Academic Regulations 2009 for B. Pharm (Regular)

(Effective for the students admitted into I year from the Academic Year 2009-2010 onwards)

1. Award of B.Pharm. Degree

A student will be declared eligible for the award of the B.Pharm. Degree if he fulfils the following academic regulations:

i. Pursue a course of study for not less than four academic years and in not more than eight academic years.

ii. Register for 220 credits and secure all 220 credits

2. Students, who fail to fulfil all the academic requirements for the award of the degree within eight academic years from the year of their a+dmission, shall forfeit their seat in B.Pharm. course and their admission is cancelled.

3. Courses of study

The course of study offered is B.Pharm at present and any other course as approved by the authorities of the University from time to time.

4. Credits

	I Year		Semester	
	Periods / Week	Credits	Periods / Week	Credits
Theory	03	06	03	04
	02	04	--	--
Practical	03	04	03	02
Seminar	--	--	6	02
Project	--	--	15	10

5. Distribution and Weightage of Marks

i. The performance of a student in each semester / I year shall be evaluated subject –wise with a maximum of 100 marks for theory and 75 marks for practical subject. In addition seminar and project work shall be evaluated for 50 and 200 marks respectively.

ii. For theory subjects the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination.

iii. For theory subjects, during the semester there shall be two midterm examinations. Each midterm examination consists of objective paper for 10 marks and subjective paper for 20 marks with duration of 1hour 50 minutes (20 minutes for objective and 90 minutes for subjective paper).

Objective paper is set for 20 bits for 10 marks. Subjective paper shall contain 5 questions of which student has to answer 3 questions evaluated***** for 20 marks. First midterm examination shall be conducted for I-IV units of syllabus and second midterm examination shall be conducted for V -VIII units. The total marks secured by the student in each mid term examination for 30 marks is considered and the better of the two midterm examinations shall be taken as the final sessional marks secured by each candidate in the subject.

However for first year, there shall be three midterm examinations as in the above pattern and the average marks of the best two mid term examinations secured in each subject shall be considered as final marks for sessionals.

***Note 1:** The subjective paper shall contain 5 questions of equal weightage of 10 marks and the marks obtained for 3questions shall be condensed to 20 marks, any fraction rounded off to the next higher mark

***Note 2:** The mid term examination shall be conducted first by distribution of the Objective paper simultaneously marking the attendance, after 20minutes the answered objective paper is collected back. The student is not allowed to leave the examination hall. Then the descriptive question paper and the answer booklet are distributed. After 90minutes the answered booklets are collected back.

iv. For practical subjects, there shall be a continuous evaluation during the semester for 25 sessional marks and 50 end examination marks.

Day-to-day work in the laboratory shall be evaluated for 25 marks by the concerned laboratory teacher based on the report of experiments/tasks. The end examination shall be conducted by the laboratory teacher and another examiner.

v. There shall be a seminar presentation in IV year II Semester. For the seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding over the topic and submit to the department before the presentation. The report and the presentation shall be evaluated by the Departmental committee consisting of Head of the department, seminar supervisor and a senior faculty member. The seminar shall be evaluated for 50 marks. There shall be no external examination for seminar.

vi. Out of a total of 200 marks for the project work, 60 marks shall be for Internal Evaluation and 140 marks for the End Semester Examination. The End Semester Examination (viva-voce) shall be conducted by an External examiner nominated by the university, HOD & Supervisor as a committee. The evaluation of project work shall be conducted at the end of the IV year. The Internal Evaluation shall be made by the departmental committee, on the basis of two seminars given by each student on the topic of his project.

vii. Laboratory marks and the sessional marks awarded by the College are not final. They are subject to scrutiny and scaling by the University wherever necessary. In such cases, the sessional and laboratory marks awarded by the College will be referred to a Committee. The Committee will arrive at a scaling factor and the marks will be scaled as per the scaling factor. The recommendations of the Committee are final and binding.

viii. The laboratory records and internal test papers shall be preserved in the respective institutions as per the University norms and shall be produced to the Committees of the University as and when the same are asked for.

6. Attendance Requirements:

i. A student shall be eligible to appear for University examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester/ I year.

ii. Shortage of Attendance below 65% in aggregate shall in NO case be condoned.

iii. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester or I year may be granted by the College Academic Committee.

iv. Students whose shortage of attendance is not condoned in any semester / I year are not eligible to take their end examination of that class and their registration shall stand cancelled.

v. A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester / I year, as applicable. They may seek readmission for that semester / I year when offered next.

vi. A stipulated fee shall be payable towards condonation of shortage of attendance to the University.

7. Minimum Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.**6**

A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together. For the Seminar he should secure 40% in the internal evaluation.

A student shall be promoted from II to III year only if he fulfils the academic requirement of securing **40** credits from

a. One regular and one supplementary examinations of I year.
b. One regular examination of II year I semester

irrespective of whether the candidate takes the end examination or not as per the normal course of study.

A student shall be promoted from third year to fourth year only if he fulfills the academic requirements of securing **68 c**redits from the following examinations,

a. Two regular and two supplementary examinations of I year.

b. Two regular and one supplementary examinations of II year I semester.

c. One regular and one supplementary examinations of II year II semester.

d. One regular examination of III year I semester irrespective of whether the candidate takes the end examinations or not as per the normal course of study.

And in case of getting detained for want of credits by sections ii and iii above, the student may make up the credits through supplementary exams of the above exams before the date of class work commencement of Third or Fourth year I semester respectively.

iv. A student shall register and put up minimum attendance in all 220 credits and earn all the 220 credits. Marks obtained in all 220 credits shall be considered for the calculation of percentage of marks obtained.

v. Students who fail to earn 220 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit their seat in B.Pharm. course and their admission shall stand cancelled.

8. Course pattern:

i. The entire course of study is of four academic years. The first year shall be on yearly pattern and the second, third and fourth years on semester pattern.

ii. A student eligible to appear for the end examination in a subject, but absent at it or has failed in the end examination may appear for that subject at the next supplementary examination offered.

iii. When a student is detained due to lack of credits / shortage of attendance he may be re-admitted when the semester / year is offered after fulfilment of academic regulations, whereas he continues to be in the academic regulations he was first admitted.

9. TRANSITORY REGULATIONS:

Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to Section **2**. and continue to be in the academic regulations they were first admitted.

10. WITH – HOLDING OF RESULTS:

If the candidate has not paid dues to the university or if any case of in-discipline or malpractice is pending against him, the result of the candidate shall be withheld and he will not be allowed / promoted into the next higher semester. The issue of degree is liable to be withheld in such cases.

11. Award of Class:

After a student has satisfied the requirements prescribed for the completion of the program and eligible for the award of B.Pharm. Degree he shall be placed in one of the following four classes:

Class Awarded	**% of marks to be secured**	
First Class with Distinction	70% and above	From the aggregate marks secured for the best 220 Credits.
First Class	Below 70% but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

(The marks in internal evaluation and end examination shall be shown separately in the marks memorandum)

12. Minimum Instruction Days:

The minimum instruction days including exams for each semester / I year shall be 90/180 days respectively.

13. There shall be no branch transfers after the completion of admission process.

14. There shall be no place transfer within the Constituent Colleges.

15. General:

i. The academic regulations should be read as a whole for purpose of any interpretation.

ii. Disciplinary action for Malpractice / improper conduct in examinations is appended

iii. Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".

iv. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

v. The University may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on roles with effect from the dates notified by the University.

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Academic Regulations for B. Pharm. (Lateral Entry Scheme)

(Effective for the students getting admitted into II year through Lateral Entry Scheme from the Academic Year 2010-2011 and onwards)

1. Award of B.Pharm. Degree

A student admitted in LES will be declared eligible for the award of the B.Pharm. Degree if he fulfills the following academic regulations:

i. Pursue a course of study for not less than three academic years and in not more than six academic years.

ii. Register for 168 credits and secure all 168 credits from II to IV year of Regular B.Pharm. Program

2. Students, who fail to fulfil the requirement for the award of the degree in six consecutive academic years from the year of admission, shall forfeit their seat.

3. The regulations **3** to **6** are to be adopted as that of B. Pharm. (Regular).

7. Minimum Academic Requirements :

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.**6**

i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together. For the Seminar he should secure 40% in the internal evaluation.

ii. A student shall be promoted from third year to fourth year only if he fulfils the academic requirements of 42 credits from the following examinations.

- **a.** Two regular and one supplementary examinations of II year I semester.
- **b.** One regular and one supplementary examinations of II year II semester.
- **c.** One regular examination of III year I semester.

And in case of getting detained for want of credits the student may make up the credits through supplementary exams of the above exams before the date of class work commencement of Fourth year I semester.

8. Course Pattern

i. The entire course of study is of three academic years on semester pattern.

ii. A student eligible to appear for the end examination in a subject, but absent at it or has failed in the end examination may appear for that subject at the next supplementary examination offered.

iii. When a student is detained due to lack of credits / shortage of attendance he may be re-admitted when the semester / year is offered after fulfilment of academic regulations, whereas he continues to be in the academic regulations he was first admitted.

9. The regulations **9** to **10** are to be adopted as that of B.Pharm. (Regular).

11. Award of Class:

After a student has satisfied the requirements prescribed for the completion of the program and eligible for the award of B.Pharm. Degree he shall be placed in one of the following four classes:

First Class with Distinction	70% and above	From the aggregate marks secured for 168 Credits. (i.e. II year to IV year)
First Class	Below 70% but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

(The marks in internal evaluation and end examination shall be shown separately in the marks memorandum)

12. The regulations **12** to **15** are to be adopted as that of B.Pharm. (Regular). All other regulations as applicable for B.Pharm. Four-year degree course (Regular) will hold good for B.Pharm. (Lateral Entry Scheme)

RULES FOR DISCIPLINARY ACTION FOR MALPRACTICE / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.

2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters

		from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer	Cancellation of the performance in that subject.

	paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

	misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of

		that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including

		practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
   (i) A show cause notice shall be issued to the college.
   (ii) Impose a suitable fine on the college.
   (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.

