B.PHARM (2008) SYLLABUS AND REGULATIONS

INDEX:

1.1 The degree of Batchelor of Pharmacy of Andhra University will be conferred on a candidates who has satisfied the following conditions.

1.2 The candidate must have passed the (i) Intermediate examination of the Board of Intermediate Education, Government of Andhra Pradesh, or Diploma in Pharmacy examination of the Dept. of Technical Education, Govt. of Andhra Pradesh or any other examination recognized by the academic senate as equivalent thereto with Physics, Chemistry and Mathematics or Biology as group subjects and must have qualified in the Entrance Exams as prescribed by the University for being eligible to join I semester of B.Pharm course.

1.3.1 The candidate must have, after passing the qualifying examination pursued a regular course of study for not less than four academic years(three academic years in the case of diploma in pharmacy holders who are admitted directly in to 2nd year(3rd semester) of B.Pharm) and satisfied the academic requirements as prescribed thereafter. The scope of subject matter in each course and periods of study shall be as indicated in the syllabus and the scheme of instruction.

1.3.2 Instruction and examination in each academic year is spread over two semester with a minimum of 90 working days in each semester (180 in any given academic year). How ever in the case of semesters I and II of B.Pharm the instruction and examination shall be organized simultaneously spread over the entire acedimic year of 180 days to save time that may be lost due to possible delays in the admission process.

1.4 Each period of instruction is of 45 minutes duration. Eight periods of instruction are provided on each day and there are six working days in a week (Monday to Saturday).

1.5 Attendance Requirements: A regular course of study during an academic semester means a minimum of average attendance of 75% of all the courses of the semester computed by totaling the number of periods of lectures and practicals, as the case may be, held in every course. In special cases where sufficient causes were shown, the Vice-Chancellor may on the recommendation of the Principal and Head of the Department concerned condone the deficiency in the average attendance to an extent of 9% for reasons such as ill health, if the application for condonation is submitted at the time of actual illness and is supported by certificate of; authorized Medical Officer approved by the Principal. However, in the case of students, who participate in activities like N.S.S., N.C.C., Inter-Collegiate tournaments conducted by Andhra University, Inter-University tournaments conducted by Inter-University Board and any such other activities involving the representation of the College/University with the prior approval of the

principal, the candidate may be deemed to have attended the college during the period solely for the purpose of the examination.

1.6 A candidate who cannot satisfy the attendance requirements in clause 1.5 because of late admission under special circumstances reasonable and acceptable to the University on the basis of document, shall fulfill the following conditions; Average attendance: A candidate shall have attended at least a total of 90% of the periods-lectures/practicals as the case may be held from the date of admission and also shall attend at least 50% of the total working days during that academic semester (Late admission means, admissions made after 45 days from date of commencement of the academic semester for the course).

1.7 If any candidate fails to satisfy the regulation under 1.5 or 1.6 she/he shall not be allowed for the University Examinations at the end of the semester, and he/she shall not be allowed for promotion to the next higher class of study. He/she shall be required to repeat the regular course of study of that academic semester along with the next regular batch.

2.0 Assessment for the award of degree shall consists of (a) Internal evaluation for 20 marks in each of the theory and practical courses separately except in course 101 A and B Biology theory and practical (bridge course). For course 101A and B the sessional marks shall be 10 and 10 respectively as detailed in the scheme of examination. (b) Semester-end examination as detailed in the scheme of examination for 80 marks in each of the theory and practical, except for 101 A and B Biology theory and practical (bridge course) for which the semester-end examination marks shall be 40 and 40 respectively.

2.1 Regulations concerning sessional examination: (a) Three shall be two sessional examinations in each theory course and the best of the two shall be taken; (b) the marks for the internal evaluation for the practical are awarded based on the continuous assessment of the performance of the candidate at the practical classes and the records. The marks certificate issued to the candidate by the University shall show separately the sessional marks, the semester-end examination marks and the aggregate of both; (c) The teacher who teaches the subject shall ordinarily to be internal examiner, (d) There shall be no provision for the improvement of the sessional marks.

2.2 Regulations concerning semester-end examination: (a) There shall be one semester-end examination in each theory course based on the question paper set by an external paper setter and it shall be evaluated by an internal examiner. There shall be one semester-end examination in each practical course and the setting and evaluation shall be done jointly by two examiners, one internal and one external. The duration of the practical examination may be of 4 to 6 hours as prescribed. There shall be no supplementary examination except for the final semester-end examinations. A candidate shall not be allowed to appear for the sixth semester end examination unless he passes in all the courses of the first and second semester end examinations and the eighth semester-end examinations unless he passes in all the courses of the third and fourth semester-end examinations.

3.1 A candidate shall be declared to have passed the examination in each semester if he obtains (i) not less than 40% marks in each theory and 40% in each practical of the semester-end examinations.

3.1a. A candidate may be permitted to improve his performance in semester-end examination of any semester only after completing the entire eight semester course of study by appearing again for the whole examinations of that semister only during four subsequent years after completion of the study of the entire course.Such an improvement can be availed only once for each one of the semester examinations of the entire course of study. When considered in its totality the better of the two performances as whole at the I, II, III, IV, V, VI, VII or VIII semesters as the case may be shall be taken into consideration for the purpose of awarding the grade.

3.1b. The courses 101 Mathematics, 101 (A) Biology theory and 101 (B) Biology practical are bridge courses for candidates with only biology and with only mathematics background respectively at the intermediate level. Candidates with Diploma in Pharmacy have to take course 101 Mathematics. The respective candidates shall have to pass in these courses. The marks awarded in these courses shall not be considered for calculation of SGPA and CGPA.

3.2 Any candidate who carried a backlog at any stage will not be eligible for rank, medal or prizes to be awarded by the University. First attempt means appearance at the first examinations conducted for the particular batch.

4.0 Every candidate shall undergo practical training for at least one month in pharmaceutical factory at the end of the final semester of the course.

Grading system:

Appropriate letter grades are awarded in each theory and practical subject to only such candidates who have passed in the university examinations. Internal assessment marks and university examination marks put together will be taken into account for the letter grading system in each subject separately.

A candidate registered for the university examination but fails to appear or fails to score the minimum required 40% marks in the university examination will get a grade 'F', indicating failure or grade of incompletion.

A subject successfully completed cannot be repeated.

Final evaluation of each subject (theory and practical separately) will be carried out on a 10- point grading system corresponding to the marks obtained in that subject. Each subject letter grade is converted into a specific grade value associated with the letter grade as given below (Table).

Table: 10-Point grading system:

S.No.	Range of marks	Grade	Grade points
1.	≥75%	O	10.0
2.	65% - 74%	A	9.0
3.	60% - 64%	B	8.0
4.	55% - 59%	C	7.0
5.	50% - 54%	D	6.0
6.	40% - 49%	E	5.0
7.	< 40%	F(Fail)	0.0
8.	The grade W represents failure due to insufficient attendance in the semester or	W	0.0

	year		
9.	Incomplete (subsequently to be changed into pass or E or O or F grade in the same semester)	I	0.0

Semester Grade point average (SGPA):
The grade points are weighted in accordance with the number of credits assigned to a theory or practical subject and it is a product of credit and grade value. The semester grade point average (SGPA) is the weighed average of grade points awarded to a candidate.

$$SGPA = \frac{\text{Total grade points of a particular semester}}{\text{Total number of credits of the semester}}$$

Performance in the non credit courses in which a pass (i.e., 35% or more) is sufficient will not be considered for calculation of SGPA.
SGPA(semester grade point average) for each semester will be calculated for those candidates who have passed all the subjects of that particular semester of the course.
D.Pharm holders, who take direct admission to third semester B.Pharm, are exempted from First and second semester B.Pharm credits.
Cumulative Grade Point Average (CGPA):
The weighed average of SGPA's of all Semesters that the student has completed at any point of time is the cumulative grade point average (CGAP) at that point of time. CGAP up to a semester willl be calculated only for those students who have passed all the subjects up to that semester . Generally, CGPA is calculated after the successful completion of the entire B.Pharm course.

$$CGPA = \frac{\sum(\text{SGAP of each semester} * \text{corresponding number of credits})}{\text{Sum of the entire course credits}}$$

After the results are declared,grade cards will be issued to each student, which will contain the list of subjects for that semester and grades obtained by the student.
For Diploma holders, who take direct admission to third semester of B.Pharm, only six semester course credits i.e.,3rd to 8th semesters of B.Pharm will be considered for CGPA calculation.

5. Guidelines for paper setting and model papers.

5.1 Guidelines for paper setting:

1. The semester end question paper in each theory course is to be set for a total of 80 marks by an external paper setter as per the general model given below.

2.1 The question paper in each theory course is to be divided into parts A and B.

2.2 Part A consists of 10 short answer questions each carrying 4 marks out of which 8 questions are to be answered by the candidate. Thus the total of part A is 32 marks.

2.3 Part B consists of six long answer questions each carrying 12 marks out of which 4 questions are to be answered by the candidate. Thus the total of part B is 48 marks.

2.4 The question given in parts A and B should be spread over the entire syllabus in an even manner.

2.5 The question paper in each semester and practical examination is to be set jointly by two examiners, one external and one internal as per the general model provided below.

5.2 M**ODEL PAPERS**

Model question paper for practical course
Course No.
Title of the course

Date of examination:

1. Synopsis	10 marks
2. Major experiment	35 marks
3. Minor experiment	20 marks
4. Viva voce	15 marks
	Total: 80 marks

Model question paper for theory course
Course No.
Title of the course

Time: 3Hrs Max.Marks:80

Part A

Answer any **eight** questions 8 X 4 =32

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Part B

Answer any **four** questions 4 X 12 = 48

11.
12.
13.
14.
15.
16.

SCHEME OF INSTRUCTION AND EXAMINATION

Course No.	Subject	Periods per week		Exam. duration (Hrs)	Marks		Total	credits
		theory	**practical**		**sessional**	**Semester end**		
B.PHARM Ist SEMESTER								
101 A	Mathematics (bridge course)	4	…	3	20	80	100	N.C.
101 B	Biology(bridge course)	2	…	3	10	40	50	N.C.
101B	Biology(bridge course) Pract	…	2	2	10	40	50	N.C.
102	English	2	…	3	20	80	100	N.C.
103	soft skills	2	…	3	20	80	100	N.C.
104	Pharmaceutical.Chemistry-I (Inorganic)	2	…	3	20	80	100	4
105	Pharm.Chemistry-II (Organic-1)	2	…	3	20	80	100	4
106	Pharma Chemistry II (Organic-I) practical	…	3	4	20	80	100	2
	Total	**14**	**5**		**140**	**560**	**700**	
Note; Biology and Mathematics are considered as one subject and hence the total is 36								
N.C means non credit course. Pass is sufficient in these subjects. These will not be considered in calculation of SGPA and CGPA.								
B.PHARM IInd SEMESTER								
201	General & Dispensing. Pharmacy	3	…	3	20	80	100	4
202	General & Dispensing. Pharmacy practical.	…	3	4	20	80	100	2
203	Physical pharmacy-I	2	…	3	20	80	100	4
204	Physical pharmacy-I Practical.	…	3	4	20	80	100	2
205	Human physiology. & Health Education.-I	2	…	3	20	80	100	4
206	Human physiology. & Health Education.-I practical.	…	3	4	20	80	100	2

207	Computer applications	2	…	3	20	80	100	2
208	Computer applications Practicals	…	3	4	20	80	100	2
	Total	**9**	**12**		**160**	**640**	**800**	
B.PHARM IIIrd SEMISTER								
301	Applied statistics	4	…	3	20	80	100	2
302	Pharmaceutical. Chemistry –III (Organic-II)	4	…	3	20	80	100	4
303	Human physiology. & Health Education.-II	4	…	3	20	80	100	4
304	Pharmaceutical. Engineering I	4	…	3	20	80	100	4
305	Physical pharmacy-II	4	…	3	20	80	100	4
306	Physical pharmacy-II Pract.	…	6	4	20	80	100	2
307	Pharmaceutical. Analysis I	4	…	3	20	80	100	4
308	Pharmaceutical. Analysis I Pract.	…	6	4	20	80	100	2
	Total	**24**	**12**		**160**	**640**	**800**	
B.PHARM IVth SEMISTER								
401	Pharmacognosy &Phytochemistry. I	4	…	3	20	80	100	4
402	Pharmacognosy &Phytochemistry. I practical.	…	6	4	20	80	100	2
403	Pharmaceutical. Microbiology	4	…	3	20	80	100	4
404	Pharmaceutical. Microbiology practical.	…	6	4	20	80	100	2
405	Applied biochemistry	4	…	3	20	80	100	4
406	Applied biochemistry practical.	…	6	4	20	80	100	2
407	Environmental sciences	4	…	3	20	80	100	2
	Total	**16**	**18**		**160**	**640**	**800**	
Note; The 4 hours of practical examination in 224 is to be divided on two consecutive days with 3 hours on the first day and 1 hour on the next day								
B.PHARM Vth SEMISTER								
501	Drug store & Industrial.	4	…	3	20	80	100	2

	Managment.& Marketing							
502	Pharmaceutical. Biotechnology	4	…	3	20	80	100	4
503	Pharmaceutical. Biotechnology practical.	…	6	6	20	80	100	2
504	Pharmaceutical.Chemistry IV(Medicinal-I)	4	…	3	20	80	100	4
505	Pharmaceutical. Chemistry- IV (Medicinal-I) practical.	…	6	6	20	80	100	2
506	Pharmaceutical. Engineering II	4	…	3	20	80	100	4
507	Pharmaceutical. Engineering II pract.	…	6	6	20	80	100	2
	Total	**16**	**18**		**140**	**560**	**700**	
B.PHARM VIth SEMISTER								
601	Forensic Pharmacy	4	…	3	20	80	100	4
602	Pharmacology I	4	…	3	20	80	100	4
603	Pharmacology I practical.	…	6	6	20	80	100	2
604	Industrial.Pharmacy & cosmetic Technology	4	…	3	20	80	100	4
605	Industrial.Pharmacy & cosmetic Technology practical.	…	6	6	20	80	100	2
606	Pharmaceutical. Analysis II	4	…	3	20	80	100	4
607	Pharmaceutical. Analysis II practical.	…	6	6	20	80	100	2
	Total	**16**	**18**		**140**	**560**	**700**	
B.PHARM VIIth SEMESTER								
701	Pharmaceutical.Chemistry -V (Natural products)	4	…	3	20	80	100	4
702	Pharmaceutical.Che (Natural p roducts)	…	6	6	20	80	100	2
703	Pharmacology II	4	…	3	20	80	100	4
704	Pharmacology II pract.	…	6	6	20	80	100	2
705	Pharmacognosy	4	…	3	20	80	100	4

	&Phytochemistry. II							
706	Pharmacognosy &Phytochemistry. II pract.	…	6	6	20	80	100	2
707	GMP and Validation	4	…	3	20	80	100	4
708	Project	…	2	…	…	…	…	…
	Total	**16**	**20**		**140**	**560**	**700**	
B.PHARM VIIIth SEMESTER								
	Project (contd…..,)	…	2	…	…	…	100	4
801	Pharmaceutical . Chemistry-VI (Medicinal- II)	4	…	3	20	80	100	4
802	Pharmaceutical . Chemistry-VI (Medicinal- II) pract.	…	6	6	20	80	100	2
803	Biopharmaceutics. & Novel drug delivery Systems	4	…	3	20	80	100	4
804	Biopharmaceutics. & Novel drug delivery Systems pract.	…	6	6	20	80	100	2
805	Clinical. Pharmacy &Therapeutics	4	…	3	20	80	100	4
806	Clinical. Pharmacy &Therapeutics pract.	…	6	6	20	80	100	2
807	Hospital &Community pharmacy	2	…	3	20	80	100	4
	Total	**14**	**20**		**140**	**560**	**700**	

B.PHARM Ist SEMESTER

COURSE NO 101A: MATHEMATICS
(BRIDGE COURSE FOR BIOLOGY STUDENTS)

Algebra: functions, mapping, one-one function or injection, onto function or Surjection, bijection, identify function, constant function, inverse function, composite function, real valued functions, addition and multiplication of real valued functions. Quadratic expressions in one variable, extreme values, change in sign and magnitude, quadratic expressions in two variables, summation series involving A.P., G.P., H.P. Expression of npr and ncr and their definitions, fundamentals of matrices.

