

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New Course Added

Course Code: BPHT 811	Program/Discipline Specific Elective Course – 01 / 02 B.Pharm- Semester-VIII **ADVANCED INSTRUMENTATION TECHNIQUES**	L-3 T-1 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding the fundamental working principles and its application of some advanced analytical instruments used in drug analysis.**	
CO2.	**Describing the principles of chromatographic separation and analysis of drugs.**	
CO3.	**Recognizing the calibration of various analytical instruments.**	
CO4.	**Reviewing analysis of drugs using various analytical instruments**	
Course Contents:		
Unit-1:	**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	**10 hours**
Unit-2:	**Thermal Methods of Analysis**: Principles, instrumentation and applications of Thermogravimetric Analysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC) **X-Ray Diffraction Methods:** Origin of X-rays, basic aspects of crystals, X- ray Crystallography, rotating crystal technique, single crystal diffraction, powder diffraction, structural elucidation and applications.	**10 hours**
Unit-3:	**Calibration and validation-**as per ICH and USFDA guidelines **Calibration of following Instruments:** Electronic balance, UV-Visible spectrophotometer, IR spectrophotometer, Fluorimeter, Flame Photometer, HPLC and GC	**10 hours**
Unit-4:	**Radio immune assay:** Importance, various components, Principle, different methods, Limitation and Applications of Radio immuno assay **Extraction techniques**: General principle and procedure involved in the solid phase extraction and liquid-liquid extraction	**08 hours**
Unit-5:	**Hyphenated techniques**-LC-MS/MS, GC-MS/MS, HPTLC-MS.	**07 hours**
Text Books: (Latest Editions)	1. Instrumental Methods of Chemical Analysis by B.K Sharma 2. Organic spectroscopy by Y.R Sharma	

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Reference Books:	1. Organic spectroscopy by William Kemp 2. Quantitative Analysis of Drugs by D. C. Garrett 3. Spectrophotometric identification of Organic Compounds by Silverstein 4. Text book of Pharmaceutical Analysis by Kenneth A. Connors 5. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel 6. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake 7. Organic Chemistry by I. L. Finar 8. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi	

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Changes in B-Pharm syllabus 2014-15 Vs 2019-20

Course BPMT 106 (Mathematics)

	Old Course	New Course
Unit-1	**Algebra:**Equations reducible to quadratics, simultaneous equations (linear & quadratic). Determinants, Properties of determinants, solution of simultaneous equations by Cramer's rule, matrices, properties of matrices, solution of simultaneous equations by matrices, pharmaceutical applications of determinants and matrices.	• Partial fraction Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction, Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics •Logarithms Introduction, Definition, Theorems/Properties of logarithms,Commonlogarithms,Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems. • Function: Real Valued function, Classification of real valued functions, Limits and continuity:
Unit-2	**Measures of Central value**: Objectives and pre-requisites of an ideal measure, mean, mode and median.	Matrices and Determinant: Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants, Product of determinants, Minors and co- Factors, Adjoint or adjugate of a square matrix, Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method, Cramer's rule, Characteristic equation and roots of a square matrix, Cayley–Hamilton theorem, Application of Matrices in solving Pharmacokinetic equations.
Unit-3	Measures of dispersion, Range, Quartile Range, Mean deviation, standard deviation, correlation, rank correlation, T-test, F-test, X2 test, Standard error of means. T- Ratio of multiple, submultiples, allied and certain angles, application of logarithms in pharmaceutical computations.	**Calculus Differentiation** : Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function , Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula), Derivative of the quotient of two functions (Quotient formula) – Without Proof, Derivative of xnw.r.tx,where n is any rational number, Derivative of ex,, Derivative of loge x , Derivative of ax Derivative of trigonometric functions from first principles (without Proof), Successive