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Course Structure (2009-10 onwards)
B.PHARMACY
I YEAR

S.No.	Course code	Subject	Th+Tu	Credits	S.No.	Course code	Lab	Credits
1	9RBS101 9RBS102	Remedial Mathematics (for Bi.P.C stream) Remedial Biology (for M.P.C stream)*	3+1 (2+1)	6 (4)	7	9RBS104	- 3/2	- (2)
2	9RBS103	English	3	6			-	-
3	9R01101	Dispensing and Hospital Pharmacy	3+1	6	8	9R01105	3	4
4	9R01102	Pharmaceutical Inorganic Chemistry	3	6	9	9R01106	3	4
5	9R01103	Pharmaceutical Organic Chemistry-I	3+1	6	10	9R01107	3	4
6	9R01104	Anatomy, Physiology and Health education	3+1	6	11	9R01108	3	4
		Total	22/ (21)	36/ (34)			12/ (15)	16/ (18)

*** Remedial biology lab for M.P.C stream students will be in alternate weeks while the evaluation of internal and end examination shall be as independent lab.**

B.Pharm II - I Semester

S. No	Course code	Subject	Theory	Credits	S. No	Course code	Lab.	Credits
1.	9RBS301	Statistical Methods & Computer Applications	4	4	6	9RBS302	3	2
2.	9R01301	Pharmaceutical Engineering –I	4	4			-	-
3.	9R01302	Pharmaceutical Organic Chemistry – II	4	4	7	9R01306	3	2
4.	9R01304	Physical Pharmacy – I	4	4	8	9R01307	3	2
5.	9R01305	Anatomy, Physiology & Pathophysiology	4	4	9	9R01308	3	2
		Total	20	20			12	8

B.Pharm II - II Semester

S. No	Course code	Subject	Theory	Credits	S. No	Course code	Lab.	Credits
1.	9RBS405	Environmental Studies	4	4			-	-
2.	9R01401	Pharmaceutical Engineering- II	4	4	6	9R01405	3	2
3.	9R01402	Pharmaceutical Analysis I	4	4	7	9R01406	3	2
4.	9R01403	Pharmacognosy – I	4	4	8	9R01407	3	2
5.	9R01404	Physical Pharmacy – II	4	4	9	9R01408	3	2
		Total	20	20			12	8

B.Pharm III - I Semester

S.No	Course Code	Subject	Theory	Credits		S.No	Course Code	Lab	Credits
1	9R01501	Pharmaceutical Biochemistry	4	4		6	9R01506	3	2
2	9R01502	Pharmaceutical Microbiology	4	4		7	9R01507	3	2
3	9R01503	Pharmacognosy –II	4	4		8	9R01508	3	2
4	9R01504	Pharmaceutical Technology –I	4	4		9	9R01509	3	2
5	9R01505	Pharmacology -I	4	4		-	-	-	-
		Total	20	20				12	8

B.Pharm III – II Semester

S.No	Course Code	Subject	Theory	Credits		S.No	Course Code	Lab	Credits
1	9R01601	Medicinal Chemistry – I	4	4		7	9R01606	3	2
2	9R01602	Pharmaceutical Technology-II	3	3		8	9R01607	3	2
3	9R01603	Pharmacology II	4	4		9	9R01608	3	2
4	9R01604	Chemistry of Natural Drugs	4	4		10	9R01609	3	2
5	9R01605	Pharmaceutical Jurisprudence	3	3		-	-	-	-
6	9AHS601	Advanced Communication Skills Lab	-	-				3	2
		Total	18	18				15	10

B.Pharm IV – I Semester

S.No	Course Code	Subject	Theory	Credits		S.No	Course Code	Lab	Credits
1	9R01701	Pharmaceutical Analysis – II	4	4		6	9R01707	3	2
2	9R01702	Biopharmaceutics and Pharmacokinetics	3	3		7	9R01708	3	2
3	9R01703	Pharmacology III	4	4		8	9R01709	3	2
4	9R01704	Medicinal Chemistry II	4	4		9	9R01710	3	2
5	9R01705	Pharmacy Administration	3	3		-	-	-	-
6	9R01706	Industrial Training and Seminar	-	-		-	-	-	2
		Total	18	18				12	10

B.Pharm IV – II Semester

S.No	Course Code	Subject	Theory	Credits		S.No	Course Code	Lab	Credits
1	9R01801	Novel Drug Delivery Systems and Regulatory Affairs	3	3		6	9R01807	3	2
2	9R01802	Pharmaceutical Biotechnology	3	3		7	9R01808	3	2
3	9R01803	Medicinal Chemistry-III	3	3		8	9R01809	3	2
4	9R01804	Pharmacognosy III	3	3		9	9R01810	3	2
5	9R01805	Clinical Pharmacy & Therapeutics	4	4		-	-	-	-
6	9R01806	Project work** & Comprehensive Viva	-	-		-	-	-	4
		Total	16	16				12	12

** Suggested areas for project work.

1. Industrial Pharmacy
2. Clinical Pharmacy/ Pharmacology
3. Pharmacognosy /Medical Chemistry
4. Pharmaceutical Analysis / Quality Assurance
5. Pharmaceutical Marketing

The candidates have to undergo Industrial Training for One month (200 Hours Minimum) during 3rd year summer vacation

T – Theory periods per week

P – Practical Periods per week

C – Credits

* -- Tutorials

End examinations in theory subjects shall be for a duration of 3 Hours with 5 questions to be answered out of 8 questions.

End examinations in practical subjects shall be for 3 Hours

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B. Pharmacy I Year	**Th**	**Tu**	**C**
	3	**1**	**6**

(9RBS101) REMEDIAL MATHEMATICS

UNIT I

Algebra:

Arithmetic Progression-Geometric Progression-Binomial theorem-partial fractions. Permutations & combinations. Matrices: basic matrix operations. Determinants- Application of determinants to solve simultaneous equations (Cramer's Rule and Cali-Hamilton's theorem).

UNIT II

Trigonometry:

Trigonometric ratios and the relations between Sin (A+B), Cos (A+B), Tan (A+B) formulae only. Trigonometric ratios of multiple and sub-multiples, angles, heights and distances (simple problems), complex numbers and Demoivre's theorem.

UNIT III

Co-ordinate Geometry:

Distances between points, Area of a triangle, Co-ordinates of a point dividing a given line segment in a given ratio. Locus equation to a straight line in different forms. Angle between straight lines-point of intersection, circles and conic sections.

UNIT IV

Differential Calculus:

Continuity and limit: Differentiation, derivability and derivative, R.H. derivatives and L.H. derivatives, Differentiation, General theorems of derivatives.

UNIT V

Derivatives of trigonometric functions (excluding inverse trigonometric and hyperbolic functions). Logarithmic differentiation, partial differentiation, maxima and minima (elementary) and successive differentiation up to second order.

UNIT VI

Integral Calculus:

Integration as an inverse process of differentiation. Definite integrals, integration by substitution, integration by parts, integration of algebraic function of e^x, evaluation of areas and volumes in simple cases.

UNIT VII

Differential equations:

Formation of a differential equation, order and degree, solution of first order differential equations.

UNIT VIII

Applications of first order and first degree differential equation- law of Natural growth and decay. Newton's Law of cooling. Definition of Linear differential equations for Homogenous, non homogenous, second and higher order equations.

TEXT BOOKS

1. Remedial Mathematics (JNTU) by Ryaz Ahmed khan – Published by S.Chand
2. Intermediate First Year and Second Year Mathematics Text Books printed and published by Telugu Academy, Himayatnagar, Hyderabad.

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B. Pharmacy I Year	**Th**	**Tu**	**C**
	2	**1**	**4**

(9RBS102) REMEDIAL BIOLOGY

UNIT I

Plant and animal cell: Detailed structure, mitosis, meiosis, different types of tissues and their functions.

Brief classification of plant and animal kingdom.

UNIT II

Simple and compound microscopes used in biology; section cutting; staining and mounting of sections.

Morphology and histology of root, stem, bark, wood, leaf, flower, fruit and seed. Modifications of root and stem.

UNIT III

Study of parasites: Structure and life history of parasites: Amoeba, Entamoeba, Trypanosoma, Plasmodium, Taenia, Ascaris, Schistosoma, Oxyuris and Ancylostoma.

UNIT IV

General structure and life history of insects like Cockroach, Mosquito and Housefly. Comparative gross anatomical features of frog, rat and rabbit.

TEXT BOOKS

1.Intermediate First Year and Second Year Botany / Zoology Text Books printed and published by Telugu Academy, Himayatnagar, Hyderabad.
2. A.C. Dutta, Text Book of Botany
3. Botany for Degree students Vol I & II by B.P. Pandey

REFERENCES

1. Concepts of biology, Enger 12th Edition 2007.
2. Text book of Biology by S.B.Gokhale
3. Outlines of zoology by M.Ekambaranatha Ayyar and T.N.Ananda Krishnan
4. A manual for pharmaceutical biology practicals by S.B.Gokhale and C.K.Gokhale

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B.Pharmacy. I Year **T P C**
3 0 6

(9RBS103) ENGLISH

1. INTRODUCTION :

The sweeping changes in the world have elevated English to the status of a tool of global communication and transformed it into e-English. The syllabus has been drafted to improve the competence of students in communication in general and language skills in particular. The books prescribed serve as students' handbooks.

The teacher should focus on the skills of reading, writing, listening and speaking while using the prescribed text and exercises. The classes should be interactive. The students should be encouraged to participate in the classroom proceedings and also to write short paragraphs and essays. The main aim is to encourage two way communications in place of the one-sided lecture.

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The text for non-detailed study is meant for extensive reading by the students. They may be encouraged to read some select topics on their own, which could lead into a classroom discussion. In addition to the exercises from the texts done in the class, the teacher can bring variety by using authentic materials such as newspaper articles, advertisements etc.

2. OBJECTIVES:

a. To improve the language proficiency of the students in English with an emphasis on LSRW skills.
b. To equip the students to study academic subjects with greater facility through theoretical and practical components of the syllabus.
c. To develop study skills as well as communication skills in formal and informal situations.

3. SYLLABUS :

Listening Skills:

Objectives

1. To enable students to develop their listening skills so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and dialects.

Students should be given practice in listening and identifying the sounds of English language and to mark stress , right intonation in connected speech.

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills :

Objectives

1. To make students aware of the role of ability to speak fluent English and its contribution totheir success.
2. To enable students to express themselves fluently and appropriately in social and professional contexts.