Trigonometry : Fundamentals of trigonometry, general definition of trigonometric ratios, sign of the trigonometric ratios as the angle varies from 0 to 2x. trigonometric ratios of the angles of 0, 90°-0,190°,270°,0°in terms of those of 0.Graphs and periodicity of trigonometric ratios .Inverse trigonometric functions. Hyperbolic functions. Expressions for sin2x, cos2x, tan2x in terms of those of x and y. Inverse hyperbolic functions.

Co-ordinate geometry: Translation and rotation of axis, locus and its equation , straight line point-slope form, slope-intercept form, perpendicular form, two point form, intercept form, symmetric form, the equation to a straight line. The straight line and the equation a +bx=0.Families of lines (one parameter),point of intersection of two straight lines, angle of intersection of two straight lines, condition of parallelism and perpendicularity of lines. Pair of straight lines, homogenous equation of the second degree in X and Y. Angle between the lines and the combined equation of the bisectors of the angles between the lines respectively by the above equation. General equation second degree in X and Y, point of intersection and the angle between the lines.

Calculus: notation of limit and continuity of a function, derivatives of composite, implicit, parametric, inverse circular, hyperbolic functions, logarithemic differentiation, derivative of a function with reference to another function, application of differentiation, partial differentiation, computation of the first and second order partial derivatives.

Integration: Integration as the inverse processes of differentiation, indefinite and definite integral, standard integral covering algebraic, trigonometric exponential and hyperbolic functions. Measures of integration, substitution methods, integration by parts, properties of definite integral and its equations, trapezoidal and Simpson's rules for approximate integration area under the curves, formation of differential equations.

COURSE NO 101 B: PHARMACEUTICAL BIOLOGY
(BRIDGE COURSE FOR MATEEMATICS STUDENTS)

Structure of the plant and animal cells. The functions of cell components. Cell division-mitosis and miosis. The animal kingdom outline, classification with salient features and examples of each phylum. Principles of the histology of animal tissues.

Amphibian(frog) Physiology with reference to cardiovascular system, nervous system and muscle contraction.

Parasitology- Introduction to the important protozoa and helminths in man.Outline of the life history of plasmodium,Trypanasoma.Liver fluke,tapeworm

and round worm.The structure and life history and physiology of amoeba and mosquito(Anopheles and Culex).

An introduction to the classification of plants with specific examples,Characterisation of the following medicinally important plant families with specific examples. Leguminosae, Rutaceae, Apocyanaceae, Solanaceae, Liliaceae, Rubiaceae, Scrophulariaceae,Compositae,Umbelliferae and Papaveraceae.

Study of general morphological and histological characters of stem, flower, root, seed and fruit. Fertilization and methods of propagation of plants.

COURSE NO 101 B: PHARMACEUTICAL BIOLOGY

PRACTICALS

Description and study of floral characters of the plants representing the families in theory; Histological studies of the leaf, flower, stem and root with description of their sections; Demonstration of muscle contraction experiment.; Frog gastrointestinal tract demonstration; Preparation of tissue slides; Observation of permanent slides.

Books suggested:

1.Text book of Botany –Vignan series
2. Text book of Zoology –Vignan series

Article I. COURSE NO 102: ENGLISH

Section 1.01 Unit;1

Role and importance of communication, verbal and non verbal communication, group communication, effective communication, barriers to communication, communication media, participating in discussions, conduct of seminars, conferences etc., making presentations through collection, evaluation, organizing the information, interacting with learners and teachers, role of wit and humor in communication.

Section 1.02 Unit;2

Spoken English Vs written English, reading method, formal/informal English(one way/two way) British /American/Indian English, how two introduce one self and others, how to tender apology, how to thank in different ways, greetings, some polite expressions.

Section 1.03 Unit;3

Agreements and disagreements, how to use a dictionary, how to use a thesaurus , vocabulary development, synonyms and antonyms, one word substitutes, comprehension.

Section 1.04 Unit;4

Communication through letters, official and personal letters, letters of complaint, letters of enquiries and responses, writing memos, circulars and notices, what to avoid while writing, paragraph writing.

Section 1.05 Unit;5

Scientific/technical report writing, drafting and delivering a speech, resume writing and interview techniques

Section 1.06 Unit;6

Grammar: sequence of tenses , voice, articles, direct and indirect speech, degrees of comparison , common errors in English made by Indian learners of English.

Section 1.07 Unit:7

Concepts of learning and listening, types and methods of learning and listening, learning and listening of knowledge, attitudes, skills and practices.

Section 1.08 Unit:8

The following four essays from "selections from modern English"prose edited by Haladhar panda are prescribed.

1. our own civilization-C.E.M.joad
2. Andrew Carnegie-E.H.carter
3. the secret of work-swami Vivekananda
4. the generation gap-Benjamin spock

Textbooks:

1. **"**bussiness correspondence and report writing"R.C.sharma and Krishna mohan ,Tata Mc grawhill publishers,New Delhi
2. Communicative English,E.Suresh Kumar,RajKamal Publications,Hyd.
3. "Selections of Modern English Prose"Ed by Hladhar Panda,Published by Universities Press(India)Pvt Ltd,Hyd.
4. A hand book of English for professionals, 2nd edition by P.Eliah Published by Pharma book syndicate

COURSE NO 103: SOFT SKILLS

Effective Communication: Elements of Communication,7Cs of Communication, Types of Communication, Speaking and Listening, Non Verbal Communication, Writing Skills, Body Language, Improvement of Communication Skills.

Effective Public Speaking: Audience Analysis, Choosing the Subject, Preparation of Speech, Presentation, Use of various Aids, Launching Pad, Evaluation, How to overcome Stage fear.

Memory Techniques: Memory Testing, Process of Learning, How to train your observation, retention of information, link method of memory, importance of memory, absent-mindedness, memory demonstration.

Human relations: Understanding people and human nature, communication barriers, skillful talk, listening to people, influencing and convincing people, making good impression, final thoughts.

Decision making: crisis, identification and understanding the problem, writing possible solutions and selecting the best one, implementation.

Stress management: causes of stress, understanding human nature, mood, temperament, needs, behavior, reactions, stress at home, work place, relaxation techniques.

Time management: importance of time, identifying time wasters, four chambers of time management, steps for proper management of time.

Goal setting: introduction, identifying goals, SWORT analysis, SMART goals, short term and long term goals, writing of mission statement, evaluation.

Team management: identifying goals, setting targets, delegating tasks, monitoring and coordination.

Interview facing: preparation of the bio-data, preparation for the interview, attire, postures and gestures, right way of answering questions.

Recommended books

1. "Quick and easy way to effective speaking" by Dale Carneige.
2. "How to develop a super power memory"by Harry Lorayne, Gaurav publishing house, New Delhi.
3. "Improve your memory" by Ran Fry.
4. "Skill with people" by Les Gibilin,Print media,New Delhi.
5. "How to develop self confidence and influence people by public speaking" by Dale Carneige.
6. "Coping with stress at work" by J.M.Atkinson.
7. "How to make successful decisions" by A.hardingham.
8. Communicative competence by Varanasi Bhaskara rao Published by Pharma book syndicate.
9. Personal and emotional competence by Varanasi Bhaskara rao Published by Pharma book syndicate.

COURSE 104: PHARMACEUTICAL CHEMISTRY- I (INORGANIC) THEORY

Brief introduction to I.P. and its contents, sources of impurities in pharmaceutical substances. Principles and procedure for the limit test of chlorides, sulphates, iron, lead and arsenic; test for purity (excluding assays) for the following compounds; aluminium hydroxide gel, barium sulphate, bismuth subcarbonate, calcium gluconate, ferrous sulphate, hydrogen peroxide, iodine, magnesium carbonate, potassium bromide, potassium permanganate and zinc oxide.

Major intra and extracellular electrolytes, requirements and functions of the following inorganic ions in the human body, sodium, potassium, calcium, chloride, iron, copper, magnesium and iodine. Physiological acid base balance, electrolytes

used in acid-base therapy, acids and bases buffers and their pharmaceutical applications.

Gastrointestinal agents: Acidifying agents, antacids, protective and adsorbents and saline cathartics. Methods of preparation and uses of the following a) Acidifying agents; hydrochloric acid, sodium acid phosphate. b) Antacids: aluminium hydroxide, sodium carbonate, magnesium carbonate (light and heavy), milk of magnesia, mnagnesium trisilcate and magnesium oxide c) Protective and adsorbents: boric acid, zinc oxide, calamine, kaolin, charcoal d) Saline cathartics: sodium potassium tartarate, magnesium sulphate, sodium phosphate.

Topical agents: Protectives, astringents, antifungal, anti protozoal and antiseptics. Ammoniated mercury, borax, hydrogen peroxide, iodine, yellow mercuric oxide, potassium permanganate, silver nitrate, silver protein, sulphar, sodium perborate, alum, bismuth subcarbonate, bismuth subgallate, zinc oxide, zinc sulphate.

Gases and respiratory stimulants: oxygen , carbon dioxide, helium , nitrogen, nitrous oxide; non essential and essential trace ions; dental products, anticarries agents, dentifrices; inorganic radiopharmaceuticals and their pharmaceutical applications. Inorganic radioopaque substances. Preparation and uses of the following reagents a) lithium aluminium hydride b)anhydrous aluminium chloride c) perchloric acid d)borontrifluoride e)ceric ammonium sulphate. Miscllaneouc inorganic pharmaceutical agents: a) expectorants and emetics b) haematinics c)poisons and antidotes d) sedatives e) complexing and chelating agents. Principles and procedures involved in identification of simple salts.

Text books;

1. Practical pharmaceutical chemistry by A.H. Beckett and J.B. Stenlake
2. Indian pharmacopoeia
3. Text book of pharmaceutical chemistry by Bently and Driver
4. Inorganic pharmaceutical chemistry by Rogers
5. Inorganic pharmaceutical and medicinal chemistry by Block, Roche, Soine and Wilson.

COURSE 105: PHARMACEUTICAL CHEMISTRY-II (ORGANIC-I)THEORY

The subject of organic chemistry will be treated in its modern perspective, keeping for the sake of convenience the usual classification covering the following topics.

Structure and properties of organic molecules: Atomic and molecular orbitals. Bond formation in organic compounds, hybridization, polarity of bonds and molecules, intra and inter molecular forces, influence of structure on physical properties, modern theories of acids and bases, homolysis and heterolysis, types of reagents and reactions, inductive and mesomeric effects; Nomenclature, concepts of isomerism.

Alkanes: Nomenclature, general methods of preparation, energy of activation, transition state, reactions of alkanes with special reference to substitution, free radicals chain reactions, stability of free radicals, bond dissociation energy, free rotation about carbon-carbon single bonds and conformational isomerism, study of

composition and uses of liquid paraffin, soft paraffin, white soft paraffin, hard paraffin and ichtammol.

Stereo chemistry: Optical isomerism, chirality, configuration, specification of R and S configuration, sequence rules, diastereomers, meso structures, stereoisomerism, Cyclo alkanes: Nomenclature, preparation, Bayer's strain theory, chair and boat conformations of cyclohexane, axial and equatorial bonds.

Halo alkanes: Nomenclature, general methods of preparation nucleophilic substitution, Sn1 and Sn2 mechanisms, E1 and E2 mechanisms for eliminations, preparation and uses of ethyl chloride, chloroform and iodoform.

Alkenes: Nomenclature, two important methods of preparation, structure of ethylene, carbonium ion theory electrophilic and free radical addition to carbon-carbon double bonds, Markovnikav's rule, peroxide effect, ozonolysis, introduction to alkadienes, stability of conjugated dienes, theory of resonance and hyperconjugation.

Alkynes: Nomenclature, acidity and general methods of preparation, structure of acetylene, reactions of alkynes (Formation of metal acetylides, stereo specific reduction of alkynes, addition reactions of alkynes).

Organometallic compounds: preparation and synthetic applications of Grignard reagents.

Alcohols: Nomenclature, industrial sources, general metod of preparation and reactions, study of ethyl alcohol, rectified spirit, industrial spirit, proof spirit, absolute alcohol, benzyl alcohol, cinnamyl alcohol, propylene glycol and glycerol.

Ethers: Nomenclature, general methods of preparation and reactions (Williamson's-synthesis and action of HI), preparation and uses of diethyl ether.

COURSE NO 106: PHARMACEUTICAL CHEMISTRY-II (ORGANIC- I)PRACTICAL

1. Experiments to provide practice to the students in the uses of organic chemistry laboratory techniques such as crystallization, distillation (at normal pressure and under reduced pressure), sublimation, determination of physical constants like melting point and boiling point.
2. Identification of mono and multi functional organic compounds by systematic qualitative organic analysis (carboxylic acid, phenols, amines, aldehydes and ketones, alcohols, esters, hydrocarbons, nitro compounds and anilides).
3. Preparation of simple organic compounds such as nitrobenzene, iodoform, acetanilide, aspirin, sulphanilic acid, benzoic acid and benzanilide.