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		Differentiation, Conditions for a function to be a maximum or a minimum at a point. Application
Unit-4	**Analytical Plain Geometry:** Certain co-ordinates, distance between two points, area of triangle, straight line, slope and intercept form, double intercept form normal (perpendicular form), slopepoint and two point forms, general equation of first degree.	**Analytical Geometry Introduction:** Signs of the Coordinates, Distance formula, Straight Line: Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines, Slope of a line joining two points, Slope – intercept form of a straight line Integration: Introduction, Definition, Standard formulae, Rules of integration, Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application
Unit-5	**Calculus:** Differential: Limits and functions, definition of differential coefficient, differentiation of standard functions, including function of a function (chain rule). Integral: Integration as inverse of differentiation indefinite integrals of standard form, integration by parts.	**Differential Equations:** Some basic definitions, Order and degree, Equations in separable form, Homogeneous equations, Linear Differential equations, Exact equations, Application in solving Pharmacokinetic equations Laplace Transform: Introduction, Definition, Properties of Laplace transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives, Application to solve Linear differential equations, Application in solving Chemical kinetics and Pharmacokinetics equations

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Course BPBT106 (Remedial Biology)

	Old Course	New Course
Unit-1	**General survey of Animal Kingdom**. Structure and life history of parasites as illustrated by amoeba, entamoeba, trypanosome, plasmodium, taenia, ascaris, schistosoma, oxyuris and ancyclostoma.	**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-2	**General structure and life history of insects** like mosquito, house fly, mites and silk worm.	**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-3	**Morphology and histology** of root, stem, bark, wood, leaf, flower, fruit and seed, modification of stems and roots.	**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 nervoussystem • Structure of a neuron

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		• 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-4	**Plant cell**: Its structure and non living inclusions, mitosis and meiosis, different types of plant tissues and their functions.	**Plants and mineral nutrition**: • Essential mineral, macro and micronutrients • Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation Photosynthesis Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis.
Unit-5	**Classification of Plant Kingdom.**	**Plant respiration**: Respiration, glycolysis, fermentation (anaerobic). Plant growth and development Phases and rate of plant growth, Condition of growth, Introduction to plant growth regulators Cell - The unit of life Structure and functions of cell and cell organelles. Cell division Tissues Definition, types of tissues, location and functions.

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Course BPHT102 (Pharmaceutical Analysis)

	Old Course	New Course
Unit-1	**Significance of quantitative analysis in** quality control different techniques of analysis, preliminaries and definitions, precision and accuracy.	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-2	**Fundamentals of volumetric** analysis, methods of expressing concentration, primary and secondary standards.	**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-3	**Acid Base Titrations**: Acid base concepts, role of solvent, relative strengths of acids and bases, ionization, law of mass action, common-ion effect, ionic product of water, pH, hydrolysis of salts, Henderson-Hasselbach equation, buffer solution, neutralization curves, acid base indicators, theory of indicators, choice of indicators, mixed indicators, polyprotic system.	**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

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		calcium gluconate. Gravimetry: Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate. Basic Principles, methods and application of diazotisationtitration.
Unit-4	**Oxidation reduction Titrations:** Concepts of oxidation and reduction, redox reactions, strengths and equivalent weights of oxidizing and reducing agents, theory of redox titrations, redox indicators, oxidation reduction curves, iodimetry and iodometry, titrations involving ceric sulphate, potassium iodate, potassium bromate, potassium permanganate.	**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-5	**Precipitation Titrations**: Precipitation reactions, solubility products, effect of acids, temperature and solvent upon the solubility of precipitate. Argentometric titrations and titrations involving ammonium or potassium thiocyanate, mercuric nitrate indicators, Gay-Lussac method, Mohr's method, Volhard's method and Fajan's method.	**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,

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Course BPHT104 (Pharmaceutical Inorganic Chemistry)