- Oral practice
- Describing objects/situations/people
- Role play – Individual/Group activities
- Just A Minute (JAM) Sessions.

(Using exercises from all units of the prescribed text)

Reading Skills:

Objectives

1. To develop an awareness in the students about the significance of silent reading and comprehension.
2. To develop the ability to guess the meanings of words from context and grasp the overall message of the text, draw inferences etc.

- Skimming the text
- Understanding the gist of an argument
- Identifying the topic sentence
- Inferring lexical and contextual meaning

- Understanding discourse features
- Recognizing coherence/sequencing of sentences

The students shall be trained in reading skills using the prescribed text for detailed study. They shalll be examined in reading and answering questions using 'unseen' passages which may be taken from the non-detailed text or other authentic texts, such as articles from magazines/newspapers

Writing Skills:

Objectives

1. To develop an awareness in the students the skill to write exact and formal writing
2. To equip them with the components of different forms of writing.
   - Writing sentences
   - Use of appropriate vocabulary
   - Paragraph writing
   - Coherence and cohesiveness
   - Narration / description
   - Note Making
   - Formal and informal letter writing
   - Editing a passage

4. TEXTBOOKS PRESCRIBED:

In order to improve the proficiency of the student in the acquisition of the four skills mentioned above, the following texts and course content are prescribed and divided into Eight Units:

For Detailed study: **ENJOYING EVERYDAY ENGLISH**,
Sangam Books (India) Pvt Ltd, Hyderabad, 2009
For Non-detailed study: **INSPIRING LIVES**,
Maruti Publications, Guntur, 2009

Unit -I

a. Heaven's Gate from **ENJOYING EVERYDAY ENGLISH**
b. Mokshagundam Visvesaraya from **INSPIRING LIVES**

Unit -II

a. Sir C.V.Raman from **ENJOYING EVERYDAY ENGLISH**

b. Mother Teresa from **INSPIRING LIVES**

Unit -III

a. The Connoisseur from **ENJOYING EVERYDAY ENGLISH**

b. Dr. Amartya Kumar Sen from **INSPIRING LIVES**

Unit -IV

a. The Cuddalore Experience from **ENJOYING EVERYDAY ENGLISH**

b. Gertrude Elion from **INSPIRING LIVES**

Unit -V

a. Bubbling Well Road from **ENJOYING EVERYDAY ENGLISH**

b. Vishwanathan Anand from **INSPIRING LIVES**

Unit-VI

a. Odds Against Us from **ENJOYING EVERYDAY ENGLISH**

b. Charlie Chaplin from **INSPIRING LIVES**

Unit – VII

Exercises on

Reading and Writing Skills
Reading Comprehension
Letter writing
Report writing

Unit – VIII

Exercises on Remedial Grammar covering Common errors in English, Subject-Verb agreement, Use of Articles and Prepositions, Active/Passive Voice, Reported speech, Tenses Vocabulary development covering Synonyms & Antonyms, one-word substitutes, prefixes & suffixes, Idioms & phrases, words often confused.

Evaluation: The question paper shall contain two parts, Part A containing questions from Units I- VI and Part B containing questions from units VII & VIII. The student is required to answer five full questions choosing at least one from Part B.

REFERENCES:

1. Technical Communication , Principle and Practice, Meenakshi Raman and Sangita Sharma, OUP, 2009
2. Essential Grammar in Use, (with CD) 3/e, Cambridge University Press, 2009
3. Resumes and Interviews, M.Ashraf Rizvi, Tata – McGraw Hill, 2009
4. Everyday Dialogues in English by Robert J. Dixson, Prentice-Hall of India Ltd., 2006.
5. Communication Skills for Technical Students, Farhathullah, T.M., Orient Blackswan, 2008
6. Developing Communication Skills, 2/e. by Krishna Mohan & Meera Banerji , Macmillan, 2009
7. English for Technical Communication, Vol. 1 & 2, by K. R. Lakshmi Narayanan, Sci tech. Publications.
8. Basic Communication Skills For Technology, Andrea J Ruthurford, Pearson Education , Asia.
9. Longman Dictionary of Contemporary English with DVD, Pearson Longman

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy I Year	**Th**	**Tu**	**C**
	3	**1**	**6**

(9R01101*)* DISPENSING & HOSPITAL PHARMACY

Section-A: DISPENSING PHARMACY

UNIT I- Genesis and Evolution of Pharmacy: History of Pharmacy, origin and development of the Pharmacopoeias, History of Ayurveda, salient features of IP, USP and BP.

UNIT II- Dispensing Pharmacy: Principles of dispensing, parts of prescription, handling of prescription, source of errors in prescription and care required in dispensing procedures including labeling of dispensed products. Weights and Measures, introduction to Latin terms, Percentage calculations, alligation method, proof spirit calculations, displacement value and calculations of isotonicity adjustment. General dispensing procedures, posology-calculations of doses.

UNIT III- Principles involved and procedures adopted in dispensing of the following classes of preparations.
i) Mixtures ii) Solutions iii) Emulsions iv) Powders
v) Lotions & liniments vi) Ointments and vii) Suspensions
Definition of the following preparations like creams, capsules, pastes, jellies, suppositories, ophthalmic, lozenges, pills, inhalations, paints, gargles, sprays and tablet triturates .

Extraction and Galen cal products: Principle and methods of extraction, preparation of infusion, tinctures, dry and soft liquid extracts.

UNIT IV- Incompatibilities: Physical, chemical and therapeutic incompatibilities – methods of overcoming and handling of prescriptions with incompatibility.

Section-B: HOSPITAL PHARMACY

UNIT V- Organization: Organization of a hospital and hospital pharmacy, responsibilities of a hospital pharmacist, pharmacy and therapeutic committee.

UNIT VI- Drug distribution: Procedural manual, drug distribution, dispensing to out-patients, in-patients and ambulatory patient-dispensing of ancillary and controlled substances, drug information center(DIC).

UNIT VII- Hospital Management: Budget preparation and implementation, hospital formulary, organization of drug store, purchase and inventory control, patient counseling, role of Pharmacist in community health care and education.

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UNIT VIII- Records: Prescription filling, drug profile, patient medication profile, cases on drug interaction, adverse reactions, idiosyncratic cases.

Note: End Exam students should write 5 out of 8 questions choosing at least two from each section

TEXT BOOKS

1 Dispensing Pharmacy, Cooper & Gunns CBS, Publ. and Distributors New Delhi – (2008).
2 Health Education and Community Pharmacy, Gupta AK, CBS, Publ. and Distributors New Delhi – (2010).
3 Hospital Pharmacy. JS Quadry.

REFERENCES

1. Essential dosage calculations -Hospital Pharmacy. Lorria & William William Hassan.
2. Dispensing Pharmacy, R.M Metha, 2006 Vallabh Publication, New Delhi.
3. Text Book of Pharmaceutics, E.A. Rawlins, Bentley's ELBS publ.
4. Health Education and Community Pharmacy, NK Jain, CBS, Publ. and Distributors New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy I Year **T P C**
3 0 6

(9R01102)PHARMACEUTICAL INORGANIC CHEMISTRY

UNIT- I

1. Classification of Inorganic Pharmaceuticals based on their applications and therapeutic uses.
2. Sources of impurities, quality control and test for purity
3. Qualitative tests for anion and cations
4. Limit tests for arsenic, heavy metals, lead, iron, chloride and sulphate.

Note: Definition, Preparation, principle behind Assays / Limit tests and Uses of the compounds mentioned in Unit II to Unit VII

UNIT - II

1. Electrolytes:

a. Sodium and potassium replenishers: Sodium chloride, compound sodium chloride solution (Ringer solution), potassium chloride, ORS.

b. Calcium replenishers: Calcium gluconate, dibasic calcium phosphate, calcium chloride.

2. Acid base regulators: Sodium bicarbonate, sodium lactate, sodium citrate/potassium citrate, sodium acetate and ammonium chloride

3. Dialysis fluids: Haemodialysis fluids.

UNIT III

Gastro-intestinal agents.

1. **Acidifiers and Antacids:**

Dilute hydrochloric acid, sodium acid phosphate, sodium bicarbonate, aluminium hydroxide gel, dried aluminium hydroxide gel, magnesium oxide (Magnesia), magnesium hydroxide mixture, magnesium trisilicate.

2. **Adsorbents and related drugs**:
Light kaolin, heavy kaolin and activated charcoal.
3. **Laxatives:**
Magnesium sulphate, sodium phosphate.

UNIT -IV

1) **Mineral Nutrients / Supplements**
   (a) **Haematinics** – Ferrous sulphate, ferrous fumarate, ferrous gluconate, ferric ammonium citrate, iron and dextrose injection.
   (b)**Halogens:** Iodine, Iodides.

2) **Pharmaceutical aids**
   (a) Excipients: Dicalcium phosphate, magnesium stearate, talc and calcium carbonate (Precipitated chalk).
   (b) **Suspending agents**: Bentonite, colloidal silica.
   (c) **Colorants:** Titanium oxide, Ferric oxide

UNIT- V

(a) **Expectorants**: Ammonium chloride, potassium iodide.
(b) **Emetics**: Potassium antimony tartarate, copper sulphate.
(c) **Antidotes:** Sodium thiosulphate, sodium nitrite.

UNIT -VI

***Topical agents*:**

1) **Astringents:** Zinc sulphate, calcium hydroxide, Bismuth sub carbonate.
2) **Topical protectants:** Zinc oxide, calamine, zinc stearate, talc, titanium-dioxide, heavy kaolin and light kaolin (only uses).
3) **Silicone polymers:** Activated dimethicone.
4) **Anti-infectives:** Hydrogen peroxide solution, potassium permanganate, silver nitrate (silver protein),iodine, (solutions of iodine, povidoneiodine), boric acid, zinc undecylenate, mercury compounds (yellow mercuric chloride).

UNIT- VII

Dental products:

1) **Fluorides**: Sodium fluoride, sodium monofluorophosphate and stannous fluoride.

2) **Oral antiseptics and astringents**: Hydrogen peroxide, magnesium peroxide, zinc peroxide andmouth washes.
3) **Dentifrices**: Calcium carbonate, dibasic calcium phosphate, calcium phosphate, sodium metaphosphate and strontium chloride.
4) **Cements & fillers** : Zinc oxide (uses only).