TEXT BOOKS:

1. Organic Chemistry By Morrison and Boyd
2. Bently and Driver's Textbook of Pharmaceutical Chemistry
3. Organic Chemistry, Vol. I by I.L. Finar.

B.PHARM IInd SEMESTER

COURSE NO 201: GENERAL AND DISPENSING PHARMACY

1. History of Pharmacy, Pharmacy Profession and Evolution of Pharmacy – Pharmacy in India – Pharmacopoeias of India, B.P., U.S.P. and International

Pharmacopoeia – Metrology – Weights and Measures – Balances – Types and Care.

2. Dosage Forms – Classification – Definition and Essential Characteristics – Formulation and its purpose – Formulation additives.
3. A Study of Principles, Formulation, General Methods of Preparation and Uses of the Following Types of Preparation Including a Study of Official (IP/BP) and other Popular Products under each Category.
    (i) Liquids for External Use: Lotions, Liniments, Glycerins, Collodions, Paints, Gargles, Mouth Washes, Ear Drops.
    (ii) Liquids for Internal Use: Waters, Solutions, Spirits, Elixirs, Syrups.
    (iii) Emulsions and Suspensions.
4. A Study of Principles, Formulation, General Methods of Preparation and Uses of the Following Types of Preparation Including a Study of Official (IP/BP) and other Popular Products under each Category.
    (i) Semisolids: Ointments, Creams, Pastes, Gels, Suppositories.
    (ii) Galenicals: A Study of Maceration, Percolation and Continuous Hot Extraction. Method of Preparation and Uses of the Following Galenicals: Compound Tincture of Benzoin, Liquid Extract of Belladonna, Dry Extract of Nux Vomica.
5. Prescription, Types, Latin Terms in Prescriptions – General Principles of Dispensing, Accuracy and Care in Dispensing and Administering Medicines, Labelling and Packing. Pharmaceutical Calculations on Percentage Solutions, Doses, Posology, Alligation, Proof Strength.
6. Principles involved and Procedures Adopting in the Dispensing of Prescriptions Covering Solutions, Mixtures, Lotions and Liniments, Emulsions, Suspensions, Powders, Suppositories and Semisolids.
7. Incompatibility: Physical, Chemical and Therapeutic – Methods of Overcoming and Handling Incompatible Prescription.

Books:

1. Introduction to Pharmaceutical Dosage Forms by H. C. Ansel; 2. Bently's Textbook of Pharmaceutics by E. A. Rawlins; 3. I.P., B.P. and B.P.C (Current Editions); 4. Textbook of Professional Pharmacy by N.K. Jain and S.N. Sharma; 5. Cooper and Gunn's Dispensing Pharmacy; 6. Tutorial Pharmacy by Cooper and Gunn; 7. The Science and Practice of Pharmacy by Remingtons. 8. Modern

dispensing pharmacy by N.K. Jain and G.D.Gupta published by pharma book syndicate.

COURSE NO 202: GENERAL AND DISPENSING PHARMACY PRACTICALS

Preparation of atleast 60 Pharmaceutical Products Covering Various Types of Dosage Forms (25) and Prescriptions (35), Aromatic Waters (3), Solutions (4), Syrups (3), Elixirs (3), Lotions (2), Liniments (2), Galenicals (1), Glycerins (3), Ointments (2), Creams (2), Mixtures (8), Powders (6), Emulsions (6), Suppositories (2), Incompatibilities (10), Paints, Gargles, Mouth Washes (3).

COURSE NO 203: PHYSICAL PHARMACY I – THEORY

Intermolecular forces and state of matter; Binding forces between molecules, the states of matter, the gaseous state, the liquid state, solids and the crystalline state phase equilibria and the phase rule.

Thermodynamics: The first law of thermodynamics thermochemistry. The second law of thermodynamics. The third law of thermodynamics. Free energy functions and applications. Some physical properties of drug molecules, dielectric constant, induced polarization, dipole moment, refractive index and molar refraction. Optical rotation, optical rotatory dispersion.

Solutions: Concentration, expressions, solutions of nonelectrolytes, ideal and real solutions, colligative properties, molecular weight determinations. Solutions of electrolytes. Properties of solutions of electrolytes. The Arhenius Theory of electrolytes and other coefficients for expressing colligative properties.

Ionic equilibria: Modern theories of acids and salts. Sorensen's pH scale, species concentration as a function of pH, calculation of pH, Graphical solution to pH problems, acidity constants. Buffers and buffered isotonic systems. The buffer equation, buffer capacity, buffers in pharmaceuticals and biologics, buffered isotonic, methods of adjusting tonicity and pH.

Electromotive force and oxidation – reduction systems: Electrochemical cells, electrometric determination of pH and redox. Viscosity and Poisseulli's formulae for

liquids, experimental determination of viscosity, Ostwold viscometer, comparison of viscosities.

Surface Tension: Definition, method of determination. Significance in Pharmacy.

COURSE NO 204: PHYSICAL PHARMACY-PRACTICAL

1. Determination of viscosity of liquids such as water, glycerin, liquid paraffin – light and heavy; 2. Determination of surface tension of water and a surfactant solution; 3. Determination of density of a solid; 4. Phase Rule: Construction of phase diagram for phenol – water system; 5. Construction of Phase diagram for triethanolamine – water system; 6. Rast camphor method: Determination of molecular weight of a substance (benzoic acid and aspirin); 7. Elevation of boiling point – determination of vant Hoff's factor; 8. Determination of refractive index and molar refractivity of liquids such as water, acetone, carbon tetrachloride and alcohol; 9.Quatitative applications of refractive index – determination of strength of alcohol or acetone; 10. Determination of specific rotation of dextrose solution and estimation of dextrose in solution by polarimetry; 11. Calibration of pH meter and determination of pH of solutions; 12. Acid – base titrations using pH meter; 13. Determination of pKa by half – neutralization method; 14. Preparation of selected buffers and determination of buffer capacity of acetate buffer.

Suggested Books:

1. Physical Pharmacy by Alfred Martin.
2. Bentley's Textbook of Pharmaceutics by E.A. Rawlins.
3. Remington's Pharmaceutical Sciences.
4. Physical pharmacy Practical text by Guru Prasad Mohanta and Prabal Kumar Manna Published by Pharma book syndicate.
5. Essentials of physical pharmacy by Derle D.V. published by pharma book syndicate.

COURSE NO 205: HUMAN PHYSIOLOGY -1 (INCLUDING HEALTH EDUCATION)

Structure of human body – skeleton, muscles, tendons, ligaments, joints. Fundamentals of anatomy of different systems of body. Functional organization of the different compartments and body fluids. Homeostatic mechanisms, electrolytes, pH

and buffers. Types of muscles, structural and functional organization, neuromuscular junction, muscle contraction and its electrical and metabolic correlates. Muscle function during exercise. Knowledge of myasthenia gravis, spasticity, tetanus.

Motility of alimentary canal and its regulation, secretions, their composition, function and regulation. Digestion of foods in mouth, stomach and small intestine. Absorption of foods. Balanced diet and deficiency disorders. Liver functions. Elimination of undigested food. Knowledge on emesis, pyloric stenosis, hyperacidity, peptic and duodenal ulcer, dyspepsia, colic, constipation and diarrhea, piles, jaundice, cirrhosis.

Composition and the functions of blood. Production of blood cells, blood groups, transfusion of blood. Blood coagulation. Formation and circulation of lymph. Knowledge on anemia and blood dyscrasias like purpura, agranulocytosis, thrombocytopenia, leukemia, leucopenia, polycythemia.

Cardiovascular system: Structure and functions of heart and blood vessels. Systemic, pulmonary, coronary and hepatic blood circulation, cardiac output, blood pressure in different blood vessels, their direct and indirect measurements. Electrophysiology and E.C.G. of heart, cardiac cycle, cardiac dysrrhythmias, congestive heart failure, hypertension, angina pectoris,
atherosclerosis, arteriosclerosis.

Personal, industrial and public hygiene. Spread and prevention of contagious diseases, venereal diseases , leprosy, droplet's infection, water and air-borne diseases, diseases caused by insects. Population problem, family planning programme .The role of pharmacist in motivating public in the implementation of family planning programme, principles of family planning methods, contraceptives and their use. First aid for fractures of limbs, joints, bleeding, drowning and snakebite, burns, scalds and poisons.

Suggested Books:

1. Shambu lingam- Essentials of Physiology
2 .Ross & Wilson- Anatomy & Physiology in health and illness-Anne Waugh, Allison Grant.
3. First Aid to the injured- Published by Saint John Ambulance Association.
4. A Treatise on Hygine and Public Health, B.N. Ghosh, Calcutta Scientific Publishing Company.

Reference Books:

1. Text Book of Medical Physiology-Arthur.C.Guyton
2. Samson Wright's Applied Physiology.

COURSE NO 206: HUMAN PHYSIOLOGY -PRACTICAL (INCLUDING HEALTH EDUCATION)

List of Experiments:

1.Identification of permanent slides of heart, liver, lung, pancreas, stomach, small intestine, uterus, ovary, testes, skin, eye, tongue, thyroid, adrenal gland, T.S. of artery

and vein, kidney; 2.Microscopic examination of epithelial cells, muscular tissue, nerve fibre, cartilage

Determination of following parameters in human blood:

3.Haemoglobin 4.Blood group; 5. Coagulation time and bleeding time;. 6.R.B.C count. 7.W.B.C count. 8. Differential leukocyte count 9.Erythrocyte sedimentation rate (ESR) 10.Determination of fragility range of sheep R.B.C. in hypotonic saline; 11.Graphical recording of simple muscle twitch (SMT) with Frog's gastronemius-sciatic muscle nerve preparation; 12. Effect of fatigue on SMT; 13.Effect of cold Ringer (10°C) on SMT; 14.Effect of warm Ringer (40^0 C) on SMT; 15.Genesis of tetanus on SMT; 16.Determination of arterial blood pressure by Sphygmomanometer; 17. Determination of vital capacity of lungs 18. Recording of normal heart beat of frog in situ.19.Recording of body temperature of humans with clinical thermometer.

COURSE NO 207: COMPUTER APPLICATIONS

Introduction to computers-their development through generations-classification-applications of computers.

Anatomy of computers; keyboard, monitor and CPU-input devices like **OCR;OMR,MICR-** output devices like printers, types of computer memory, storage devices-floppy disk, hard disk drives and magnetic tapes.

Software-types of software-machine language-binary code-bits and –bytes-ASC11 codes, high level languages, languages processors- compilers, interpreters, problem solving, algorithms and flow charts.

BASIC-character set-features of BASIC program-statements, keywords-writing and editing a program-execution, saving and loading Constants and variables, expressions- use of statements like LET, INPUT, READ DATA, RESTORE, REM, PRINT, END-printer controls-control statements GOTO,ON GOTO,IF THEN, IF – THEN-ELSE, FOR NEXT, GOSUB-graphics in basic

Operating systems-MSDOS-various internal commands-DIR and its keys, MD, RD, CD,COPY CON, COPY, REN, DEL, TREE, DEL TREE, FORMAT.

Windows- important features, various accessories-windows explorer, locating and copying files.

MS-OFFICE: MS-WORD-editing documents, formatting text and various features.

MS- EXCEL- organization of work sheet, editing cells, generating graphs.

ORACLE-introduction to managing data-data base concepts-RDBMS characteristics.

Interactive SQL-the oracle data types- two dimensional matrix creation, creating tables, data entry, editing data, updating-computation-logical operations, manipulating data-oracle functions-indexes

COURSE NO 208: COMPUTER APPLICATIONS (PRACTICAL)

1. use of MS-DOS commands like DATE, TIME, DIR,COPY CON, MD, CD,RD, COPY, DEL, FORMAT, PATH etc.,
2. writing of at least ten programs in basic using various statements like REM, LET, PRINT, END, INPUT, READ-DATA, GO TO, IF THEN, FOR-NEXT,PSET, LINE, CIRCLE, COLOUR etc.,
3. At least five exercises each in MS-WORD and MS-EXCEL using various features available/preparation of documents- editing-tabulation of data-generation of charts.
4. at least five exercises in data base management using ORACLE- interactive SQL-creating tables, editing, computation etc.,

RECOMMENDED BOOKS:

1. basic computer programming- V.K Jain, pusthak mahal, Delhi
2. programming in basic by E.Balagurusami,tatamcgrawhill
3. programming in basic-Gottfried,tata mcgrawhill
4. abc of windows 98-BPB Publications ,New Delhi
5. working in microsoft office-Ronmansfield
6. commercial application development using ORACLE developer 2000 by Iran bay ross,BPB Publications, New Delhi
7. Computer fundamentals with pharmacy applications by N.K.Tiwari published by pharma book syndicate.

B.PHARM IIIrd SEMISTER

COURSE NO 301: APPLIED STATISTICS

A study of the following with reference to Pharmaceutical Sciences

Applications of statistics in pharmaceutical sciences

Scales of measurement (nominal, ordinal, interval, ratio)

Definitions, Concept, Applications, merits and demerits of mean, median, mode, standard deviation, relative standard deviation, variance, coefficient of variation, skewness, kurtosis.

Definition and concept of precision, accuracy, mean error, relative error, significant numbers

Concept, applications, properties, calculations involved in correlation (Pearson's correlation coefficient, Spearman's rank correlation coefficient) and regression (linear regression, least square method)

Probability: Definitions (Random event, Elementary event, Exhaustive event, mutually exclusive events, complementary events, independent events, classical and modern definitions of probability, random variable.)

Addition theorem, Multiplication theorem, Baye's theorem

Probability distributions such as normal, binomial and poisson distributions. Sampling distribution, standard error, confidence limits.