	Old Course	New Course
Unit-1	**A.** Sources of impurities & their control, limit test for iron, arsenic, lead, heavy metals, chloride & sulphate. **B.** An outline of methods of preparation, uses, sources of impurities, tests of purity and identification and special tests, if any, of the following classes of inorganic pharmaceuticals included in Indian Pharmacopoeia. (1996) Gases and Vapours: Inhalants (oxygen), Anaesthetics (Nitrous oxide). Pharmaceutical aids and necessities: water, purified water, Water for Injection, Sterile Water for Injection, pharmaceutical acceptable glass, acids and bases. Topical Agents: Protectives (calamine, talc, kaolin), astringents (zinc oxide, zinc sulphate) and anti infectives (boric acid, hydrogen peroxide, povidone iodine, potassium permanganate). Dental Products: Dentifrices- anti-caries agents (Sodium fluoride).	**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-2	**Gastrointestinal Agents:** Acidifying agents (Dil. HCl), antacids (Aluminium hydroxide, calcium carbonate, magnesium hydroxide, light & heavy magnesium oxide, light & heavy magnesium carbonate), cathartics (Disodium hydrogen phosphate, magnesium sulphate), protective and adsorbents (activated charcoal, light kaolin, aluminium sulphate), Miscellaneous Agents: Expectorants (ammonium chloride, potassium iodide), antioxidants (sodium metabisulphite).	**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-3	**Major Intra and extra- cellular electrolytes:** Physiological ions, Electrolytes used for	**Gastrointestinal agents Acidifiers**: Ammonium chloride* and Dil. HCl Antacid: Ideal properties of antacids,

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	replacement therapy, acid-base balance & combination therapy (calcium chloride, calcium gluconate, calcium lactate, sodium dihydrogen phosphate, sodium acetate, sodium bi carbonate, sodium chloride, potassium chloride, magnesium chloride). Cationic and anionic components of inorganic drugs useful for systemic effects.	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-4	**Essential and Trace Elements**: Transition elements and their compounds of pharmaceutical importance. Iron and haematinics (ferrous fumurate, ferrous sulphate, ferrous gluconate), mineral supplements (copper, zinc, chromium, manganese, sulphur, iodine). Co-ordination compounds and complexation- study of such compounds used in therapy including poison antidotes (calcium folinate, sodium thiosulphate).	**Miscellaneous compounds** **Expectorants**: Potassiumiodide,Ammoniumchloride*. Emetics: Coppersulphate*, Sodium potassium tartarate Haematinics: Ferrous sulphate*, Ferrous gluconate Poison and Antidote: Sodium thiosulphate*, Activated charcoal, Sodium nitrite333 Astringents: Zinc Sulphate, Potash Alum
Unit-5	**Inorganic Radio-Pharmaceuticals**: Nuclear radio pharmaceuticals, nomenclature, methods of obtaining, standards and units of activity, measurement of activity, clinical application and dosage, hazards and precautions.	**Radiopharmaceuticals**: Radio activity, Measurement of radioactivity, Properties of α,β, y radiations, Half-life, radio isotopes and study of radio isotopes - Sodium iodide I131, Storage conditions, precautions & pharmaceutical application of radioactive substances

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Course BPHT103 (Pharmaceutics-I)

	Old Course	New Course
Unit-1	**History of Pharmacy**: Origin & development of pharmacy, scope of pharmacy, introduction to pharmacopoeias with special reference to I.P, B.P., U.S.P. Pharmaceutical Additives: Colouring, flavouring & sweetening agents, co-solvents, preservatives, surfactants & their applications, antioxidants.	**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-2	**Size Reduction** : Definition, factors affecting size reduction, principles, laws & factors affecting energy requirements, different methods of size reduction, study of mills & disintegrator, various methods & equipments employed for size separation.	**Pharmaceutical calculations**: Weights and measures – Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point and molecular weight. • Powders: Definition, classification, advantages and disadvantages, Simple & compound powders – official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions. • Liquid dosage forms: Advantages and disadvantages of liquid dosage forms. Excipients used in formulation ofliquid dosage forms. Solubility

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		enhancement Techniques.
Unit-3	**Pharmaceutical calculations** : Posology, calculation of doses for infants, adults and elderly patients; Enlarging and reducing prescriptions, percentage solutions, allegation, alcohol dilution, proof spirit.	**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-4	**Extraction &Galenicals**: Extraction processes, study of infusion, decoction, digestion, percolation, maceration & their modifications. Factors affecting selection of extraction processes.	**Suppositories:** Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories Pharmaceutical incompatibilities: Definition, classification, physical, chemical and therapeutic incompatibilities with examples
Unit-5	**Mixing**: Theory of mixing, solid-solid, solid-liquid & liquid-liquid mixing equipments. Introduction to Pharmaceutical Dosage Forms: A brief theory of Solutions, mixtures, spirits, aromatic waters, glycerine, paints, syrups, elixirs, mouth washes, mucilages, lotions, liniments, pastes, inhalations and powders.	**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 dosagesforms