UNIT-VIII

Miscellaneous Medicinal Agents

a)	Antineoplastics	: Cisplatin
b)	Antidepressants	: Lithium carbonate
c)	Diagnostic agents	: Barium sulphate
d)	Surgical aids	: Plaster of Paris
e)	Antirheumatic agents	: Sodium aurothiomalate
f)	Internal parasiticid	: Sodium antimony gluconate
g)	Anti thyroid agents	: Potassium perchlorate

TEXT BOOKS

1. Pharmaceutical Inorganic Chemistry by Madan-S.Chand
2. Inorganic Medical and Pharmaceutical Chemistry, J.H Block, E.Roche, T.O Soine and C.O. Wilson, Lea & Febiger Philadelphia PA. 1974

REFERENCES

1. Practical pharmaceutical chemistry, Part-I, A.H.Beckett and J.B.Stenlake, The Athtone press, University of London, London.
2. Inorganic chemistry, Gary L.Miessler and Donald A.Tarr,3/e, Pearson education, New Delhi
3. Inorganic pharmaceutical chemistry, P. Gundu Rao, Vallabh Prakashan, Delhi.
4. Advanced Inorganic Chemistry, G.D.Tuli, Satya prakash, S.Chand 2006.
5. Modern inorganic chemistry by William L. Jolly Mc Graw-Hill, New Yark 1984
6. Indian Pharmacopoeia 1996, 2007.

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B. Pharmacy I Year	**Th**	**Tu**	**C**
	3	**1**	**6**

(9R01103)PHARMACEUTICAL ORGANIC CHEMISTRY-I

UNIT – I

Structure and Activity of Organic Molecules: Shapes of organic molecules, bond lengths, bond angles and bond dissociation energies. Electronic effects in organic molecules: inductive effect, electromeric or mesomeric effect, hyperconjugation, concept of resonance; types of organic reagents and reactions.

UNIT – II

Study of Hydrocarbons:

Aliphatic/Alicyclic Hydrocarbons: Nomenclature, isomerism (chain, conformational and geometrical) relative stabilities (heats of combustion and hydrogenation), ring stabilities of cyclohexane, chair-boat conformation, Bayer's strain theory and sachse-mohr theory. Free radical substitution reactions (halogenation) of alkanes, selectivity of halogens.

Alkenes: Electrophilic addition reactions of alkenes, Markovnikov's rule, Anti-Markovnikov,s rule, Kharasch effect, Bayer's oxidation (cis-hydroxylation, polymerisation).

Alkadienes: Stability & 1,4 addition reactions of conjugated alkadienes.

Alkynes: Acidity of 1-alkynes, formation of metal acetylides. Stereo specific reduction of alkynes. Addition of hydrogen halide (HCl) addition of water and keto-enol tautomerism.

UNIT – III

Aromatic Hydrocarbons: Kekule's structure of benzene, bond lengths, heats of hydrogenation and stability, molecular orbital picture of benzene, aromaticity, Huckel's rule, nomenclature of benzene derivatives, characteristic reactions of benzene, theory of reactivity and orientation in monosubstituted benzenes.

Polynuclear aromatic hydrocarbons: Nomenclature, structure and aromatic character of naphthalene, anthracene, phenanthrene and naphthacene resonance structures, electron density and reactivity. Electrophilic substitution, oxidation and reduction reactions.

UNIT – IV

Halogen Compounds-Aliphatic: Nomenclature, general methods of preparation, characteristic nucleophilic substitution reactions, factors that play role in SN^1 and SN^2, Walden inversion, elimination reaction and Saytzeff's rule.

Halogen Compounds-Aromatic: Nomenclature, low reactivity of halo benzenes towards nucleophilic substitution, arenas, Benzyne ion concept..

UNIT – V

Alcohols: Nomenclature, classification, general methods of preparation, physical properties, hydrogen bonding, characteristic nucleophilic substitution reactions (replacement of -OH by -Cl), elimination reactions, and relative reactivities of 1^o, 2^o and 3^o alcohols, Meerwein Pondorff Verley reduction.

Ethers: Nomenclature, Williamson's synthesis, action of hydro iodic acid on ethers (Ziesel's method).

Phenols: Nomenclature, general methods of preparation, physical properties, acidity of phenols, stability of phenoxide ion, reactions of phenols, Kolbe-schmidt reaction stability of conjugated dienes, and Fries rearrangement, Reamer-Tiemann Reaction.

UNIT – VI

Carbonyl Compounds: Nomenclature, two important methods of preparation, polarity of carbonyl group, relative reactivities of carbonyl compounds, nucleophilic addition and addition-elimination reactions, oxidation-reduction reactions, aldol condensation, Cannizzaro reaction, benzoin condensation, Perkins reactions, Reformatsky reaction, Oppenauer oxidation.

UNIT – VII

Carboxylic acids and their derivatives:

Carboxylic acids: Nomenclature, intermolecular association, stability of carboxylate anion, two important methods of preparation, decarboxylation, functional groups reactions, reduction of carboxylic acids.

Acid derivatives: (acid chlorides, anhydrides, esters and amides). Nomenclature, reactions like hydrolysis, reduction of esters and amides, Hofmann's degradation of amides. Brief account of preparation and properties of malonic and acetoacetic esters, their importance in organic syntheses.

UNIT – VIII

Nitrogen Compounds:

Nitro compounds: Nomenclature, acidity of nitro compounds containing α-hydrogens, reductive reactions of aromatic nitro compounds.

Amines: Nomenclature, basicity of amines, classification, relative reactivity, Hinsberg method of separation, acylation reactions. Diazotisation and reactions of diazonium salts.

Nitriles and isonitriles: Nomenclature, two methods of synthesis, reactivity and functional reactions.

TEXT BOOKS

1. Advanced pharmaceutical organic chemistry, Bahl & Bahl, S.Chand
2. Organic chemistry, T.R.Morrison and R.N.Boyd, Pearson Education India , New Delhi.

REFERENCES

1. Organic chemistry, Bruice 6th Edition, Pearson Publisher, 2010.
2. Reactions and Mechanism, Jerry March, 4th edition Wiley Publication.
3. organic chemistry, Carey, 8th Edition, Mc Graw-Hill.
4. organic chemistry, Pillai Orient Longman Publisher.
5. The Fundamentals Principles of Organic Chemistry Vol.I & Vol. II, I.L. Finar, ELBS/Longman.

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B. Pharmacy I Year	**Th**	**Th**	**C**
	3	**1**	**6**

(9R01104) ANATOMY PHYSIOLOGY AND HEALTH EDUCATION

UNIT-I

Scope of anatomy and physiology, basic terminology used in these subjects. Structure of cell, its components and their functions. Elementary tissues of the human body: epithelial, connective, muscular and nervous tissues, their sub- types and characteristics. Body fluids, Homeostasis

UNIT-II

Skeletal system: Structure, composition and functions of skeleton classification of joints, types of movements at joints,

Skeletal muscles: Gross anatomy, physiology of muscle contraction, physiological properties of skeletal muscles and their disorders.

UNIT-III

Haemopoietic system: Composition and functions of blood and its elements, their disorders, blood groups and their significance, mechanism of coagulation, disorders of platelets and coagulation. Anemia and its types.

Lymph and Lymphatic System: Composition, formation and circulation of lymph; disorders of lymph and lymphatic system. Basic physiology and functions of spleen.

UNIT-IV

Cardiovascular system: Basic anatomy of the heart. Physiology of heart, blood vessels and circulation. Basic pulmonary, coronary and hepatic system. Understanding of cardiac cycle, heart sounds and electrocardiogram. Blood pressure and its regulation. Brief outline of cardiovascular disorders like hypertension, hypotension, atherosclerosis, angina, myocardial infarction, congestive heart failure and cardiac arrhythmias.

UNIT-V

Digestive System: Gross anatomy of the gastro-intestinal tract, functions of its different parts including those of liver, pancreas and gall bladder, various gastrointestinal secretions and their role in the absorption and digestion of food, peptic ulcer, ulcerative colitis and hepatic disorders.

UNIT-VI

Respiratory System: Anatomy of respiratory organs. Functions of respiration, mechanism and regulation of respiration, respiratory volumes and vital capacity. Asthma, tuberculosis.

UNIT-VII

Concepts of health & disease, disease causing agents and prevention of disease.

Balanced diet and nutritional deficiency disorders,

First Aid: Emergency treatment of shock, snakebites, burns, poisoning, fractures and resuscitation methods.

Demography and family planning:

Demography cycle, population problem, family planning and various contraceptive methods. Medical termination of pregnancy.

UNIT-VIII

Brief outline of communicable diseases, their causative agents, modes of transmission and prevention:- chicken pox, measles, influenza, diptheria whooping cough, tuberculosis, poliomyelitis, hepatitis, cholera, typhoid, food poisoning, helmenthiasis, malaria, filariasis, rabies, trachoma, tetanus, leprosy, syphilis, gonorrhea and Aids.

TEXT BOOKS

1 Human Anatomy & physiology and Health education, Dr.Jayaveera, K.N,Vrushabendra Swamy.BM, S.Chand 2009.

2. Essential of Human Anatomy & Physiology, Elaine N. Marieb 6th Edition Benjamin eumming's

3. Principles of Anatomy and Physiology, Tortora, G.J and Anagnodokas, N.P Harper & Row Publishers N.Y

REFERENCES

1. Text Book of Human Anatomy, Ross & Willson, M.J.Mycek S.B Gerther and MMPER
2. Human Physiology, C.C.Chatterjee.Rosen Educational Publishing 13th Edition
3. Fundamentals of Anatomy & Physiology, Rizzo, Cengage learning (2009) 3rd Edition.
4. Human Anatomy, Mc Kinley, Mc Graw Hill 2009.
5. Textbook of Medical Physiology, Guyton, AC Guyton WB Sannders Company, 1995. 12th Edition Saunder's – Elsewier.

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B. Pharmacy I Year	**T**	**P**	**C**
	0	**3/2**	**2**

(9RBS104) REMEDIAL BIOLOGY LAB

About 12-15 experiments/exercises (approx. of 2 hrs duration) may be designed covering the following topics and evenly distributed over the academic calendar.

a. Care and uses of microscope
b. Gross identification of permanent slides of structure and life cycle of plants/animals mentioned in the theory syllabus.
c. Morphology of plant parts indicated in theory.
d. Preparation, Microscopic Examination of stem, root and leaf of mono and dicot leaves.
e. Structure of human parasites and insects mentioned in the theory with the help of specimen.
f. Anatomical features of different organs of frog and rabbit using charts.