Elements of sampling theory: Definitions and concepts of population, sample, discrete variable, continuous variable, different sampling methods.
Testing of hypothesis: Definition and concept of null hypothesis, types of error, level of significance, criterion value, T-test, χ^2-test.
Text Books:

1. Comprehensive Statistical Methods, by P.N.Arora, Sumeet Arora, and S. Arora (S. Chand & company)

2. Miller & Freund's Probability and statistics for engineers by Richard A. Johnson, (Pearson Education Publishers)

3. Statistics – Theory, Methods and Application by DC Sancheti and VK Kapoor()(Sulthan and chand&sonsPublishers)

Reference Book:

1. Pharmaceutical Statistics by S. Bolton

2. Biostastics and computer applications by G.N.Rao and N.K Tiwari published by pharma book syndicate.

COURSE NO 302: PHARMACEUTICAL CHEMISTRY-III (ORGANIC-II) THEORY

1. Benzene and aromaticity: Modern structure of benzene aromaticity. Huckels rule, Nomenclature of benzene derivatives, Electrophilic substitution reactions – mechanisms of nitration, halogenation, sulphonation and Friedel-crafts alkylation, Theory of reactivity and orientation in mono substituted benzenes, preparation and uses of gammabenezene hexachlorilde, saccharine and chloramines-T.
2. Aldehydes and Ketones: Nomenclature, general methods of preparation, structure versus reactivity, Nucleophilic addition reactions, acidity of alpha-hydrogens and carbanion addition reactions. Haloform reaction of methyl ketones. Praparation and uses of formaldehyde, paraformaldehyde, acetaldehyde, paraldehyde, acetone, chloral hydrate, benzaldehyde, cinnamaldehyde, vanillin.
3. Carboxylic acids: general methods of preparation, reactions, acidity preparation and properties of hydroxy acids and dicarboxylic acids. Preparations and uses of acetic acid, lactic acid, oleic acids, succinic acid and tartaric acid.
4. Sulphonic acids: Methods of preparation and uses of alkyl and aryl Sulphonic acids – sodium lauryl sulphate.
5. Functional derivatives of carboxylic acids – Nucleophilic acyl substitution reactions; preparation of acid chlorides, amides, anhydrides and ester from acids. Nucleophilic acyl substitution reactions – preparation and uses of ethyl acetate, diethyl phthalate, methyl salicylate, ethyl acetate and aspirin. Preparation and synthetic uses of malonic ester and aceto acetic ester.
6. Phenols: General methods of preparation, acidity, characteristic reactions. Preparation and uses of phenol, catechol, resorcinol, hydroquinone and pyrogallol.
7. Aryl-halides – Nucleophilic aromatic sybstitution. General methods of preparation, reactivity of aryl halides, nucleophilic aromatic substitution reactions.

8. Amines: General methods of preparation, basicity of amines, characteristic reactions of amines, separation of different classes of amines, Ring substitution in aromatic amines, quaternary ammonium compounds, preparation and uses of ethonalamine, aniline, acetanilide, urea and tetrabutyl ammonium hydroxide, cetyl trimethyl ammonium bromide.
9. Diazonium compounds: preparation, reactions and uses.
10. Polynuclear aromatic compounds: structure and reactions of naphthalene, anthracene and phenanthrene.
11. Name reactions: Mannich reaction. Micheal addition, Beckmann rearrangement. Fries rearrangement, Bayer-villiger oxidation.

TEXT BOOKS:

1. Organic chemistry by Morrison and Boyd
2. Bently and Dirver's Textbook of pharmaceutical Chemistry
3. Organic Chemistry, Vol. I, by I.L. Finar.

COURSE NO 303: HUMAN PHYSIOLOGY II

Endocrine glands: Adrenal, thyroid, parathyroid, pituitary, thymus and gonads,their hormones and physiology. Knowledge on addison's disease, Hirsutism, Cretinism, Goiter, Myxedema, tetany, acromegaly. Physilogy of male and female reproductive systems; Production of gametes, sex differentiation, fundamental knowledge on puberty, menstrual cycle, conception, parturition and menopause knowledge on common chromosomal abnormalities.

Respiratory organs and their physiology. Mechanisms of respiration. Molecular aspects of cellular respiration. Transport of gases between lungs and tissues. Artificial respiration methods. Knowledge on asthma, bronchitis, pulmonary tuberculosis. Kidney structure of nephron, formation of urine, knowledge of micturition, crystalluria, function of rennin-angiotensin system, acid-base balance of body fluids. Nephritis, kidney function in geriatrics. Excretory organs skin, sweat glands and their function.

Central nervous system (CNS): Membrane potentials, nerve excitation and conduction, neurons, neuronal tansmission, receptors. Fundamentals of anatomy of brain and spinal cord. Reflex action and reflex arc. Functions of cerebrum, cerebellum, thalamus, hypothalamus, midbrain, pons, medulla oblongata and ranial nerves. Spinal cord and spinal nerves. Reticular activating system, limbic system and their functions, sleep, EEG, ventricles of the brain, cerebrospinal fluid (CSF) and its circulation, blood brain barrier, epilepsy, anxiety, schizophrenia, depression, sleep, insomnia, parkinsonism.

Autonomic nervous system (ANS): Parasympathetic and sympathetic divisions of ANS. Fundamentals of anatomy of ANS – Physilogy of ANS. Neurotransmittors-Chemical transmission, cholinergic and adrenergic nerves. Organs of special senses- taste, smell, touch, hearing and vision. Glaucoma, mydriasis, miosis, conjunctivitis, deafness.

Metabolism of carbohydrates, proteins, fats and minerals. Metabolic disorders- diabetes, thermoregulation- pyrexia, pain – inflammation- arthritis.

Immune systems. Immunocomponent cells and their development – autoimmune disorders.

Suggested Books:

1. Shambu lingam- Essentials of Physiology
2 .Ross & Wilson- Anatomy & Physiology in health and illness-Anne Waugh, Allison Grant.
3. First Aid to the injured- Published by Saint John Ambulance Association.
4. A Treatise on Hygiene and Public Health, B.N. Ghosh, Calcutta Scientific Publishing Company.

Reference Books:

1. Text Book of Medical Physiology-Arthur.C.Guyton
2. Samson Wright's Applied Physiology

COURSE NO 304: PHARMACEUTICAL ENGINEERING – I

A study of the following topics with particular reference to pharmaceutical industry.

1. Fluid Flow: Definitions, Material balance, energy balance, Bernoulli's equation, stream line and turbulent flow, Reynolds number, roughness of pipe surfaces, energy loses in flowing fluids through pipes. Measurement of pressure and fluid flow. Different types of manometers, orifice meter, venture meter, pilot tube and Rotameter. Solutions to simpler numerical problems.
2. Transportation of fluids: Pipe fittings and valves. Pumping equipment, reciprocating pumps, diaphragm pumps, centrifugal pumps, rotary pumps and compressors. Use of compressed air, air lift pumps, screw pumps, monopump and peristaltic pump. Water supply and maintenance of water at different temperatures.
3. Heat transfer: Introduction, conduction, Fourier's law, conduction through plain and cylindrical surfaces, compound resistances. Heat transfer from condensing vapours. Drop wise and film type condensation. Properties of steam, Heat exchangers. Parallel and counter current flow. Radiation, Stephan's and Kirchoff law, Physical nature of surfaces. Heat conservation and insulation. Requirements of a good conductor.
4. Evaporation: General principles, methods of supply of heat, types of evaporators, jacketed evaporators, film evaporators, forced circulation evaporators, evaporator accessories, wet and dry condensers, vacuum pumps, gauzes, steam traps.

5. Distillation: Theory applied to binary mixtures, boiling point and equilibrium diagrams, constant boiling mixtures, equilibrium distillation, differential distillation, steam distillation, rectification, distillation stills, automatic water stills, molecular distillation and its application.
6. Filtration: Filtration media and filter aids, types of filters, filter presses, rotary continuous filter and Meta filters. Sterile filtration of liquids, air filters. Filter operation, effect of pressure and temperature on rate of filtration, compressibility of filter cake, elementary theory of filtration, solutions of simpler numerical problems. Centrifuges, theory and equipment and applications.
7. Materials of construction: Consideration of mechanical properties, corrosion and contamination. Consideration of ferrous metals and their alloys. Non – ferrous metals like copper, tin, lead, nickel, zinc, silver and platinum. Non – metallic materials like stone ware, wood, glass, rubber and plastics. Materials of Pharmaceutical packaging; Industrial hazards and safety precautions; Mechanical, chemical, electrical, fiber and dust hazards. Safety requirements, fire extinguishers, industrial dermities.

Text Books:

1. Introduction to Chemical Engineering by Water L. Badger and Julius T. Bancher; 2. The Theory and Practice of Industrial Pharmacy by Leon Lachman, H. A Lieberman and Joseph L. Kanig; 4. Tutorial Pharmacy – Cooper and Gunn 5. Pharmaceutics, The Science of Dosage Form Design, edited by Michael E. Aulton.

COURSE NO 305: PHYSICAL PHARMACY – II

A study of the applications of physico – chemical properties to pharmacy with special reference to the following:

1. Solubility and distribution phenomena: Solvent – solute interactions, solubility of gases in liquids, liquids, solids – factors influencing solubility – methods of increasing solubility, distribution coefficient significance of distribution coefficient.
2. Complexation: Types of complexes, methods of analysis, Complexation and drug action.

3. Kinetics: Rates and orders of reactions, determinations of order of a reaction influence of temperature and other factors on reaction. Decomposition of medicinal agents. Methods and principles of stabilization. Accelerated stability analysis – principles and methods. An introduction to ICH guidelines.
4. Interfacial phenomena: Liquid interfaces, adsorption at liquid interfaces. Surface active agents classification, properties, applications HLB. Adsorption at solid interfaces. Electric properties at interfaces – Zeta potential and its importance.
5. Colloids: Types, methods of preparation, properties, protective colloid action, Solubilization. Gels, Structure, properties and applications.
6. Coarse dispersions: Emulsions, Suspensions and semisolids. Suspensions – interfacial properties of suspended particles, setting in suspensions. Formulation and evaluation of flocculated and deflocculated suspensions. Emulsions: Theories of emulsification, physical stability of emulsions, preservation of emulsions, rheological properties of emulsions, suspensions and semisolids.
7. Rheology: Newtonian systems. Thixotropy measurement and its applications in pharmacy. Determination of viscosity, viscometer.
8. Micromeritics: Particle size and size distribution, methods of determining particle size particle shape, particle number, surface area – methods of determining surface area, derived properties of powders – their significance.

Text Books:

1. Physical Pharmacy by Alfred Martin; 2. Tutorial Pharmacy by Cooper and Gunn, edited by S.J. Carter; 3. Remington's Practice of Pharmaceutical Sciences.

COURSE NO 306: PHYSICAL PHARMACY – II – PRACTICAL

1. Determination of solubility of drugs in single and mixed solvents; 2. Construction of phase diagram for the system of methyl salicylate – isopropanol water; 3. Determination of partition coefficient of benzoic acid in peanut oil – water system; 4. Influence of additives (glycerol in aqueous phase) on the partition coefficient; 5. Study of Complexation of copper and glycine by pH titration method;

6. Determination of rate constant of a first order reaction; 7. Determination of rate constant of second order reaction; 8. Determination of surface and interfacial tensions; 9. Determination of SMC of a surfactant by capillary rise principle; 10. Determination of HLB of a surfactant; 11. Determination of Cloud and Kraft point; 12. Study of adsorption of oxalic acid on charcoal – construction of adsorption isotherms; 13. Influence of suspending agent on the sedimentation parameters in a suspension; 14. Determination of degree of flocculation in a suspension; 15. Determination of particle size by gravity sedimentation Andreason's Apparatus; 16. Determination of globule size and size distribution in an emulsion; 17. Study of physical stability of selected emulsions; 18. Preparation of colloids 9 (lyophilic and lyophobic) and study of protective colloidal action; 19. Determination of bulk and true density (by liquid displacement method) of crystalline solids; 20. Micromeritic studies on tablet granulations – determination of bulk and granule densities, angle of repose, compressibility index, influence of glidants on flow properties.

COURSE NO 307: PHARMACEUTICAL ANALYSIS –I (THEORY)

1. A general introduction to pharmaceutical analysis and general aspects of standardization of pharmaceutical chemicals and formulated products mentioned in Indian pharmacopoeia. Importance of proper sampling and general books for pharmaceutical standards like pharmacopoeias, National formularies.
2. computation of analytical results, significant numbers, rejection of doubtful values with reference to volumetric and gravimetric analysis, sources of errors and calibration of analytical equipment used in volumetric and gravimetric analysis.
3. Acid-Base titrations: theoretical basis of neutralization reactions including electrolytic dissociation, application of law of mass action, relative strength of acids and bases, hydrolysis of salts and buffer solutions, theory of neutralization indicators and factors involved in the selection of indicators for different types of acid-base titrations. Procedures involved in different types of titrations using strong acid, week base, strong base, week base and back titration with blank determination.
4. Oxidation-reduction titrations: theoretical considerations including standard potentials, calculation of redox potentials, redox indicators, principle and procedure involved in different types of redox titrations using potassium permanganate, iodine. Titrations of released iodine and back titration of excess iodine, potassium iodate, ammonium ceric sulphate and titanous chloride.
5. Precipitation titrations: principles and procedures involved in argentimetry, use of silver nitrate and ammonium thiocyanate. Indicators used in

precipitation titrations including adsorption indicators, Mohr's and volhard's methods with examples.

6. Complexometric titrations: basic principles of complexometric analysis including theories of complex ions, chelating agents, properties of metal complexes with particular reference to EDTA. Basic principles of complexometric analysis including theories of complex formation. Werener's coordination number and structure of complex ions, chelating agents, properties of metal complexes with particular reference to EDTA, various examples of titrations of metal ions using disodium acetate, indicators and end point detection using indicators and by physical methods, masking and demasking agents, pharmaceutical applications of complexometry with particular reference to I.P.
7. Non-aqueous titrations: principles, advantages and pharmaceutical applications, solvents reagents and indicators used in nonaqueous titrimetry, other methods of detecting end points. Examples of titrations of alkali metal and alkaline earth metal salts of organic acids, primary, secondary and tertiary amines, halogen acid salts of bases, titration of acidic substances.
8. Principles and procedures involved and application of nitrite titrations, titrations using 2, 6-dichlorophenol-indophenol. Aquametry including use of Karl-fisher reagent and moisture balances. Drying and distillation, oxygen flask combustion method of analysis.
9. A detailed study of gravimetric analysis including principles involved, critical factors and typical methods involving precipitation, coagulation, digestion, filtration and incineration procedures with suitable examples. Advantages and disadvantages, sources of errors and their elimination in gravimetric analysis.
10. Gas analysis: principles of gas analysis, use of hempel's gas burette and pipette, nitrometer, haldome's and orset's gas analysis apparatus and their operations. Examples of gas analytical methods of pharmaceutical significance.

Text books:

1. Indian pharmacopoeia
2. practical pharmaceutical chemistry by A.H. Becket and stenlake

COURSE NO 308: PHARMACEUTICAL ANALYSIS –I (PRACTICAL)

Acid-base titrations
1. Standardization of HCl 2. Standardization of H_2SO_4 3. Standardization of NaOH 4. Assay of boric acid 5. Assay of sodium bicarbonate 6. Assay of borax 7. Assay of calcium hydroxide 8. Assay of zinc oxide 9. Assay of calcium carbonate 10. Assay of acetyl salicylic acid 11. Assay of formaldehyde 12. Assay of NaOH in presence of sodium carbonate.