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Course BPHT101 (Human Anatomy and Physiology-I)

	Old Course	New Course
Unit-1	**a.** Introduction to human body & organisation of human body. **b.** Functional & structural characteristics of a cell. **c.** Detailed structure of cell membrane & physiology of transport process. Structural & functional characteristics of tissues- epithelial, connective, muscular and nervous.	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-2	**Skeletal system:** Structure, composition & functions of skeleton. Classification of joints, types of movements of joints.	**Integumentary system** Structure and functions of skin Skeletal system Divisions of skeletal system, types of bone, salient features and functions of bones of axial and appendicular skeletal system Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction Joints Structural and functional classification, types of joints movements and its articulation
Unit-3	**Anatomy & physiology of skeletal & smooth muscle**, neurotransmission, physiology of	**Body fluids and blood Body fluids,** composition and

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	skeletal muscle contraction, energy metabolism, types of muscle contraction, muscle tone.	functions of blood, hemopoeisis, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood, Reticulo endothelial system. **Lymphatic system** Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system
Unit-4	**Haemopoietic system:** Composition & function of blood & its elements, erythropoiesis, blood groups, blood coagulation.	**Peripheral nervous system:** Classification of peripheral **nervous system:** Structure and functions of sympathetic and parasympathetic nervous system. Origin and functions of spinal and cranialnerves. Special senses Structure and functions of eye, ear, nose and tongue and their disorders.
Unit-5	**Concepts of health & disease:** Disease causing agents & prevention of disease.	**Cardiovascular system** Heart – anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, elements of conduction system of heart and heartbeat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart

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Course BPHP152 Pharmaceutical Analysis-I

	Old Course	New Course
UNIT-1	**1.** Standardization of analytical weights and calibration of volumetric apparatus. **2.** Acid Base Titrations: Preparation and Standardization of acids and bases, official assay procedures, e.g. boric acid etc. **3.** Oxidation Reduction Titrations: Preparation & standardization of some redox titrates e.g. potassium permanganate, potassium dichromate, iodine, sodium thiosulphate etc. Some exercises related to determinations of oxidizing & reducing agents. **4.** Precipitation Titrations: Preparation and standardization of titrates like silver nitrate and ammonium thiocyanate.	**I Preparation and standardization of** (1) Sodium hydroxide (2) Sulphuric acid (3) Sodium thiosulfate (4) Potassium permanganate (5) Ceric ammonium sulphate **II Assay of the following compounds along with Standardization of Titrant** (1) Ammonium chloride by acid base titration (2) Ferroussulphate by Cerimetry (3) Coppersulphate by Iodometry (4) Calcium gluconate by complexometry (5) Hydrogen peroxide by Permanganometry (6) Sodium benzoate by non-aqueoustitration (7) Sodium Chlorideby precipitation titration **III Determination of Normality by electro-analytical methods** (1) Conductometric titration of strong acid against strong base (2) Conductometric titration of strong acid and weak acid against strongbase (3) Potentiometric titration of strong acid against strong base **Suggested List of Experiments** 1. To perform Limit Test of Chloride, Sulphate, Iron, Heavy metal and Arsenic in the given sample. 2. Salt analysis 3. Preparation of Compounds

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Course BPHP154 (Pharmaceutical Inorganic Chemistry)

	Old Course	New Course
Unit-1	**Suggested List of Experiments** **1.** To perform Limit Test of Chloride, Sulphate, Iron, Heavy metal and Arsenic in the given sample. **2.** Salt analysis. **3.** Preparation of Compounds.	**I Limit 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

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Course BPHP252 (Pharmaceutical Organic Chemistry-I)