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B. Pharmacy I Year	**T**	**P**	**C**
	0	**3**	**4**

(9R01105) DISPENSING & HOSPITAL PHARMACY LAB

About 18-20 experiments/exercises (approx. of 2 hrs duration) may be designed covering the following 1 to 5 topics and evenly distributed over the academic calendar. Exercises for topic 6 may be conveniently devised

1. Dispensing of prescriptions falling under the categories; Mixtures (Megnessium hydroxide IP), Syrups(Simple syrup,Flavored syrup), solutions (Cresol with soap solution, strong ammonium acetate solution, Lugol' solution), emulsions (Liquid paraffin and castor oil emulsions), creams (cold creams), ointments (sulphur ointment,Zinc oxide ointment), powders (dusting and eutectic powders), lotions (calamine lotion), liniments (terpentine liniment), elixirs (Piperazine citrate elixirs), tincture (iodine tincture), paints (throat paint), gargles (potassium chlorate gargles), gels(Bentonite gel) colloidion (salicylic acid colloidion), mouthwash (antiseptic mouthwash).
2. Identification of various types of incompatabilities in a prescription, correlation there of and dispensing of such prescriptions.
3. Dispensing procedures involving pharmaceutical calculations, pricing of prescriptions and dosage calculations for paediatric and geriatric patients.
4. Dispensing of prescriptions involving adjustment of tonicity. Preparation of normal saline and dextrose solutions.
5. Preparation of Pharmacopoeial extracts and galenical products utilizing various methods of extraction viz Maceration and percolation.
6. Project report on visit to the community pharmacy for Counseling on the rational use of drugs and aspects of health care.

LIST OF MINIMUM EQUIPMENT REQUIRED

A. Adequate number of the following, such that each student gets one set

1. Mortars and pestles.
2. Analytical balance and weight box.
3. Percolators

4. Dispensing containers.
B. pH meter.
C. Electronic balance
D. Adequate quantities of chemicals and glassware

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B. Pharmacy I Year	**T**	**P**	**C**
	0	**3**	**4**

(9R01106) PHARMACEUTICAL INORGANIC CHEMISTRY LAB

List of experiments:

A) Limit tests for the following as per the procedure given in Indian Pharmacopoeia (1996 – including the latest addenda)

1) Chlorides
2) Sulphates
3) Heavy metals
4) Iron
5) Arsenic
6) Modifications in limit test for chlorides and sulphates in potassium permanaganate, sodium bicarbonates, sodium benzoates and sodium salicylates.

B)

7) Balances and Weighing; Calibration of weights, Pipette and Burette.
8) Preparation and standardization of Hydrochloric acid solution (0.1N).
9) Preparation and standardization of Potassium permanganate solution (0.1N & 0.1M).
10) Preparation of a primary standard solution of 0.1N Potassium hydrogen-phthalate.
11) Preparation and standardization of 0.1N EDTA solution.
12) Preparation and purification of Boric acid.
13) Preparation and purification of Sodium citrate.
14) Preparation and purification of Potash alum.
15) Preparation and purification of Magnesium stearate.
16) Assay of sodium bicarbonate and assay of Boric acid (Neutralization).
17) Assay of Calcium gluconate (or) any calcium compounds (Complexometry).
18) Assay of Copper sulphate (Redox titration).
19) Assay of Sodium acetate (Non-aqueous titration).
20) Assay of Ferrous sulphate (Oxidation-reduction / Redox titration).

21) Swelling power in bentonite
22) Test for purity (Ammonium salts in potash alum, presence of iodates in KI)

REFERENCES

1. Indian Pharmacopoeia - 1996.
2. Vogel's Qualitative Analysis

LIST OFMINIMUM EQUIPMENT REQUIRED

1. Analytical balances
2. Physical balances
3. Suction pumps
4. Oven
5. Hot plates
6. Water baths
7. Distillation unit
8. Limit test apparatus for arsenic
9. Adequate glasswares

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B. Pharmacy I Year	**T**	**P**	**C**
	0	**3**	**4**

(9R01107) PHARMACEUTICAL ORGANIC CHEMISTRY-I LAB

Introduction to Equipment & Glassware, Recrystallization method, details of M.P, B.P and distillation

I. Preparation of organic compounds (each involving a specific organic reaction covered in theory)

1.	N-Acetylation	: Preparation of Acetanilide from Aniline
2.	O-Acetylation	: Preparation of Aspirin from Salicylic acid
3.	Nuclear Bromination	: Preparation of p-Bromoacetanilide From Acetanilide
4.	Hydrolysis	: Preparation of p-Bromoaniline from p-Bromoacetanilide
5.	Nuclear Nitration	: Preparation of m-Dinitrobenzene from Nitrobenzene
6.	Reduction	: Preparation of m-nitro aniline from m-dinitro benzene.
7.	Oxidation	: Preparation of Benzoic acid from Benzyl chloride
8.	Esterification	: Preparation of n-Butylacetate from n-Butylalcohol
9.	Etherification	: Preparation of β-Naphthyl methyl ether from β-Naphthol
10.	α-Halogenation	: Preparation of Iodoform from Oxidation of Acetone / Ethanol
11.	Extensive Nuclear Substitution	: Preparation of tribromophenol
12.	Bromination	: Tribromoaniline from Phenol or Aniline
13.	Addition / elimination	: Preparation of phenyl hydrazone or oxime from Benzaldehyde

II. Identification of organic compounds belonging to following classes by systematic qualitative organic analysis including preparation of derivatives.

1. Phenols
2. Amides
3. Carbohydrates
4. Amines
5. Carboxylic acids
6. Aldehydes and Ketones
7. Alcohols
8. Anilides and nitrocompounds
9. Esters

REFERENCES

1.Text Book of Practical Organic Chemistry, Vogel's, 5th Edition Pearson.
2. Laboratory Manual of Organic Chemistry, R.K. Bansal, New Age International 5th Edition 2007.
3. Advanced Practical Organic Chemistry, O.P. Agarwal, 3rd Edition Goel Publication.
4. Practical Organic Chemistry, F.G.Mann & B.C. Saunders, Pearson 4th Edition.

LIST OFMINIMUM EQUIPMENT REQUIRED

1. Triple beam balances
2. Physical balances
3. Melting point apparatus
4. Suction pumps
5. Oven
6. Hot plates
7. Water baths
8. Distillation unit
9. Refrigerator
10. Adequate glassware

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy I Year	**T**	**P**	**C**
	0	**3**	**4**

(9R01108) ANATOMY, PHYSIOLOGY HEALTH EDUCATION LAB
(21 Experiments)

1. Study of human skeleton – 2 Experiments
2. Study of different systems with the help of charts and models – 2 Experiments.
3. Microscopic study of different tissues -3 Experiments.
4. Estimation of Haemoglobin in blood, Determination of bleeding time, clotting time - 3 Experiments.
5. Estimation of R.B.C. count – 2 Experiments.
6. Estimation of W.B.C count - 2 Experiments.
7. Estimation of D.L.C. -2 Experiments.
8. Recording of body temperature, pulse rate and blood pressure, basic understanding of electrocardiogram-PQRST waves and their significance - 3 Experiments.
9. Determination of vital capacity, experiments on spirometry – 2 Experiments.
10. Study of different family planning appliances

REFERENCES

1. Practical Biochemistry, Plummer,
2. Human Anatomy & Physiology, Elaine N. Marieb,.
3. Human Physiology, A.K. Chartterjee,

LIST OF MINIMUM EQUIPMENTS REQUIRED

1. Microscopes
2. Glass slides
3. Hemocytometer with micropipettes
4. Sahli's hemoglobinometer
5. Huchinson's spirometer
6. Sphygmomonometer
7. Stethoscope
8. Permanent slides for various tissues

9. Models for various organs and system
10. Specimen of various organ and system
11. Skeleton and bones
12. Clinical thermometers
13. ECG graphs.
14. Stop clocks
15. Different contraceptive devices and models.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy II –I Semester **T P C**
4 0 4

(9RBS301) STATISTICAL METHODS AND COMPUTER APPLICATIONS

Section - A: Bio-statistics

UNIT-I

Data collection and treatment: Significant digits and rounding of numbers, data collection, random and non-random sampling methods, sample size, data organization, diagrammatic representation of data, bar, pie, 2-D and 3-D diagrams, standard deviation and standard error of means, co-efficient of variation, confidence (fiducial) limits, probability and events.

Probability and Distributions: Bayer's theorem, probability theorem, probability distribution, elements of binomial and poison distribution, normal distribution curve and properties, kurtosis and skewness**.**

UNIT - II

Regression: Correlation and regression analysis, method of least squares and non-linear regression.

UNIT.III

Statistical inference: Common parametric and non-parametric tests employed in testing of significance in biological/pharmaceutical experiments and elements of ANOVA (One way and two way).

UNIT.IV

Design of experiments: Basic concepts of CRD, RBD and Latin square designs.

Sampling and Quality Control: Concept of random sampling, statistical QC charts. Applications of statistical concepts in pharmaceutical sciences.

Section - B: Computer Applications

UNIT.V

Overview of Computer with general applications: components of computers., computer languages useage of computers.Introduction to Operating system

UNIT.VI

INTRODUCTION TO MS – OFFICE: MS-Word: Basics, working with files, working with text, formatting paragraphs, stayles, lists, tables, graphics, spellings and grammer and page formatting macros, table of contents.

MS-Excel: Basics, spreadsheets, data types, fformulas, formatting, charts, graphs.

MS-Power Point: Power point Basics, views, slide controls, applied design, page setup, templates, back ground control, colour screens, transitions, and animations, working with texts, and working with graphics.

MS- Access: Database concepts, screen layouts, creating tables, data sheet records, table relationships, sorting and filtering, queries forms, form controls, sub forms, reports, importing, experoting, linking.

UNIT.VII

Information Technology today: internet and world Wide Web (WWW): structure and organization of the www, browsers, information search in www, search engines, pharmaceutical resources in www types of indexing tools & search strategies, Hyper Text Manuscripts Language (HTML) and E-mail.