Redox titrations:
13. Standardization of iodine 14. Standardization of $KMnO_4$

15. Assay of ferrous sulphate 16. Assay of hydrogen peroxide 17. Assay of sodium nitrate18. Estimation of ascorbic acid with 2,6-dichlorophenol indophenol 19. Assay of mercuric chloride 20. Assay of sodium metabisulphite 21. Assay of copper sulphate

Precipitation titrations
22. Standardization of silver nitrate
23. Assay of potassium chloride 24. Assay of ammonium thiocyanate 25. Assay of mercuric oxide

Complexation titrations
26. Standardization of EDTA
27. Assay of calcium gluconate injection/tablets 28. Assay of aluminium sulphate

Non-aqueous titrations
29. Assay of thiamine hydrochloride

Gravimetry
30. Determination of sulphate as barium sulphate 31. Estimation of magnesium as magnesium pyrophosphate 32. Determination of thiamine as silico tungstate

Limit tests
33. Limit test for chlorides 34. Limit test for sulphates
35. Limit test for iron

B.PHARM IVth SEMESTER

COURSE NO 401: PHARMACOGNOSY AND PHYTOCHEMISTRY-I

Introduction ,development,present status and future scope of pharmacognosy; Classification of crude drugs : Alphabetical, morphological,taxonomical,chemical and therapeutic; Cultivation,collection, processing and storage of crude drugs,factors influencing cultivation of medicinal plants.Types of soils and fertilizers of common use.

A study of mineral drugs,fossil organisms, Diatomite, chalk, kaolin, bentonite, Fuller's earth. A study of commercial fibres, their sources, preparation, characters, chemical tests, uses, etc.-Cotton, cellulose, regenerated cellulose, Jute, Wool, Silk, Nylon; Starch – manufature and general characteristics of wheat, potato, maize and rice starches, soluble starch, dextran.

Microscopical and macroscopical characters, varieties, cultivation, collection, principal, constituents, chemical nature, tests for identification, adulterants, substituents and uses of the following drugs. Leaves: Eucalyptus, senna, adhatoda, digitalis, squill and datura. Flowers: Cloves, pyrethrum, saffron. Fruit : Fennel, cumin, coriander, ajowan, dill, caraway, orange, lemon and capsicum.

Powders of natural occurrence: Lycopodium,pollen,kamala,lupulin; Entire organisms:Carrageenan,ergot,penicillin,ephedra,belladonna,lobelia,peppermint,vi nca and leech.

Microscopic characters, cultivation, collection, commercial varieties, adulterants, chemical constituents and uses of the following drugs. Barks : Cinchona, cinnamon, cascara segrada, kurchi, wild cherry,quillaia. Seeds: Nux vomica, strophanthus, linseed, ispaghula, castor,areca nut, colchicum.Woods: Quassia, Sandal.

Recommended Books :

1. Atal,CK and Kappor,BM.Cultivation and Utilisation of Medicianl Plants.
1. Trease,CE and Evans,WC. Textbook of Pharmacognosy.11th to 14th Editions. Tindal L. U.K.
2. Tyler,VC Brady, LR and Robers JE.Pharmacognosy.8th Edition, Lea & Febeger, Philadelphia.
3. Wallis,TE. Textbook of Pharmacognosy,5th Edition,J & A,Churchill Limited,U.K.
4. Kokate,CK Purohit,AP. And Gokhale,SB.Pharmacognosy.

COURSE NO 402: PHARMACOGNOSY AND PHYTOCHEMISTRY-I PRACTICAL

Organoleptic examination ,description and microscopical examination of the drugs mentioned below.
Powders: Lycopodium, Kamala; Starches: Wheat, potato, rice and maize; Leaves: Eucalyptus, senna, datura, adhatoda and digitalis; Barks:Cinnamon,cinchona,cascara and kurchi; Wood: Quassia;Seeds: Nux-vomica, linseed; Fruit: Fennel, coriander, cumin, cloves.

Identification of crude drugs studied in theory in their "entire" and "broken" condition by their gross characters and by qualitative tests.

Books Recommended :

1.Wallis,TE.Analytical Microscopy,J&A,Churchill Limited,U.K.
2. Kokate,CK. Practical Pharmacognosy.
3.Lalla,PK. Practical Pharmacognosy,Lina,Calcutta,1981.

COURSE NO 403: PHARMACEUTICAL MICROBIOLOGY

Section 1.09 Unit-I

1. History, branches of microbiology and importance of pharmaceutical microbiology. Contribution of Antony Van Leeuwenhoek, Robert Koch, Louis Pasteur and Alexander Fleming.
2. Microscopy – Principle and description of light microscopes and electron microscope
3. Structure of procaryotic and eucaryotic cells and their comparison.
4. Theory of staining, simple, Gram's, acid fast, negative, flagella and spore staining methods.

(a) Unit-II

1. Study of morphology, broad classification of bacteria, yeasts, actinomycetes, fungi, viruses and life cycle of bacteriophage.
2. Types and preparation of media for bacterial, fungal and actinomycete cultures.
3. Different methods of isolation and preservation of microbial cultures.
4. System of identification of bacteria – preliminary criteria for identification, some biochemical tests – Fermentation of carbohydrates, nitrate reduction, starch hydrolysis and gelatin liquefaction, H_2S production.
5. Study of bacterial growth – Growth, generation time, growth rate and growth curve. Techniques for quantitative measurement of bacterial growth (viable and total counts). Synchronous and continuous growth.
6. Effect of UV light, temperature, pH, osmotic pressure, salt concentration and metal ions on bacterial growth.

(b) Unit-III

1. Sterilization methods: Moist heat, dry heat, filtration, gaseous and radiation methods. Sterilization indicators. Principle and significance of test for sterility.
2. Concept of asepsis and maintenance of aseptic conditions.
3. General principles of antibiotics, clinically useful antibiotics, mode of action, sensitivity tests and antibiotic resistance.
4. Dynamics of disinfection, merits and demerits of different disinfectants, commonly used disinfectants, their mechanism of action. Evaluation of disinfectants (Rideal Walker and Chick Martin coefficients and their limitations)
5. Introduction to microbiology of water and milk. Bacteriological examination for assessment of the quality of milk and water.
6. Microbial limit tests for *E. coli* and *Pseudomonas*

(c) Unit-IV

1. Immunity : Definition of antigen and antibody, types of antigens and antibodies, classification of immunoglobulins, types of immunity.
2. Antigen-antibody reactions (agglutination, precipitation, neutralization and complement fixation). Hyper sensitive types of reactions.
3. Definition of infection, non-specific defence mechanisms, bacterial toxins, virulence and virulence factors and attenuation.
4. Methods of transmission of communicable and infectious diseases, carriers, vectors and reservoirs.
5. General methods of immunization against diseases.

(d) Unit-V

1. Study of etiology, diagnosis, sources of infection, mode of trasmission, immunization methods, prevention and control of the following diseases, Bacillary dysentery, typhoid, cholera, amoebiasis, syphilis, gonorrhoea, AIDS,

tetanus, diphtheria, tuberculosis, leprosy, food poisoning and infective hepatitis.

2. Genetic recombination – Bacterial conjugation, transformation and transduction. Mutation, mutagens, mechanism of mutation, types of mutations, isolation of nutritional and antibiotic resistant mutants.

COURSE NO 404: PHARMACEUTICAL MICROBIOLOGY - PRACTICALS

List of experiments:

1.Preparation of nutrient broth; 2. Preparation of nutrient agar; 3. Inoculation of bacteria; 4. Isolation of pure cultures; 5. simple staining; 6. Gram's staining; 7.Motility of bacteria; 8. Spore staining; 9. Oligodynamic action of copper; 10. Liquefaction of gelatin; 11. Starch hydrolysis; 12. Nitrate reduction; 13. H_2S production 14. Phenol coefficient; 15. Chick Martin coefficient; 16. Viable count; 17. Fermentation of carbohydrates; 18. Microbiology of water; 19. Microbiology of milk; 20. Antibiotic sensitivity test; 21. Morphology of yeast, fungi and actinomycetes

Text books and Reference books:

1. Microbiology by Pelczar, M.J. Reid, R.D. and Chan, E.S. Tata McGraw Hill Publishing Co. Ltd.;
2. Medical microbiology edited by Robert Cruick Shank. ELBS edition;
3. Bentley's text book of pharmaceutics
4. Pharmaceutical microbiology by Harrish M. Baillere, Tindal and Co., London;
5. Tutorial Pharmacy by Cater S.J. Kothari Book Depot, Bombay;
6. Pharmaceutical microbiology edited by Hugo and Russel, P.g. publishing company Ltd., New Delhi

COURSE NO 405: APPLIED BIOCHEMISTRY

Brief chemistry of carbohydrates, lipids, proteins and nucleoproteins and detailed metabolism of the above. Outlines of the mechanism of protein synthesis and genetic regulation metabolism. Outlines of biochemistry of cell division and metastasis.

Biochemistry of important body fluids. Principles involved and apparatus used in the analysis of blood, urine and faeces and interpretation of results.

Enzymes : Classification, mode of action, factors affecting the enzyme action and co-enzymes.

Brief outline of energy and phosphate metabolism and detoxification mechanisms of the body. Principles involved in biological oxidation.

The biochemical role of vitamins and hormones-principles of nutrition and dietetics.

Books suggested :

1. Review of Physiological Chemistry by Harold,A.Harper;
2. Textbook of Biochemistry by West, Todd, Manson, Van Bruggen.

Reference Books :

5. Hawk's Physiological Chemistry by Bernard L.Oser;
6. Biochemistry by Albert Lehninger.

COURSE NO 406: APPLIED BIOCHEMISTRY PRACTICAL

1.General tests for identification of carbohydrates, proteins and lipids; 2.Qualitative examination of blood and urine for abnormal constituents ; 3. Qualitative tests for detection of poisons ; 4.Analysis of milk and other food items ; 5.Quantitaive estimation of glucose in blood ; 8. Quantiative estimation of cholesterol in blood ; 9. Estimation of triglycerides in blood ; 10. Estimation of blood urea nitrogen; 11. Estimation of SGPT and SGOT in blood ; 12. Estimation of bile pigments in blood ; 13. Estimation of drugs in blood.

COURSE NO 407: ENVERONMENTAL SCIENCES

Module 1 ; introduction

- Definition, scope and importance
- Measuring and defining environmental development ; indicators.

Module 2 ; ecosystems

Introduction, types, characteristics features ,structure and functions of ecosystems

1. forest
2. grassland
3. desert
4. aquatic(lakes, rivers and estuaries)

Module 3 ; environmental and natural resources management

- land resources
    1. land as a resource
    2. common property resources
    3. land degradation
    4. soil erosion and desertification
    5. effect of modern agriculture, fertilizer-pesticide problems,
- forest resources
    1. use and over –exploitation

2. mining and dams-their effects on forest and tribal people.

- Water resources
  1. use and over utilization of surface and ground water
  2. floods, droughts
  3. water logging and salinity
  4. dams-benefits and costs
  5. conflicts over water
- energy resources
  1. energy needs
  2. renewable and non renewable energy sources
  3. use of alternate energy sources
  4. impact of energy use on environment

Module 4 ; bio diversity and its conservation

- Value of bio-diversity-consumptive and productive use, social , ethical, aesthetic and option values.
- Bio-geographical classification of India-India as a mega diversity habitat
- Threats to biodiversity-Hot spots, Habitat loss, poaching of wildlife, loss of species, seeds, etc.,
- Conservation of bio-diversity-in-situ and Ex-situ conservation

Module 5 ; Environmental pollution-local and Global issues

- Causes, effects and control measures of
  1. . Air pollution
  2. indoor air pollution
  3. water pollution
  4. soil pollution
  5. Marine pollution
  6. noise pollution
  7. solid waste management, composting, vermiculture
  8. Urban and industrial wastes., recycling and re-use
- Nature of thermal pollution and nuclear hazards
- Global warming
- Acid rain
- Ozone depletion

Module 6 ; environmental problems in India

- Drinking water, sanitation and public health
- Effects of activities on the quality of environment
  1. Urbanization
  2. transportation
  3. Industrialization
  4. Green revolution
- Water scarcity and ground water depletion
- Controversies on major dams,-resettlement and rehabilitation of people; problems and concerns
- Rain water harvesting, cloud seeding and watershed management

Module 7 ; Economy and Environment

- The economy and environment interaction
- Economics of development, preservation and conservation
- Sustainability: theory and practice

- Limits to growth
- Equitable use of resources for sustainable lifestyles
- Environmental impact assessment

Module 8 ; Social issues and the environment

- Pollution growth and environment
- Environmental education
- Environmental movements
- Environmental Vs development

Module 9 ; Institution and governance

- Regulation by government
- Monitoring and enforcement of environmental regulation
- Environmental acts
    1. water(preservation and control of pollution) act
    2. air(preservation and control of pollution) act
    3. Envt.protection act
    4. wild life protection act
    5. forest conservation act
    6. coastal zone regulations
- Institutions and policies relating to India
- Environmental governance

Module 10 ; International convections

- Stockholm conference 1972
- Earth summit 1992
- World commission for environmental development(WCED)

Module 11 ;case studies

- Chipko movement
- Narmada bachao andolan
- Silent valley project
- Madhura refinery and Taj mahal
- Industrilisation of pattancheru
- Nuclear reactor at Nararjuna sagar
- Tehri dam
- Ralegaon siddhi (Anna Hazare)
- Kolleru lake-aquaculture
- Florisis in Andhra Pradesh

Module 12 ; Field work

- Visit to a local area to document and mapping environmental assets-river/forest/grass/land/hill/mountain.
- Study of local environment-common plants, insects, birds
- Study of simple ecosystems-pond, river, hill,slopes etc.,
- Visit to industries,water treatment plants, affluent treatment plants.

Text books:

1. Introduction of Environmental sciences by Y.Anjaneyulu published by pharma book syndicate.
2. Text book of environmental science and technology by M.Anji Reddy published by pharma book syndicate.

B.PHARM Vth SEMISTER

COURSE NO 501: DRUG STORE AND INDUSTRIAL MANAGEMENT & MARKETING

1. Drug Store Management: Selection of site, space, layout and legal requirements. Storage of drugs of various schedules and maintenance of records as per requirement. Hospital supplies, requirements for dispensing extemporaneous preparations. Importance and objectives of purchasing, selection of suppliers, credit information, tenders, contracts and price determination, removal of expired drugs. Patient counseling – maintenance of records.
2. Plant location and layout of an industry: Various factors affecting locational aspects, layout of building and equipment. Product layout versus process layout and compliance of pollution control measures.
3. Production, planning and control – scientific purchasing, quality control, problems of productivity, stores organization, location of stores, receiving, inspection of materials and issue from the store, control of stores and stocks, stores accounting and records. Personnel management – selection, appointment, training, transfer, promotion, demotion policies, remuneration, job evaluation, human relations.
4. Sales organization: Market, definition, different approaches to the study of marketing, institutional approach, market planning, product planning, method of marketing, wholesalers, retailers, functional approach, efficiency in marketing, commodity approach.