	Old Course	New Course
Unit-1	**1.** Identification of elements and functional groups in given sample. **2.** Purification of solvents like benzene, chloroform, acetone and preparation of absolute alcohol. **3.** Synthesis of compounds involving benzoylation, acetylation, bromination, reduction, & oxidation. **4.** Synthesis of following compounds picric acid, Aniline, Acetanilide, Aspirin, Hippuric acid, PBromo acetanilide, Iodoform, Oxalic acid.	**1.** Systematic qualitative analysis of unknown organic compounds like **a) Preliminary test:** Color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc. **b)** Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test **c)** Solubility test **d)** Functional group test like Phenols, Amides/ Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides. **e)** Melting point/Boiling point of organic compounds **f)** Identification of the unknown compound from the literature using melting point/ boiling point. **g)** Preparation of the derivatives and confirmation of the unknown compound by melting point/ boiling point. **h)** Minimum 5 unknown organic compounds to be analysed systematically. **2.** Preparation of suitable solid derivatives from organic compounds **3.** Construction of molecular models

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Course BPHT301 (Pharmaceutical Organic Chemistry-II)

	Old Course	New Course
Unit-1	**ά, β- Unsaturated carbonyl compounds,** cycloaddition. Compounds containing active methylene group and their synthetic importance- Acetoacetic ester and malonic ester. Polynuclear hydrocarbons-Napthalene, anthracene and phenantherene.	**Benzene and its derivatives** • Analytical, synthetic and other evidences in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's rule • Reactions of benzene - nitration, sulphonation, halogenation-reactivity, Friedel crafts alkylationreactivity, limitations, Friedel crafts 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-2	**Heterocyclic Compound –** Nomenclature, Chemistry, preparation, properties and pharmaceutical importance of pyrrole, furan, thiophen, pyridine, pyrimidine, imidazole, pyrazole, thiazole, benzimidazole, indole, phenothiazine.	**Phenols*** - Acidity of phenols, effect of substituents on acidity, qualitative tests, 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 and important reactions of benzoic acid.
Unit-3	**Name reactions –** Definition, reaction mechanism and synthetic application of Merwin –Pondorff, Verley reduction, Oppeneaur oxidation, Bechmann rearrangement, Mannich reaction, Diel's alder reaction, Michel, Reformatsky, Knoevanegal reaction, Benzoin condensation. Connizaro, witting, fries, sandmegr and bechmann.	**Fats and Oils** **a.** Fatty acids – reactions. **b.** Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils. **c.** Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination.
Unit-4	**Classification, structure, reactions, structure elucidation, identification of Carbohydrates:** Monosaccharide – Glucose and fructose, Disaccharides – Sucrose, lactose and maltose, Polysaccharides–Starch.	**Polynuclear hydrocarbons:** **a.** Synthesis, reactions **b.** Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives
Unit-5	Classification, identification, general methods of preparation and reactions of amino acids and proteins. Structure	**Cyclo alkanes* Stabilities** – Baeyer's strain theory, limitation of Baeyer's strain theory, Coulson and Moffitt's

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	of Nucleic Acids. Chemistry & identification of oils, fats and waxes.	modification, Sachse Mohr's theory (Theory of strainless rings), reactions of cyclopropane and cyclobutane only.

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Course BPHP351 (Pharmaceutical Organic Chemistry-II)

	Old Course	New Course
	1. Identification of organic compounds with derivatization. **2.** Synthesis of Organic Compounds involving two steps. **3.** Workshop on molecular modelling of some organic molecules.	**1.** Experiments involving laboratory techniques a. Recrystallization b. Steam distillation **2.** Determination of following oil values (including standardization of reagents) a. Acid value b. Saponification value c. Iodine value **3.** Preparation of compounds a. Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol /Aniline by acylation reaction. 2,4,6-Tribromo aniline/Para bromo acetanilide from Aniline/ **b.** Acetanilide by halogenation (Bromination) reaction. **c.** Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction. **d.** Benzoic acid from Benzyl chloride by oxidation reaction. **e.** Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction. 1-Phenyl azo-2-napthol from Aniline by diazotization and coupling reactions. **f.** Benzil from Benzoin by oxidation reaction. **g.** Dibenzal acetone from Benzaldehyde by Claison Schmidt reaction **h.** Cinnammic acid from Benzaldehyde by Perkin reaction **i.** P-Iodo benzoic acid from P-amino benzoic acid

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