Database Management: Concepts and Objectives of database management systems, advantages of the database management systems and examples of DBMS packes (like DBASE III)

Introduction to structured Query language (SQL): over view of SQL, Reserved words, SQL Commands.

UNIT.VIII

Computer Applications in pharmaceutical and clinical studies, computer validation -introduction.

TEXT BOOKS

1. Biostatistics by R.S.Shukla & P.S.Chandel-S.Chand
2. Pranab Kumar Benarjee, Introduction to Biostatistics S. Chand 2nd Edition.
3. Khan and Khanum, Fundamentals of Biostatistics UKAAZ – B.S. Publication, 2004 1st Edition.
4. Text book of STATISTICAL Methods and computer applications by Dr. A. Ramakrishna Prasad.

5. Ron Mansfiled, Working In Microsoft Office. 1st Edition Mc Graw-Hill.
6. Ivan Bayross, SQL, PL/SQL The Programming Language of oracle. 2nd Edition.

REFERENCE

1. Dona E. Knath, The Art Of Computer Programming by Pearson Education (Singapore) Pvt. Ltd Delhi, 110 092.
2. Remez Elmasi, Shankar. B. Navathe, Fundamentals Of Database System, Pearson Education (Singapore) Pvt. Ltd Delhi, 110 092.
3. Collins, Dictionary of Computers and IT by Ian Sinclair, Harper Collins Publishers Glasgow, UK.
4. Y. Raja Raman, Computer Programming in C. 16th Edition, Prentice Hall of India, New Delhi.
5. Principles of Bio-Statistics –pagano-, Cengage learning

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy II –I Semester **T P C**
4 0 4

(9R01301) PHARMACEUTICAL ENGINEERING - I

UNIT-I

Introductory concepts: Unit operation / Unit processes, material and energy balance, molecular units, mole fractions, gas laws, mole volume, primary and secondary quantities, equilibrium state, rate process, steady and unsteady states, dimensionless equations, dimensionless formulae, dimensionless groups, different types of graphic representation, mathematical problems.

UNIT –II

Fluid Flow: Types of flow, Reynold's number, viscosity, concept of boundary layer, basic equations of fluid flow, valves, flow meters, manometers and measurement of flow and pressure.

UNIT-III

Material handling systems:

a. Liquid handling - Study of different types of pumps such as Reciprocating pumps, Turbine pumps and centrifugal pumps.
b. Gas handling - Various types of fans, blowers and compressors.
c. Solid handling - Conveyors

UNIT-IV

Filtration and Centrifugation: Theory of filtration, Factors affecting filteration, filter aids, filter media, industrial filters including filter press, rotary filter, edge filter, Air filteration, equipments and mechanism. Mathematical problems of filtration, optimum-cleaning cycle in batch filters.

Principles of centrifugation, industrial centrifugal filters, centrifugal filters, and centrifugal sedimeters.

UNIT-V

Crystalization: Characteristics of crystals like; purity, size, shape, geometry, habit, forms, size and factors affecting it. Solubility curves and calculation of yields. Supersaturation theory and its limitations. Nucleation mechanisms, crystal growth. Study of various types of crystallizers such as Swenson walker crystalizer, vacuum crystalizer, Krystal crystallizer. Caking of crystals and its prevention. Numerical problems on yields.

UNIT-VI

Dehumidification and Humidity control

Basic concepts and definition, wet bulb and adiabatic saturation temperature. Psychrometric chart and measurement of humidity, application of humidity measurement in pharmacy, equipments for dehumidification operations.

Refrigeration and air-conditioning: Principles and applications

UNIT-VII

Materials of Construction: General study of composition, corrosion, resistance, properties and applications of the materials of construction with special reference to stainless steel, glass and polymers.

UNIT-VIII

Industrial hazards and safety precautions: Mechanical, Chemical, Electrical, fire and dust hazards. Industrial dermatities, accident records etc.Basic safety measures.

TEXT BOOKS

1. S.J. Carter, Cooper and Gunn's Tutorial Pharmacy 6th ed CBS publisher, Delhi.
2. C.V.S. Subramanayam, Pharmaceutial Unit Operation, Vallabh Prakashan
3. Prof. K. Samba Murthy, Pharmaceutical Engineering. New Age International Publishers Ltd.
4. Badjer & Banchero, Introduction to Chemical Engineering. Mc Graw-Hill.

REFERENCES

1. Perry's Handbook of Chemical Engineering. 8th Edition Mc Graw-Hill.
2. Unit Operations by Mc Cabe & Smith. 5th Edition Mc Graw-Hill.

3. Mc Cabe & Smith, Elements of Chemical Engineering. 4th Edition Prentice Hall International.
4. Lippincott Williams and Wilkins: Remington Pharmaceutical Sciences.
5. EA Rawlins, Bently's Text Book of Pharmaceutics, 8th edition, ELBS

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy II –I Semester **T P C**
4 0 4

(9R01302) PHARMACEUTICAL ORGANIC CHEMISTRY - II

Note: Definition, nomenclature, structure, aromaticity, reactivity, acidity-basicity and characteristic reactions of the following heterocyclic compounds.of Unit I and II
Few Examples of Drugs which contain the cited ring system.

UNIT – I
Five membered and six membered ring systems with one hetero atom: Furan, pyrrole, thiophene and pyridine.
Fused ring systems with one hetero atom: Indole, quinoline, iso-quinoline, and acridine.

UNIT – II
Five membered and six membered ring systems with two heteroatoms: Pyrazole, imidazole, oxazole, isoxazole, thiazole, pyrazine, pyrimidine and pyridazine.
Fused ring systems with two heteroatoms: Benzimidazole and phenothiazine, Cinnoline, Quinazoline and Quinoxaline.

UNIT - III
Stereochemistry of Carbon compounds: Optical rotation, plane polarized light, optical activity, chirality, notations (assignment of configuration), relative configuration (Fischer DL configuration), absolute configuration (R & S), sequence rules (with examples), enantiomers, meso compounds, racemic mixture, resolution.
Stereochemistry of alkenes*:* Concept of E & Z configurations.Elements of symmetry.

UNIT - IV
Carbohydrates: Definition, classification, nomenclature, relative configuration of some important monosaccharides, study of glucose

structure, mutarotation, ring structure, oxidation-reduction reactions, osazone formation, epimerization, Lobry De Bruyn – Van Ekenstein reaction, structure of the disaccharide sucrose, glycosidic linkage, non-reducing nature; structural components of starch and cellulose. A brief account on pharmaceutical importance of various carbohydrates.

UNIT - V

a) **Amino acids**: Definition, classification, configuration, three important methods of preparation of amino acids, physical properties, Zwitter ionic nature and isoelectric point. peptide synthesis and important reactions of amino acids.

b) **Polypeptides and proteins:** Definition, classification of proteins, denaturation, C-terminal and N-terminal concept,. Brief account of primary, secondary, tertiary and quartenary structure. A brief account of the pharmaceutical importance of amino acids, polypeptides and proteins.

UNIT – VI

a. **Glycosides**: Definition, classification, α, β – glycosidic linkages, enzymatic hydrolysis, physiological importance.
b. **Lipids (oils and fats):** Definition, fatty acids, characterization of lipids (Saponification value, acid value and Iodine value), hydrogenation and rancidity of oils and fats.

UNIT - VII

a) **Purine derivatives (xanthine bases**): Chemical structures of uric acid and methylated xanthines (caffeine, theophylline and theobromine) of physiological/ pharmaceutical significance.
b) Definitions of nucleic Acids, nucleotides, nucleosides, A brief account on structure of DNA & RNA.

UNIT – VIII

A study of the mechanism and application in synthesis of the following named reactions:

A. Beckmann rearrangement
B. Birch reduction
C. Mannich reaction
D. Michael addition reaction

E. Wittig reaction
F. Lossen rearrangement
G. Curtius rearrangement
H. Schmidt reaction

TEXT BOOKS

1. Arun Bahl & S.S Bahl, Advanced Organic Chemistry-S.Chand.
2. R Morrison and R. Boyd, organic chemistry, Pub by Printice Hall of India, New Delhi.
3. I L Finar, Organic Chemistry, Vol. I. & II, 6th Pearson education
4. O.P Agarwal, A Textbook of Organic Chemistry
5. Eliel, Stereochemistry of Organic compounds.
6. Oraganic reactions,Stereo chemistry&mechanizam by PS Kalsi

REFERENCES

1. Jerry March, Advanced Organic Chemistry 4th Edition Wiley Publication.
2 Cram & Hammond.Organic Chemistry Mc Graw-Hill.
3. A.I. Vogal's , A textbook of practical organic chemistry Mc Graw Hill. 6th Edition.
4. Solomons, Organic Chemistry 9th Edition Wiley Publication.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy II –I Semester	**T**	**P**	**C**
	4	**0**	**4**

(9R01304) PHYSICAL PHARMACY – I

UNIT I

Intermolecular forces and states 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.

UNIT II

Thermodynamics: The first law of thermodynamics. Thermochemistry. The second law of thermodynamics. The third law of thermodynamics, Free energy functions and applications.

UNIT III

Physical properties of Drug Molecules: Dielectric constant, induced polarization, dipole moment, refractive index and molar refraction and optical rotatory dispersion.

UNIT IV

Solutions of Non electrolytes: Concentration expressions, ideal and real solutions, colligative properties, molecular weight determinations.

UNIT V

Solutions of Electrolytes: Properties of solutions of electrolytes. The Arrhenius theory of electrolyte dissociation. The modern theory of strong electrolytes and other coefficients for expressing colligative properties.

UNIT VI

Ionic equilibria: Activity co-efficient and ionic strength, modern theories of acids, bases and salts, Sorensen's pH scale, concentration as a function of pH, calculation of pH and acidity constants.

UNIT VII

Buffers and buffered isotonic systems: The buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions, methods of adjusting tonicity and pH (relevant numerical problems).

UNIT VIII

Electromotive force and oxidation-Reduction systems: Electrochemical cells. Electrometric determination of pH and redox.