   Distribution policies: Selective and Exclusive distribution, pricing and discount policies, credit policies, trade indication marks, patent policies. Sales promotion policies – detailing to physician, professional persons, sampling, window and interior display, product advertising, sales promotion publicity.
5. Budgets and budgetary controls: Elements of accounting, double entry book keeping, books of accounts, trial balance, final accounts of business and profit, profit and loss accounts, appropriation accounts, balance sheets.

Suggested Book:

1. Remington's Pharmaceutical Sciences.
2. Pharmaceutical marketing in India, concepts strategy cases by Subba Rao Chaganti Published by Pharma book syndicate.
3.

COURSE NO 502: PHARMACEUTICAL BIOTECHNOLOGY

Unit-I : Biological Products

1. Animal products:
   I) Insulin – Extraction, Purification and types of formulations
   II) Preparation and uses of Pancreatin, Pepsin, Heparin, Thyroid and Liver preparations as per I.P.
2. Blood products & Plasma substitutes: Prepartion, uses and storage of the following; Whole human blood, Dried human plasma, human gamma globulins, clinical dextran and absorbable haemostats.

3. Immunological products: Preparation & standardization of the following;
   Vaccines – BCG, DPT, Poliomyelitis and Typhus.
   Toxoids – Diphtheria and Tetanus.
   Antitoxins – Diphtheria and Gas-gangrene

Unit-II: Fermentation Products

Introduction to fermentation, aerobic and anaerobic, surface, submerged and solid state fermentations and fermentation media. Design and operation of industrial fermenter. Fermentative production, recovery and uses of the following,

I)	Antibiotics	- Penicillin and Streptomycin
II)	Organic acids	- Citric and Lactic acids
III)	Solvents	- Alcohol
IV)	Vitamins	- Vitamin-B_{12}
V)	Miscellaneous	- Lactobacillus spores

Unit-III: Testing methods

1. Test for sterility: Sterility testing media, sampling, neutralization of various antimicrobial substances in dosage forms, conducting the tests for injections, surgical sutures (Catgut), cotton, tubings and bottles.
2. Principles of microbiological assay of amino acids, vitamins and antibiotics. Detailed assay of lysine, vitamin-B_{12} and penicillin.
3. Radioimmuno assay(RIA): Principle and applications. Estimation of insulin in blood by RIA. ELISA: Principle and applications

Unit-IV: Enzymes, Enzyme immobilization and microbial transformations

1. Enzymes: Sources and general methods of preparation. Preparation of fungal diastase. Applications in pharmaceutical industry, therapeutics and clinical assays
2. Immobilization: Advantages and limitations, techniques of immobilization of enzymes and cells.
3. Microbial transformations: Advantages, different types of microbial and steroid
   Conversions

Unit-V: Recombinant DNA technology

1. Introduction to genetic engineering. Brief description of (a) Restriction of DNA (b) Ligation of DNA (c) Introduction into host cells (d) Recombinant selection (e) Use of the plasmids and bacteriophages as cloning vehicles, artificial plasmid vectors, cosmids and phasmids (f) Agarose gel electrophoresis, southern, northern and western blotting.
2. Applications of R-DNA technology: Production of human insulin and hepatitis B vaccine. Hybridoma technology: Production of monoclonal antibodies and their applications.
3. Bioinformatics: Introduction, scope and applications

COURSE NO 503: PHARMACEUTICAL BIOTECHNOLOGY – PRACTICALS

List of experiments:

1. Sterilization by autoclaving and test for sterility; 2. Sterilization by dry heat and test for sterility; 3. Sterilization by heating with bactericide and test for sterility; 4. Sterilization by gas and test for sterility; 5. Test for sterility of commercial dextrose injection I.P.6. Test for sterility of preparation containing sulphanilamide; 7. Preparation and standardization of a bacterial vaccine. 8.Fermentative production of penicillin/Neomycin (Demonstration) 9. Fermentative production of glutamic acid (Demonstration); 10. Microbiological assay of penicillin including construction of standard curve; 11. Test for presence of fungi in tap water; 12.Determination of minimum inhibitory concentration of phenol; 13. Immobilization of microbial cells by entrapment in sodium alginate; 14. Isolation of DNA from bacteria (Demonstration).

Text books and Reference books:

1. Bentley's text book of pharmaceutics by Herold Davis - 7th and Latest edition
2. The microbiological assay of Vitamin B-complex and amino acids by E. C. Barton – Wright, Sir Issac Pitman and Sons Ltd., London
3. Analytical microbiology by Kavanagh, Academic press
4. Tutorial pharmacy by Cooper and Gunn
5. Indian Pharmacoepoeia, Volume-II, 1996 Edition.
6. Remington's Pharmaceutical Sciences
7. Pharmaceutical biotechnology by Vyas and Dixit, BS Publications & distributors, New Delhi.
8. Pharmaceutical Biotechnology by K.Sambamurthy & Ashutoshkar, New age international publishers.
9. Industrial microbiology by L.E. Casida JR., New age international publishers.
10. Principles of gene manipulation by Primrose, Twyman, 6th Edition, Blackwell.
11. Foundation in Pharmaceutical Biotechnology by B.P Nagori and Roshan Issarani published by Pharma book syndicate.

COURSE NO 504: PHARMACEUTICAL CHEMISTRY-IV (MEDICINAL- I)THEORY

1. History, introduction and development of medicinal chemistry, nomenclature of drugs.
2. Heterocyclic compounds: Nomenclature and numbering of heterocyclic systems, general methods of preparation and important reactions of five membered and six membered heterocyclic systems-pyrrole, furan, thiophene, pyridine, quinoline, isoquinoline and indole
3. Acquaintance with the following heterocyclic systems commonly encountered in therapeutic agents with suitable examples. Aziridine, thiadiazole, oxazole, isoxazole, thiazole, imidazole, pyrazole, pyridazine, pyrimidine, piperazine, piperidine, benzothiazole, purine, benzimidazole, indole, benzothiadiazine, pteridine, pthalazine, quinazoline, quinoline, isoquinoline, benzopyran, benzodiazipines, phenothiazine, aciridine, thiaxanthene

A study of the classification, mode of action, structural activity realationship (wherever applicable) and synthesis of specified members of the following classes of drugs.

4. General anaesthetics: Halothane, thiopental sodium and diethyl ether.
5. Sedatives and hypnotics: Phenobarbital, buspirone, diazepam, alprazolam.
6. Anticonvulsants: phenytoin, valproic acid, etho suximide, carbamazepine .
7. Central voluntary muscle relaxants: mefenicin, methocarbamol
8. Analgesics: Narcotic analgesics-derivatives of morphin, morphinan, phenylpiperidine, benzazocine, diphenyl propylamine and isosters. Narcotic antagonists-morphine derivatives, miscellaneous compounds, antitussives and expectorants. Synthesis of meperidine, methadone, pethidine and propoxiphen.
9. Nonsteroidal anti-inflammatory analgesics and antipyretics- paracetamol, asprin, indomethacin, diclophenac sodium, ibuprofen and piroxicam.
10. Analeptics: Nikethamide, picrotoxin, pentelene tetrazole, ethamiban, doxapram
11. Antipsychotic agents: chloropromazine, promethazine, thiothexene and haloperidol.
12. Antidepressants: imipramine, desipramine, amitryptiline, isocarboxazide phenelzine
13. Antithyroid drugs: Hormones of the thyroid gland and antithyroid drugs
14. Diagnostic agents: Radio-opaques, agents for kidney function and liver function tests, miscellaneous agents.
15. Local anaesthetics: benzocaine, procaine, lignocain and dibucaine.
16. Antihistaminic agents: diphenhydramine HCl, chloropheniramine, chlorcyclizine, cetrizine, meperamine, ranitidine and omeprazole.
17. Antidiabetic agents: Insulin and its preparations, tolbutamide and glibenclamide

COURSE NO 505: PHARMACEUTICAL CHEMISTRY-IV (MEDICINAL- I)

Section 1.10 PRACTICAL

1. Preparation of drugs including heterocyclic compounds involving two or more steps like: Benzimidazole, 3,4-dihydroxy-4-oxo-phthalazine, Benztriazole, 1,2,3,4-tetrahydrocarbazole, 6-methyl uracil, 7-hydroxy-4-methyl coumarin,3-methyl-1-phenyl-5-pyrazolone, Benzoin, Diphenylhydantoin, Chlorbutol.
2. Identification tests for selected drugs.
3. Analysis of formulations containing selected drugs like meprobamate, phenytoin, ibuprofen, chlorpromazine, lignocaine, oxyphenbutazone, diphenhydramine.

TEXT BOOKS:

1. Wilson and Gisvold, Textbook of organic, Medicinal and Pharmaceutical Chemistry
2. Bently and Driver's Textbook of Pharmaceutical Chemistry
3. Remington's Practice of Pharmaceutical Sciences.
4. Medicinal chemistry by Nadendla Rama Rao Published by Pharma book syndicate.

Reference Books

1. Organic Chemistry, Vol. I. By I.L.Final
2. Essentials of Medicinal Chemistry by Karlkovas
3. Medicinal Chemistry, Vol. I,II and III. By A.Burger
4. Indian Pharmacopoeia.

COURSE NO 506: PHARMACEUTICAL ENGINEERING – II

A study of the following unit operations as applied to Pharma Industry.

I. Drying : Introduction, classification of drying equipment - static bed, moving bed and fluidized bed systems – spray dryer, infrared drying, freeze drying, choice of dryers. Factors influencing the rate of drying, Mechanism of drying with carrier gas, typical drying curve.

II. Crystallization : Crystal forms and Crystal habbit – supersaturation and formation of crystals and crystal growth, Mier's supersaturation theory of Crystallization and its limitations, solubility curves.

III. Mixing: Solid – solid mixing mechanism of mixing. Mixers: V type, drum, paddle and Rotocube mixers – selection of mixer, mixing of viscous masses: kneading machines and ointment mills. Liquid – liquid and gas – liquid mixing equipment. Impellers – their characteristics and field of operation.

IV. Size reduction : Classification of equipment – cutting roll, edge runner and end runner mills, disintegrators, hammer mills, ball and tube mills, colloid mills – impact mills, fluid energy mill, choice of size reduction machinery – theory of size reduction. Energy for size reduction.

V. Size separation: Screens and screening equipment – air and hydraulic separators, sedimentation, particle size distribution and its measurement – representation of data.

VI. Refrigeration: Principles and equipment, choice of refrigerant, coefficient of performance. Humidity control: Definition, methods of monitoring and drying gases – air conditioning, cooling towers – wet and dry bulb hygrometry, study of air handling systems.

VII. Extraction: Principles of solid – liquid and liquid – liquid extraction, equipment, diffusion batteries – extraction of towers – Podbielniak extraction.

Text Books

1. Introduction to Chemical Engineering by Walter L. Badger and Julius T. Banchero.

2. Elementary Chemical Engineering by Max S. Peters.
3. The theory and practice of Industrial Pharmacy by Leon Lachman, H.A. Lieberman and Joseph L. Kanig.
4. Pharma ceutical engineering by K.Sambamurthy published by New age international (P) LTD. Publishers
5.

COURSE NO 507: PHARMACEUTICAL ENGINEERING – II PRACTICAL

I. Determination of radiation constant of brass, iron, unpainted and painted glass (4 experiments).
II. Steam distillation – To calculate the efficiency of steam distillation.
III. To determine the overall heat transfer coefficient.
IV. Construction of drying curves (for calcium carbonate and starch).
V. Determination of moisture content and loss on drying.
VI. Determination of humidity of air – i) From wet and dry bulb temperatures – use of humidity chart, II) Dew point method.
VII. Surface evaporation – To calculate the mass transfer coefficient from water to air.
VIII. Size analysis by sieving – To evaluate size distribution of tablet granulations – construction of various size frequency curves including arithmetic and logarithmic probability plots.
IX. Size reduction : To verify the laws of size reduction using ball mill.
X. Demonstration of colloid mill, fluidized bed dryer, freeze dryer and such other major equipments.

Text books:

1. Pharmaceutical engineering Practical manual(unit operations) by Sudhakara Reddy published by Pharma book syndicate.

B.PHARM VIth SEMISTER

COURSE NO 601: FORENSIC PHARMACY

Evolution of pharmacy and drug legislation in India. A study of the following acts with upto date amendments.

a) Pharmacy Act

b) Drugs and Cosmetic Act and Rules

c) Narcotic Drugs and Psychotropic Substances Act (1986)

d) Drugs and Magic Remedies Act

e) Drugs (Price Control) Order

f) Medicinal and Toilet Preparations (Excise duties) Act and Rules.

g) Patents Act and Intellectual Property Rights

h) Medical Termination of Pregnancy Act

i) Code of Pharmaceutical Ethics

Suggested Books

1. Original Laws Published by Government of India.
2. Forensic Pharmacy by B.M. Mithal
3. Laws of drugs in India – Hussain
4. Intellectual Property Law by R.K. Nagarajan
5. Text book of forensic pharmacy by C.K.Kokate and S.B.Gokhale published by Pharma book syndicate.

COURSE NO 602: PHARMACOLOGY-I THEORY

1. General pharmacology: How do drugs act? Receptor and non receptor mechanisms of drug action. Brief introduction to structure activity relationship. Normal and unwanted activities of drugs. Factors influencing drug action.
2. Drugs acting on Central Nervous System: Central depressants- ethyl alcohol, general anesthetics, basal narcotics, hypnotics, analgesic hypnotics, anxiolytics, antipyretic analgesics.

CNS stimulants and analeptics.

Psychopharmocological agents: Neuroleptics, antidepressants, anxiolytics, hallucinogens.

Habit forming drugs and drugs of addiction.

3.Drugs acting on Autonomic Nervous System: Parasympathomimetic and parasympathetic blocking agents. Sympathomimetic and sympathetic blocking agents. Ganglionic stimulants and blockers, skeletal muscle relaxants.

4. Drugs acting on Cardiovascular system: Coagulants, anticoagulants, Drugs acting on blood forming organs, antihypertensive agents, vasodilators, antianginal agents, antiarrhythmics, cardiotonics, plasma substitutes, antihyperlipidemic agents.