TEXT BOOKS

1. Patrick J. Sinko, Martin's Physical Pharmacy and Pharmaceutical Sciences Fifth Edition. Lippin Cott Williams and Wilkins.
2. Essentials of physical chemistry & pharmacy by Arnikas, S.S.Kadam Orient longmans
3. B.S Bahl, Arun Bahl and G.D Tuli, Essentials of Physical Chemistry S.Chand
4. C.V.S.Subramanyam, Essentials of Physical Pharmacy, Vallabh Prakashan.
5. Derle D.V., Essentials of Physical Pharmacy Pharma Med Press

REFERENCES

1. Pharmacopoeia, (I.P., B.P., U.S.P. and European.)
2. Martindale, The Extra Pharmacopoeia; latest edition, the Royal Pharmaceutical Society.
3. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences.
4. Robin. J. Haiwan, Hand Book of Pharmacy & Health Care ED, The Pharma Press UK.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy II –I Semester	**T**	**P**	**C**
	4	**0**	**4**

(9R01305) ANATOMY, PHYSIOLOGY AND PATHOPHYSIOLOGY

UNIT-I

Central Nervous System: Functions of different parts of brain and spinal cord. Structure of blood brain barrier and its importance. Neurochemical transmission in the central nervous system, reflex action, electroencephalogram, Specialized functions of the brain, cranial nerves and their functions. Epilepsy, psychosis, depression, mania.

Autonomic Nervous System: Physiology and functions of autonomic nervous system. Mechanism of neurohumoral transmission in the A.N.S.

UNIT-II

Urinary System: Various parts, structures and functions of the kidney and urinary tract. Physiology of urine formation and acid base balance. Urinary tract infections, acute and chronic renal failure.

UNIT-III

Reproductive Systems: Male and Female reproductive systems and their hormones, physiology of menstruation, coitus and fertilization. Sex differentiation, spermatogenesis & ogeneisis. Pregnancy its maintenance and parturition.

UNIT-IV

Study of sense organs: **Structure eye, ear, nose, skin and tongue along with their detailed functioning**

UNIT - V

Endocrine System: Basic anatomy and physiology of pituitary, thyroid, parathyroid, adrenals, pancreas, testes and ovary, their hormones and functions.

UNIT-VI

Basic Principles of Cell Injury, Adaptation & process of inflammation: Causes of cellular injury, pathogenesis, and morphology of cell injury. Cellular adaptations, atrophy, hypertrophy. acute and chronic inflammation, mediators of inflammation, brief outline of the process of repair.

UNIT-VII

Cancer: Classification of tumors, difference between benign and malignant tumors, disturbances of growth of cells, etiology and pathogenesis of cancer, invasions, metastasis and patterns of spread of cancer and histological diagnosis of malignancy

UNIT-VIII

Pathophysiology of common disease like rheumatoid arthritis, gout, epilepsy, psychosis, hypertension, angina, congestive cardiac failure, atheroselerosis, myocardial infarction, diabetes, peptic ulcer, asthma, hepatic disorders, T.B, UTI and STD.

TEXT BOOKS

1. Human Anatomy & physiology and Health education, Dr.Jayaveera.K.N,Vrushabendra Swamy.BM, S.Chand 2009
2. Robbins, SL & Kumar, Basic Pathology. 8th Edition Elsewies.
3. Sherword- Principles of Human Physiology. Cenage learning.
4. Ross & Willson, Principles of anatomy and physiology, John wiley & Sons
5. C.C.Chatterjee, Human Physiology, Pub by Medical allied agency, Delhi, India
6. Mary V. Buras, Pathophysiology: A self Instructional programme. Prentice Hall.
7. Mary Lou Mulvihill, Human Diseases: A Systemic approach. Prentice Hall 6th Edition.

REFERENCE BOOKS

1. A.C Guyton, Textbook of medicinal physiology by by W.B.Prism books Pvt. Ltd., Delhi.
2. Joseph Dipiro, Patho Physiology and applied therapeutics.
3. M.P. Rang, M.N.Dale, J.M Riter Anotamy & Physiology

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy II –I Semester	**T**	**P**	**C**
	0	**3**	**2**

(9RBS302) STATISTICAL METHODS AND COMPUTER APPLICATIONS LAB

1. **Solving biostatistics problems** related to inference, sampling, graphical representation of data etc., with the help of calculators & software programs like Graph-pad. Concentruction of bar diagram and Pie diagram
   a. Computation of Mean, S.D. and Co-eficient of variation
   b. Computation of Karlpearson Co-efficient of skewness
   c. Fitting of binomial distribution (Direct method)
   d. Fitting of poisson distribution (direct method)
   e. Fitting of normal distribution (ordinary method)
   Fitting of Straight line
   a. Computation of correlation co-efficient by forming two regression lines(ungrouped and grouped data)
   b. Test for means (single mean and two mean)
   c. Test for correlation co-efficient (Parametric tests)
   d. Chi-^{2} test for goodness of fit (binomial, poisson)
   e. t-test for means
   f. f- test for variance
   g. analysis of variance – one way classification
   h. Analysis of variance – two way classification
   i. Construction of X, chart
   j. Construction of R chart.
2. **Sample programs in C**: Program to calculate simple and complex arithmetic expressions, program using structures, program using loops and nested loops, program using functions and simple programs using arrays.
3. **Operating systems** like WINDOWS, UNIX, etc.
4. **Software packages** like MS-WORD, EXCEL, ACCESS, and POWER POINT.
5. Plotting of standard graph and calculating slope and regresscion etc
6. Determination of $t_{1/2}$,AUC,t_∞ using standard graph

References:

1. Experimental Statistics by Dr.K.Balaji-S.Chand

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy II –I Semester	**T**	**P**	**C**
	0	**3**	**2**

(9R01306)) PHARMACEUTICAL ORGANIC CHEMISTRY-II LAB

I. Quantitative determination of organic compounds via functional groups

a. Phenolic groups by bromination method
b. Alcoholic group by acetylation method.
c. Carbonyl group by hydroxylamine hydrochloride-pyridine method.
d. Aldehyde group by sodium sulphite-sulphuric acid procedure.
e. Carboxyl group by acid-base method.
f. Determination of acetone by sodium hypoiodide method
g. Amino group by bromination method.
h. Amino acid formal titration method.

II. Synthesis/preparation involving more than one step (Any five).

a. P-bromoaniline from acetanilide
b. P-nitroaniline from acetanilide
c. P-nitrophenyhydrazine from p-nitroaniline
d. 3-methyl -1-phenyl-5-pyrazone from ethylacetoacetate.
e. Benzilic acid from benzene.
f. Benzyl benzoate from benzaldehyde (Cannizzaro's reactions)
g. Preparation of 2-phenylindole from Phenylhydrazine by Fischer's method.

III. Systematic analysis of organic binary mixtures

IV Analysis of oils & fats

a. Determination of Acid value of fixed oils.
b. Determination of Saponification value of a fixed oil.
c. Determination of Iodine value of a fixed oil.
d. Determination of Acetyl value of a fixed oil.

REFERENCES

1 . Indian Pharmacopoeia. – 1996.
2. A.I. Vogel's – Practical Organic Chemistry – Prentice Hall.

LIST OFMINIMUM EQUIPMENT REQUIRED

1. Triple beam balances
2. Physical balances and analytical balances
3. Melting point apparatus
4. Suction pumps
5. Oven
6. Hot plates
7. Water baths
8. Distillation unit
9. Refrigerator
10. Mechanical stirrer
11. Reflex flask with condenser
12. Magnetic stirrer with thermostat
13. Adequate glassware's

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy II –I Semester	**T**	**P**	**C**
	0	**3**	**2**

(9R01307) PHYSICAL PHARMACY – I LAB

1. Percent composition – Capillary Flow method
2. Percent composition – polarimeter & refractometer
3. Molecular weight – Landsberger method.
4. Molecular weight – Rast camphor method.
5. Calibration of pH Meter using standard buffers
6. pH Estimation – pH meter
7. pKa Estimation by Half Neturalization Method
8. Refractive index of liquids.
9. Phenol water system – CST
10. Lower consolute temperature – Tea and Water
11. Heat of neutralization
12. Phase diagram -Phenol – Water, Effect of Impurities.
13. Ternary phase diagram.
14. Preparation of Buffers and Buffer Capacity Determination.
    a) Phosphate buffer
    b) Citrate buffer
    c) Borate buffer

LIST OF MINIMUM EQUIPMENT REQUIRED

1. Ostwald's viscometer
2. Stalgnometer
3. Polarimenter
4. Abbey's refractomenter
5. CST apparatus
6. pH meter
7. Colorimeter
8. Digital balances

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy II –I Semester	**T**	**P**	**C**
	0	**3**	**2**

(9R01308) ANATOMY, PHYSIOLOGY AND PATHOPHYSIOLOGY – LAB

(14 Experiments)

1. Study of reproductive system with the help of charts and models – 2 Experiments.
2. Microscopic studies of abnormal tissue sections – 4 Experiments.
3. Simple experiments involved in the analysis of normal and abnormal urine; collection of specimen, appearance, determination of pH, sugars, proteins, urea and creatinine – 4 Experiments.
4. Physiological experiments on nerve-muscle preparations (Only theory 4-Experiments)
    a. To study simple muscle curve
    b. To study the effect of temperature on muscle contraction
    c. To study the effect of load and after load on muscle contraction
    d. To study the fatigue curve

REFERENCES

1. Plummer, Practical Biochemistry 3rd Edition. Tata-Mc Graw-Hall 2006.
2. Chatterjee, Human Physiology 13th Edition, Rosen Educational Publishing.

LIST OF MINIMUM EQUIPMENT REQUIRED

1. Sherington's drum
2. Student kymograph
3. Muscle electrodes
4. Lucos moist chamber
5. Myographic lever
6. Stimulator
7. Microscopes
8. pH meter
9. Glass slides for abnormal tissues
10. Adequate glasswares
11. Thermometers

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy II –II Semester **T P C**
4 0 4

(9RBS405) ENVIRONMENTAL STUDIES

UNIT-I:
The Multidisciplinary nature of environmental studies:
Definition, scope and importance.

UNIT-II:
Natural Resources:

a. ***Forest resources****:* Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
b. ***Water resources****:* Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
c. ***Mineral resources***: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
d. ***Food resources****:* World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies
e. ***Energy resources****:* Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources, case studies.
f. ***Land resources***: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

UNIT-III:
Conservation of natural resources: Role of an individual in conservation of natural resources.Equitable use of resources for sustainable lifestyles.