5. Drugs acting on the kidney: Diuretics, antidiuretics, drugs useful in urinary tract infections.

Text Books:

1.Textbook of Pharmacology by Rang and Dale .
2. Essentials of Medical Pharmacology. -KD Tripathi.
3.Lippincort's illustrated pharmacology.
4.Pharmacology and pharmacotherapeutics by Satoshkar and Bandarkar.

Reference Books:
Pharmacological basis of Therapeutics by Goodman and Gillman.
Text book of clinical pharmacology –Bertram.C.Katzung

COURSE NO 603: PHARMACOLOGY-I PRACTICAL

List of Practicals:

1. Excretion of drugs in urine, sweat, saliva in humans.
2. Involvement of acetylcholine in ciliary movement of frog's oesophagus.
3. Drug action on the eye of rabbit- miotics and mydriatics.
4. Drug antagonism with pilocarpine and atropine in rabbits.
5. Straub test and analgesia with morphine in the mice.
6. Drug action on in situ rectum of frog.
7. Drug action on intact frog heart.
8. Action of acetylcholine and nicotine on the rectus abdominis muscle of frog.
9. Dose response curve (DRC) with acetylcholine on rectus abdominis muscle of frog.
10. Potentiation of acetylcholine response but not of nicotine by eserine on rectus abdominis muscle of frog.
11. Inhibition of acetylcholine response by curare/procaine/quinidine/pethidine on rectus abdominis muscle of frog.
12. Different stages of general anaesthesia using ether in mice.
13. Effect of ions on isolated perfused frog heart.
14. Effect of digoxin on normal & hypodynamic heart.

COURSE NO 604: INDUSTRIAL PHARMACY & COSMETIC TECHNOLOGY

I. Pre – formulation: Objectives – Protocols – Physical, chemical, Micromeritic studies in pre – formulation, stability considerations, drug – excipient compatibility.

II. Formulation Development : Factors involved,

III. Case studies: Formulation of (i) An antacid product (ii) An ampicillin product for Paediatric use (iii) An antibacterial product for a child (iv) Pain balm (v) An anti-inflammatory gel.

IV. A study of the formulation, process and equipment used in the large scale manufacture, evaluation, and quality control of the following dosage forms.

(i) Suspensions (ii) Emulsions (iii) Liquid orals (Syrups and Elixirs).

i. Tablets (ii) Tablet Coating – sugar, film and enteric coating

ii. Capsules – hard and soft.

V. (i) Parenterals (ii) Other sterile products – eye ointments, eye drops.

VI. (i) Sustained release products (ii) Microencapsulation and microcapsules (iii) Aerosol preparations

VII. Formulation and preparation of the following Cosmetics – Hand lotions and creams, face powders, baby and bath powders, dentifrices, shampoo, lipstick, shaving preparations and hair dyes and creams, skin creams.

COURSE NO 605: INDUSTRIAL PHARMACY & COSMETIC TECHNOLOGY PRACTICAL

Formulation, preparation and quality control of pharmaceutical products (25) covering dosage forms listed in theory. The number of products under each category is as follows:

Tablets – 6, Liquid orals – 4, Emulsions – 3, Capsules – 2, Parenterals – 4, SR Tablets – 2, Cosmetics – 4.

Text Books:

1. The theory and practice of Industrial Pharmacy by Leon Lachman, H.A. Lieberman and Joseph L. Kanig.
2. Pharmaceutics, The Science of Dosage Form Design, edited by Michael E. Aulton.
3. Science and Technology of Cosmetics by Sagarin.
4. Remington's Practice of Pharmaceutical Sciences.
5. Cosmetics a practical manual by Swarnalata saraf and shailendra saraf published by pharma book syndicate.

COURSE NO 606: PHARMACEUTICAL ANALYSIS –II (THEORY)

Physicochemical aspects of analytical chemistry with special reference to pharmaceutical analysis.

Chromatographic methods-1: Principles, theories, instrumentation and applications Involved in a) Column chromatography b) Paper chromatography c) Thin layer chromatography and HPTLC d) Ion-exchange and gel filtration techniques

Chromatographic methods-II: Principles, theories, instrumentation and applications

Involved in a) Gas chromatography (GC) b) High performance liquid chromatography (HPLC)

Spectrophotometric analysis: A discussion of basic principles including interaction of matter with electro-magnetic radiation, absorption, emission, luminescence and scattering phenomena, units of measurement and definition of terms: a) absorptiometry: quantitative consideration of absorption phenomena including Beer and Lambert,s laws and their mathematical expression, deviations from the laws and methods used in absorption spectrophotometry (visible, UV and IR) including sources, monochromators, detectors, preparation of calibration curves and pharmaceutical applications. Sources of errors and their correction and validation of spectrophotometric methods. B) Basic principles, equipment and methods used and pharmaceutical applications of flame photometry, photofluorimetry, turbidimetry and nephlometry.

Electrochemical Analysis: A discussion of basic principles involved in electrochemical analysis, electrochemical cells and half-cells, electrodes, electrode reactions and electrode potentials:a) Potentiometry: basic principles involved in measurement of EMF and pH , Nernest equation, typical equipment and their construction, factors influencing EMF of cell, portable, stationary and on-line equipment for pH measurement, applications b) Potentiometric titrations including principles involved, methods for detection pf end point including dead stop mend point, applications in neutralization, redox and precipitation titrations, equipment used, exploration of titration curves obtained with acids and bases of different strength and mixture of acids. c) Conductometric titrations: basic principles, titrations, equipment and applications.
d) Polarography: basic principles, titrations, equipment and applications in qualitative and quantitative analysis.e) amperometric titrations: basic principles, titrations, equipment and applications

Basic principles, definition of terms, equipment and their working and applications of – NMR and Mass spectrometry. Thermal methods of analysis and radioimmunoassay assay.

Reference books

1. Pharmaceutical chemistrty by L.G. Chatten (Marcel Dekker)
2. A text book of pharmaceutical analysis by K.A. Connors (John Willey)
3. Pharmaceutical analysis- modern methods by J.W. Munson (Marcel Dekker)
4. Instrumental methods of analysis by Willard, Merritt, Dean and Settle (CBS publishers)
5. Text book of analytical chemistry by Y.Anjaneyalu, K.Chandra sekhar and Valli manickam.
6. Introduction to Instrumental analysis by Robert D.Braun Published by Pharma book syndicate.

COURSE NO 607: PHARMACEUTICAL ANALYSIS –II (PRACTICAL)

1. Separation of plant materials by column chromatography 2. Separation and identification of flavonoids/sulphonamides by paper chromatography 3. Separation and identification of sulphonamides by paper chromatography 4. Separation and identification of amino acids by TLC methods 5. Separation and identification of barbiturates by TLC methods 6. Determination of λ max,($KMnO_4$ and methylene blue solutions).7. Demonstration experiments in HPLC and GLC 8. Assay of sulphadiazine tablets by visible spectrophotometry 9. Assay of sulphadiazine tablets by UV spectrophotometry 10. Demonstration experiments in IR spectrophotometry injcluding interpretation of given spectra. 11. Fluorimetric estimation of quinine sulphate in formulations 12. Fluorimetric estimation of riboflavin in formulations 13. Flame photometric estimation of sodium and potassium ions 14. Potentiometric analysis a) Determination of pH of two solutions b) Titration of strong acid against strong base c) Titration of strong base against weak acid d) Simultaneous determination of strong acid and weak acid in a mixture e) Potentiometric assay of any two formulations from I.P. 15. Conductometric titration of NaOH with HCl 16. Polarographic estimation of drug official in I.P. 17. Determination of concentration of sugar solution by polarimetry 18. Determination of critical micellar concentration (butyric acid in water using abbe refractometer.19. Demonstration experiments in detection of polymorphism and pseudo polymorphism in pharmaceuticals by DTA and DSC 20. Assay of an ointment and cream official in I.P. 21. Complete testing and assay of any two drugs as per I.P. monograph.

Reference books

1. A text book of pharmaceutical analysis by K.A. Connors (John Willey)

B.PHARM VIIth SEMESTER

COURSE NO 701: PHARMACEUTICAL CHEMISTRY-V (NATURAL PRODUCTS)

1. Carbohydrates: Classification and general properties. Knowledge of structure including stereochemistry of glucose, fructose, and sucrose. General treatment of pharmaceutically important carbohydrates-maltose, lactose, starch, cellulose, dextrin, and glycosides.
2. Amino acids and proteins: Classification and general reactions of amino acids and their relationship to proteins and polypeptides. Methods of preparation of amino acids, classification and general reactions of proteins, degradation of proteins-hydrolysis and end group analysis-protein hormones, oxytocin.
3. Purines and xanthine derivatives: Structure and synthesis of uric acid, Theo bromine, theophylline, and caffeine. General aspects of nucleoproteins and nucleic acids,
4. Lipids: Fixed oils and fats. Fatty acids: chemistry and analysis of oils and fats.
5. Terpenes: Occurrence, general methods of isolation and classification, chemistry of citral, limonene, ∝-terpeneiol, carvone, camphor and menthol.

Preparation, general composition, properties and analysis of essential oils of I.P.

6. Alkaloids: Classification, general methods of isolation, chemical tests for alkaloids, Chemistry and uses of ephedrine, nicotine, papaverine and atropine.
7. Vitamins: Classification, chemistry, physiological role and uses of thiamine, riboflavin and ascorbic acid. Skeletal structures of vitamins official in I.P.
8. Steroids: Nomenclature and skeletal structures of ergosterol, stigmasterol, cholsterol and bile acids. Chemical tests for steroids. Calciferols and Sapogenins – diosgenin, hecogenin
9. Hormones: Sex hormones, structure and physiological properties of testosterone, progesterone, estrone, estriol and estradiol. Their synthesis from cholesterol or diosgenin. Synthetic estrogens. Introduction to oral contraceptives. Cortisones; prednisolone, aldosterone, synthesis of cortisone. Steroidal anti-inflammatory drugs: structures and their therapeutic uses.
10. Glycosides: Enzymatic and hydrolysis reactions of glycosides, mechanism of action, SAR, therapeutic uses and toxicity of glycosides. Cardiac glycosides of digitalis, bufa and squill. Structure of salicin, hesperidin and rutin.
11. Antibiotics: A general study of antibiotics, isolation or synthesis, chemistry and uses of penicillin, chloramphenicol and streptomycin, general introduction to tetracycline and other antibiotics included in I.P.
12. Spectroscopy and structure: an introductory treatment of U.V., I.R. and NMR spectroscopy in structure deterimination.

COURSE NO 702: PHARMACEUTICAL CHEMISTRY-IV (NATURAL PRODUCTS)

Section 1.11 PRACTICAL

1. Determination of acid value
2. Determination of saponification value
3. Determination of iodine value
4. Determination of unsaponifiable matter
5. Determination of Eugenol in clove oil
6. Estimation of cineole in eucalyptus oil
7. Estimation of citral in lemon grass oil
8. Determination of aminophylline
9. Determination of caffeine citrate
10. Estimation of strychnine hydrochloride
11. Tests for absence of arachis oil, cottonseed oil and sesame oil in other oils
12. Reactions of carbohydrates, glycosides, alkaloids, amino acids (including Xanthine alkaloids), sterols and vitamins
13. Identification of selected natural products
14. Preparation of caffeine from Tea dust
15. Preparation of caseine and estimation of nitrogen
16. Soxhelt extraction of a crude drug
17. Assay of tincture Nuxvomica/Tincture Belladona

SUGGESTED BOOKS

1. Organic chemistry, Vol. II. By I.L. Finar
2. Wilson and Gisvold, Textbook of Organic, Medicinal and Pharmaceutical Chemistry

3. Bently and Driver's Textbook of Pharmaceutical chemistry
4. Remington's Prtactice of Pharmaceutical Sciences
5. Indian Pharmacopoeia.

COURSE NO 703: PHARMOCOLOGY-II- THEORY

1. Chemotherapy: sulphonamides, antibiotics, antiviral, antifungal agents and antineoplastics.
2. Drug treatment in tuberculosis, leprosy, venereal diseases, malaria, filaria, leishmaniasis, trypnasomiasis, amoebiasis and helmenthiasis.
3. Vitamins and hormones: vitamins, thyroid, parathyroid, adrenal cortex, insulin and oral antidiabetic drugs.
4. Pharmacology of drugs acting on sex organs: Oral Contraceptives, oxytocic agents and uterine relaxants.
5. Immunity and biological standardisation: vaccines and immune sera, immunosuppressive agents.
6. Methods of biological assay, principles of bioassays, fundamentals of biometric analysis. Detailed study of the official bioassay methods for adrenaline, posterior pituitary, insulin, gonadotrophic hormones, cholera vaccine and diphtheria antitoxin.
   Tests for pyrogens: LAL Test & rabbit method.
7. Pharmocology of local anaesthetics.
8. Drugs acting on respiratory system: cough suppressants, bronchodilators, drugs used in asthma.
9. Miscellaneous: chelating agents, demulcents, counter-irritants, diagnostic agents.
10. Drugs acting on GI tract: digestants, antispasmodics, anti-diarrhoeal agents, cathartics, emetics, antiemetics, drugs used in inflammatory bowl syndrome, antacids and drugs used in gastric ulcers.

Text Books:

1.Textbook of Pharmocology by Rang and Dale
2. Essentials of Medical Pharmacology. -KD Tripathi
3.Lippincort's illustrated pharmacology
4.Pharmacology and pharmacotherapeutics by Satoshkar and Bandarkar.

Reference Books:

1. Pharmacological basis of Therapeutics by Goodman and Gillman.
2. Text book of clinical pharmacology –Bertram.C.Katzung
3. Indian Pharmacopoeia.

COURSE NO 704: PHARMOCOLOGY-II- PRACTICAL

List of Practicals:

1. Action of drugs adrenaline,Ach on isolated smooth muscle (physiological antagonism)

2. Action of atropine and Ach (receptor antagonism) on isolated smooth muscle of rabbit intestine.

3. Action of histamine & antihistamine (receptor antagonism) on isolated smooth muscle.

4.Drug antagonism studies on isolated smooth muscle strips Adrenaline× propanolol (receptor antagonism) of rabbit intestine.

5. Two-point bioassay of acetylcholine on frog rectus abdominis muscle.

6. Three-point bioassay of acetylcholine on frog rectus abdominis muscle.

7. Bioassay of histamine on guineapig ileum.

8. Action of drugs on rabbits eye (local anaesthetics).

9.Action of drugs on mice (CNS stimulants).

10. Action of drugs on mice (CNS depressants).

11.Test for pyrogens (rabbit method).

12. Insulin hypoglycaemic action in rabbits.

COURSE NO 705: PHARMACOGNOSY AND PHYTOCHEMISTRY II

General Pharmacognosy:Advantages and disadvantages of obtaining drugs from cultivated and wild plants.Variability of drug constituents due to exogenous and endogenous factors like altitude, temperature, rain fall, light, propagation by seed vegetative means, mutation, hybridization; Deterioration of crude drugs during storage by insects, pests and enzymes. Factors influencing the storage of crude drugs. Methods of storage.

Evaluation of crude drugs: Identity, purity and quality of crude drugs by organoleptic microscopic, physical, chemical and biological evaluation; Methods of adulteration, detection and identification of adulterants types and significance of standards for crude drugs included in I.P. and B.P. Quantitative pharmacognosy.

A detailed study of the following drugs, their classification methods of preparation, commercial varieties, active principles, their chemical nature, identification, tests and uses; Roots and rhizomes :Male fern, valerian, rhubarb, podophyllum, liquorice, turmeric ,ginger, ipecac, rauwolfia, aconite and jalap; Unorganised drugs: opium, aloes, kino, gambier, agar, alginates, gelatin.

Resins, gum resins, oleoresins-colophony, benzoin, shellac, myrrh, galbanum, asafetida, turpentine, balsam of Tolu, balsam of Peru and storax; Glands and glandular secretions-thyroid, pituitary, adrenal, pancreas and musk; Gums and saccharin substances: acacia, tragacanth and honey.

Chromatography and some related terms. Classification and a study of various chromatographic methods. Column, paper, thin layer and gas chromatography, HPLC and their applications to natural products. Biogenesis; Pathways leading to formation of plant products; Historical development of plant tissue culture, types of cultures,

nutritional requirements, growth and their maintenance, applications of plant tissue culture in production of pharmaceutically important secondary metabolites.

Recommended Books :

1. Atal CK and Kapoor BM. Cultivation and utilization of Aromatic Plants. CSIR Publications;
2.Tyler,VC,Brady,LR and Robers,JE.Pharmacognosy.,11th to 14th Editions;
3.Wallis,TE.Textbook of Pharmacognosy,5th Edition,J & A,Churchill Limited, U.K. 4. Kokate, CK Purohit, AP. and Gokhale, SB. Pharmacognosy;
5.Ross,MF. And Brain,KR.An introduction to Phytopharmacy,Pitman Medical – Kent; 6. Deinvert,J. and BajajYPS.Applied and Fundamental Aspects of Plant Cell ,Tissue and Organ Culture,Berlin.

COURSE NO 706: PHARMACOGNOSY AND PHYTOCHEMISTRY II (PRACTICAL)

1.Identification of powdered crude drugs and their combinations with the help of organoleptic, microscopic and chemical tests;2.Determination of leaf constants such as stomatal index, stomatal number, vein islet number and palisade ratio; 3.Thin layer chromatographic studies of extracts from crude drugs.

Recommended Books:

1.Pharmacopoeia of India,1985;
2.Practical Pharmacognosy,3rd Edition, By Kokate,C.K.;
3.Practical Pharmacognosy by Lala,P.K.,Lina,Calcutta,198.

COURSE NO 707: GMP AND VALIDATIONS

1. CGMP: A detailed study of GMP as prescribed in Schedule M of Drugs and Cosmetics Act and Rules. Requirements regarding premises, sanitations, personnel, equipment and building, documentation and records and processes.
2. Control of Production Procedures: Manufacturing Control – In – Process Quality Control for solids, liquids, semisolids and parenteral products – packaging control.
3. Control of Finished Products: Tablets, Capsules, Parenterals, Semisolids and Liquid Orals.
4. Validations: Types and Protocols of Validations – A study of Process Validation. Validation of Equipments, Cleaning Validation, Analytical Method Validation – Procedures and Examples.

5. Quality Control and Quality Assurance: Principles and General Concepts – Duties and Responsibilities of Quality Control and Quality Assurance Departments in a modern Pharmaceutical Concern – Sources of Quality Variation – Control of Quality Variation. Raw Material Control – Quality Assurance before Start – up and at Start – up; Manufacturing Control – Packaging Materials and Labels control.
6. Concept of Statistical Quality Control – Quality Control Charts – Sampling and Sampling Plans.

Books:

1. The Theory and Practice of Industrial Pharmacy by Leon Lachman, H.A. Liberman and Joseph L. Kanig, 3rd Edition.
2. Tablets – Vol. I, II and III by Leon Lachman et al.
3. Modern Pharmaceutics by Banker.
4. Quality Assurance of Pharmaceuticals Vol. I and Vol. II published by Pharma book syndicate.

COURSE NO 708: PROJECT

B.PHARM VIIIth SEMESTER

COURSE NO: 708 PROJECT (contd.....,)

COURSE NO 801: PHARMACEUTICAL CHEMISTRY-V1 (MEDICINAL-II)

1. Physico-chemical properties and biological activity: Influence of partition coefficient, covalent bonding, hydrogen bonding, surface activity, redox potentials, chelation, enantiomeris, and geometrical isomerism on biological activity.
2. Factors affecting absorption, transport, distribution and elimination of drugs, protein binding of drugs.
3. Introduction to the concepts of prodrugs, soft drugs and targeted drugs
4. Introduction to principles of chemotherapy, chemotherapeutic index, drug resistance, super infection.
   A study of the classification, mode of action, uses and synthesis of specified members in each of the following categories.
5. Antiinfective agents: (a) Ectoparasiticides: Lindane, pyrethrins, sulfurated compounds, benzyl benzoate (b) Antiseptics and disinfectants: alcohol, formaldehyde, resorcinol, hydrogen peroxide, benzalkonium chloride, gentian violet, methyline blue and furazolidone.
6. Sulphonamides: sulfisoxazole, sulphamethazole and sulphathiazole.

7. Antimycobacterial agents: (a)Antitubercular agents: PASA, isoniazid (b) antileprotic agents: dapsone
8. Anthelmintics: diethyl carbamazine citrate, mebendazole, tinidazole, thiabendazole and pyrantel pamoate
9. Antimalarials: chloroquine, primaquine, mefloquine and pyrimethamine
10. Antiamoebic agents: metronidazole, diloxanide furoate and carbarsone.
11. Antifungal agents: clotrimazole, ketocanazole and tolnaftate.
12. Antiviral agents: acyclovir, zidovudine, idoxuridine and adamantine
13. Cytostatic agents: chlorambucil, cyclophospamide, lomustine, methotrexate, 5-flouro uracil and mercaptopurine
14. Adrenergic drugs: Biosynthesis and metabolism of catecholamines, direct and indirect sympathomimetics, mode of action and structure activity relations, adrenergic blocking agents, synthesis of amphetamine, phenyl ethylamine and isoproterneol.
15. Chlolinergic agents and anticholinesterases: Structural features of acetylcholine, cholinergic agonists, anticholinesterases, synthesis of carbachol, physostigmine, neostigmine and dicyclomine.
16. Diuretics: acetazolamide, furosemide, ethacrynic acid and hydrochlorthiazide.
17. Antihypertensives: methyl dopa, amlodipine, prazocin and propranolol.

COURSE NO 802: PHARMACEUTICAL CHEMISTRY-V (MEDICINAL-II)

Section 1.12 PRACTICALS

1. Preparation of synthetic drugs involving two or three steps such as benzocaine, barbituric acid , methaqualone, cinchophen, phenolphthalein.
2. Identification of drugs.
3. Analysis of formulations containing drugs studied in theory such as Chloroquine phosphate, metronidazole, diethyl carbamazine, pentobarbitone, dapsone, isoniazid, tolbutamide, sulpha drugs.

TEXT BOOKS:

1. Wilson and Gisvold, Textbook of organic, Medicinal and Pharmaceutical Chemistry
2. Bently and Driver's Textbook of Pharmaceutical Chemistry
3. Remington's Practice of Pharmaceutical Sciences.

Reference Books

1.Organic Chemistry, Vol. I. By I.L.Final
2.Essentials of Medicinal Chemistry by Karlkovas
3.Medicinal Chemistry, Vol. I,II and III. By A.Burger
4.Indian Pharmacopoeia.

COURSE NO 803: BIOPHARMACEUTICS AND NOVEL DRUG DELIVERY SYSTEMS

1. Biopharmaceutics: Introduction, fate of drug after administration, routes of drug administration, drug absorption and disposition. Drug absorption:

Oral, Percutaneous, rectal, factors involved, mechanisms and kinetics – a detailed study of physicochemical, biological and dosage form considerations in drug absorption.

2. Drug dissolution and bioavailability: Concepts, definitions, factors involved, assessment, official methods, applications and significance.
3. Drug distribution: Localization and protein binding – enterohepatic cycling – first pass effect. Drug elimination: Metabolism, hepatic metabolism, microsomal and non microsomal metabolism, enzyme induction and inhibition and their influence on drug activity, drug excretion through urine, bile, lungs and skin – renal clearance. Significance of Biopharmaceutics in product formulation and development.
4. Pharmacokinetics: Introduction, compartment models, blood level curves, pharmacokinetic parameters, biological half – life, apparent volume of distribution, renal clearance, absorption rate, AUC – their significance, kinetics of blood levels following IV, Oral, single and repeated administration. Introduction to dosage regimens.
5. Novel Drug Delivery Systems: Introduction, Basic Concepts in Controlled Release – Mechanisms and Basic Techniques used. Advantages and Disadvantages of controlled release products. A brief study of the following types of controlled release systems.
    (i) Oral Controlled Release: Matrix Tablets, Coated Pellets, OROS.
    (ii) Parenteral Controlled Release: Microspheres, Emulsions and Suspensions.
    (iii) Transdermal Therapeutic Systems (TTS): Basic concepts, Limitations, Design for TTS.
    (iv) Implants and Implantable Devices: An introduction to Osmotically Controlled Drug Delivery Systems
    (v) A study of Liposomes, Resealed Erythrocytes, Nanoparticles and their applications.

Text Books:

1. Theory and Practice of Industrial Pharmacy by Leon Lachman, Lieberman and Kanig; 2. Remington's Practice of Pharmaceutical Sciences; 3. Biopharmaceutics

and Clinical Pharmacokinetics by Milo Gibaldi. Published by Pharma book syndicate, 4thedition 4. Biopharmaceutics and Pharmacokinetics by Brahmankar; 5. Modern Pharmaceutics by Banker. 6. Oral drug delivery technology by Aukunaru Jithan Published by Pharma book syndicate.

COURSE NO 804: BIOPHARMACEUTICS AND NOVEL DRUG DELIVERY SYSTEMS – PRACTICAL

1. Evaluation of Dissolution Rate of Commercial Brands (atleast two brands) of Paracetamol Tablets as per IP/BP/USP.
2. Evaluation of Dissolution Rate of Commercial Brands (atleast two brands) of Indomethacin Conventional and SR Capsules as per IP/BP/USP.
3. To study the effect of surfactant on the dissolution rate of poorly soluble drugs.
4. Preparation and Evaluation of solid dispersions of insoluble drugs in PVP/PEG/Mannitol (with atleast two drugs)
5. Preparation and Evaluation of Matrix Tablets for Sustained Release (with atleast two drugs).
6. Determination of K_{el} and $t_{1/2}$ of atleast one drug.
7. Determination of V_d and renal clearance.
8. Determination of K_a and AUC.
9. Analysis of pharmacokinetic data as per one compartment model (I.V).
10. Analysis of pharmacokinetic data as per one compartment model (oral).

COURSE NO 805: CLINICAL PHARMACY & THERAPEUTICS

General concept: Clinical pharmacokinetics, drug interactions, adverse drug reactions, parenteral nutrition, Pharmacoeconomics, Pharmacogenomics, Pharmacovigilance, Therapeutic drug monitoring, Neutraceuticals, essential drugs and rational drug usage.

Age related drug therapy: concept of posology, drug therapy for neonates, pediatrics and geriatrics. Drugs used in pregnancy and lactation.

Drug therapy in gastrointestinal, hepatic, renal, cardiovascular and respiratory disorders.

Drug therapy for neurological and psychological disorders.

Drug therapy in infections of respiratory system, urinary system, infective meningitis, TB, HIV, malaria and filaria.

Drug therapy for thyroid and parathyroid disorders, diabetes mellitus, menstrual cycle disorders, menopause and male sexual dysfunction.

Drug therapy for malignant disorders like leukemia , lymphoma and solid tumors.

Drug therapy for rheumatic , eye and skin disorders,.

COURSE NO 806: CLINICAL PHARMACY & THERAPEUTICS PRACTICALS

1. Calculation of elimination t ½ of a drug from a given data.
2. Calculation of absorption t ½ of a drug from a given data.
3. Calculation of pediatric dose from adult dose.
4. Prediction of drug interaction from a given set of drugs.
5. Prediction of drug interaction from a given set of drugs.
6. Prediction of drug interaction from a given set of drugs.
7. Dosage schedules of important drugs used for TB.
8. Dose and dosage schedule of digoxin.
9. Dosage adjustment of drugs in renal failure.
10. Adverse effects of selected drugs.
11. Drugs not to be used in pregnancy.
12. Care to be taken by lactating mothers in drug use.

Suggested books:

1.Clinical pharmacy and therapeutics: Roger Walker and Clive Edwards

2.Contemparary perspectives on clinical pharmacotherapeutics: Kamlesh.Kohli

COURSE N0 807: HOSPITAL AND COMMUNITY PHARMACY

1. Hospital Pharmacy – Definition, Hospital organization, Pharmacy organization and personnel, Location and layout of a hospital pharmacy unit in a hospital, responsibilities of a hospital pharmacist.
2. Pharmacy and therapeutics committee, Hospital formulary, Dispensing to inpatients (a) Floor stock system, (b)Individual prescription order system, (c) Combination of (a) and (b), Dispensing to out patients.
3. Purchase and inventory control in hospitals and in community pharmacy, Storage of drugs.
4. Drug info ration center, Central sterile supply, Intravenous drug admixture, Unit dose dispensing, prepackaging in the hospital
5. Manufacturing – Bulk and sterile handling of controlled drugs, Current state of hospital Pharmacy in India.

6. Community Pharmacy: (1) Drug house management – selection of site, space, lay-out, and legal requirements, Structure of pharmacy organization.
7. Sales promotion: Market research-salesmanship, qualities of a salesman, advertising and window display.
8. Recruitment, training, evaluation of pharmacists and compensation to the pharmacist.
9. Pharmacy finance: Capital requirements, sources of pharmacy capital, Risk management and insurance.

Reference Books:

1. Merchant and qadry's text book of hospital pharmacy revised by Dr. Ramesh K Goyal and RK Parikh; BS Shah Prakashan Publications.
2. Hospital Pharmacy by William E Hassan.
3. Pharmacy management for students and practitioners, by C. Patrick Tharp and Pedro J Lecca.
4. Remington's Pharmaceutical Sciences.