UNIT-IV:
Ecosystems: Concept of an ecosystem.Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids.

Introduction, types, characteristic features, structure and function of the following ecosystem:

a) Forest ecosystem b) Grassland ecosystem, c) Desert ecosystem, d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT-V:

Biodiversity and its conservation: Introduction, definition: genetic species and ecosystem diversity.

Biogeographically, classification of India. Value of biodiversity: consumptive use, productive use, and social, ethical, aesthetic and option values, biodiversity at global, national and local levels. India as a mega-diversity nation. Hot spots of biodiversity. **Threats to biodiversity:** Habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India.

Conservation of biodiversity: In-situ conservation of biodiversity

UNIT-VI :

Environmental Pollution: *Definition, causes, effects and control measures of:*

a) Air pollution, b) Water pollution, c) Soil pollution, d) Marine pollution, e) Noise pollution, f) Thermal pollution and g) Nuclear hazards.

Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies.

Disaster management: Floods, earthquake, cyclone and landslides.

UNIT-VII:

Social Issues and the Environment**: From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management Resettlement and rehabilitation of people; its problems and concerns.**

*Case studies***.** Environmental ethics**: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear Accidents and holocaust.**

Case studies*:* **Wasteland reclamation**. Consumerism and waste products.

UNIT VIII:

Environment protection Act. The air (prevention and control of pollution) act 1981. The Water (prevention and control of pollution) act 1974.The wildlife protection Act 1972. The Forest conservation Act 1980. Issues involved in enforcement of environmental legislation. Public awareness.

Human population and the Environment

Population growth, variation among nations. Population explosion – Family welfare programme. Environment and human health, human rights. Value education. HIV / AIDS, women and child welfare, role of information technology in environment and human health. Case studies.

TEXT BOOKS

1. Environmental studies by K.Mukkanti,S.chand
2. Environmental studies ,Dr.R.J.Ranjit Daniel, Dr.Jagadhish Krishnaswamy Wiley India Pvt. Ltd, 2009.
3. M. Anji Reddy, Text Book of Environmental Sciences & Technology, BS Publications
4. Connar, Basic Concepts of Environmental Chemistry, LewisPublications.
5. D.K Asthana and Meera, Text book of Environmental studies. S.Chand 2009.
6. Y. Anjaneyulu, Introduction to Environmental Science, B.S. Publication, Hyderabad
7. C. Manohar Chary, P Jayram Reddy, Principles of Environmental Studies, Pharma book syndicate.

REFERENCES

1. William P. Cunningham & Mary Ann Cunningham, Principles of Environmental Science - Inquiry & Applications. Mc Graw – Hill.
2. W. P. Cooper& et al, Environmental Encyclopedia, Jaico Publishing House, Mumbai.
3. K. C. Agarwal, Environmental Biology, Nidi Publishers Ltd, Bikaner.
4. Environmental Protection and laws, Himalaya Publ House, New Delhi.
5. R.Rajagopalan, Environmental Studies, Oxford University Press.

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B. Pharmacy II –II Semester	**T**	**P**	**C**
	4	**0**	**4**

(9R01401) PHARMACEUTICAL ENGINEERING – II

UNIT-I

Heat Transfer: Source of heat, heat transfer, steam and electricity as heating media, brief knowledge of heat exchangers. Determination of requirement of amount of steam/electrical energy, steam pressure, boiler capacity, mathematical problems on heat transfer.

UNIT-II

Evaporation: Basic concept of phase equlibria**.** Definition and theory of evaporation, factors affecting evaporation, evaporators-film evaporators and single effect evaporators.

UNIT-III

Distillation: Raoult's law, phase diagrams, volatility, simple steam and flash distillations, principles of rectification, Azeotropic and extractive distillation.

UNIT-IV

Drying: Moisture content and theory of drying, rate of drying and time of drying calculations, drying curves. Classification and types of dryers, dryers used in pharmaceutical industries- tray dryer, Fluid bed dryer, spray dryer and freeze-dryer.

UNIT-V

Size Reduction: Definition, theory and objectives of size reduction, factors affecting size reduction, laws governing energy and power requirements of a mill. A brief study of ball mill, hammer mill and fluid energy mill .

UNIT-VI

Size Separation: Official standards for powders, sieves, modes of motion in size separation. Sieve Analysis – Testing of powders. Equipments for size separation-vibrating screens, cyclone separators, air and hydraulic separat.

UNIT-VII

Mixing: Theory of mixing, solid-solid, solid-liquid and liquid-liquid mixing equipment-double cone, twin-shell, silverson mixer, colloid mill, sigma blade mixer, planatery mixer, propeller mixer and turbine mixer.

UNIT-VIII

Automated process control systems: Elements of automatic process control and introduction to automatic process control systems. Elements of computer aided manufacturing (CAM). Reactors and fundamentals of reactors design for chemical reactions.

TEXT BOOKS

1. S.J. Carter, Cooper and Gunn's Tutorial Pharmacy, 6th ed., CBS publisher, Delhi.
2. CVS Subhramanyam, Pharmaceutical Engineering. Vallabh Prakasham New Delhi.
3. K. Samba Murthy, Pharmaceutical Engineering new Age International Publishers Ltd. 1998.
4. Mc Cabe & Smith.Unit Operations. Mc Graw-Hill.

REFERENCE BOOKS

1. W.I. Macebe and J. C. Smith Macro, Unit Operations To Chemical Engineering, Hill Int. Book Co., London. Mc Graw-Hill.
2. L. Lachman, H. Lieberman & J**.** L Kaniz, The Theory And Practice Of Industrial Pharmacy, Lee & Febiger Philadelphia, USA
3. Badzer & Banchoro, Introduction to Chemical Engineering. Tata – Mc Graw Hill.
4. Perry's Handbook of Chemical Engineering Mc Graw – Hill.
5. M.E.Aulton, Pharmaceutics- The science of dosage form design, 2nd edition Churchill Livingstone.
6. E.A. Rawlin's, Bentley's Text Book of Pharmaceutics, 8th ed ELBS

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy II –II Semester

T	P	C
4	0	4

(9R01402) PHARMACEUTICAL ANALYSIS – I

UNIT –I

Computation of analytical results, significant figures, concept of error, precision, accuracy, standard deviation, rejection of doubtful values with special reference to volumetric analysis.

Calibration of analytical equipment used in volumetric analysis.

UNIT-II

(a) **Theory of Neutralization Titrations**: Acid-base concept, Acidimetry, Alkalimetry, Common ion effect and solubility product, pH, buffers and indicators.

(b) General principles and theory of oxidation-reduction methods and precipitation methods. An account of the indicators used in these titrations.

Application of the above methods in the analysis of drugs, as under IP 2006-2007

UNIT -III

a) **Complexometric titration:** Theory, types and application in pharmaceutical analysis. Masking and demasking and their applications.

b) **Non-aqueous titration:** Theory, types, solvents used and application in pharmaceutical analysis.

UNIT - IV

a). Potentiometry: Introduction, electrochemical cells and half cells. Electrode, measurement of potential, applications in pharmaceutical analysis.

b). Conductrometric titrations: Basic concepts, different types of conductrometric titrations, apparatus used, applications in pharmaceutical analysis.

UNIT - V

a). Polarography: Basic concepts, apparatus and principles, general polarographic analysis, applications in pharmaceutical Analysis.

b). Amperometric titrations with one polarized electrode, general procedure, titration curves, applications in pharmaceutical analysis.

UNIT-VI

Flamephotometry: Introduction, study and working principles of instrumentations used for analysis, applications in pharmaceutical analysis.

UNIT – VII

Study of separations and determinations involving the following techniques and their applications in pharmacy

a). Column chromatography ; Adsorption and partition theory, adsorbents used, preparation, procedure and methods of detection.

b). Thin layer chromatography: theoretical consideration, preparation, procedure and detection of compounds.

c). Paper Chromatography: theory, different techniques employed, filter papers used, qualitative and quantitative detection.

UNIT-VIII

a. Principle, instrumentation and applications involved in the follwing

i. Refractometry
ii. Polarimetry
iii. Nephelometry and turbidimetry

b). Physical and chemical methods of determination of moisture content (including Karl-Fisher method).

TEXT BOOKS

1. Kasture & Wadodkar, Text Book of Pharmaceutical analysis Vol.I & II. Nirali Prakasham New Delhi.
2. Instrumental approach to chemical analysis by A.K.Srivastav, PC Jain,S.chand
3. A. Day Under Wood, Text Book of Quantative Analysis 6th Edition, Interscience Publishers. NY.
4. Connors, A Textbook of Pharmaceutical Analysis. Wiley India Pvt. Ltd.
5. B.K. Sharma, Instrumental Chemical Analysis, Goel Publishers.

6. Chatwal & Anand, Instrumental Methods of Analysis. Himalaya Publishing Home, 2009.

REFERENCE

1. A.H. Beckett & J.B Stanlake Vol.I&II., Practical Pharmaceutical Chemistry, Athlone Press of the Univ of London
2. A.I Vogel, Quantitative Chemical Analysis, ELBS ed.
3. L M. Atherden, Bentley and Driver's Textbook of Pharmaceutical Chemistry., Oxford University Press, Delhi.
4. Pharmacopoeia (IP, BP, USP).
5. Y.Anjaneyulu, K.Chandrasekhar, Valli Manickam, A Textbook of Analytical Chemistry Pharma Med Press2006.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy II –II Semester	**T**	**P**	**C**
	4	**0**	**4**

(9R01403) PHARMACOGNOSY – I

UNIT-I

Definition, history, scope and development of Pharmacognosy.

UNIT-II

Brief introduction to natural sources of drugs with examples: Plant, Animal, Mineral, Marine and microorganisms.

UNIT-III

Classificaion of crude drugs: Alphabetical, morpholoigcal, taxonomical, pharmacological, sero taxonomical, chemotaxonomical and chemical classification with suitable examples.

UNIT-IV

Cultivation, collection, processing, drying and storage of medicinal plants.

- Factors influencing cultivation of medicinal plants.
- Plant hormones and their applications.
- Improved methods of cultivation techniques: polyploidy, mutation and hybridization with reference to medicinal plants.

Adulteration: Definition, modes of alduteration and methods of detection of adulterants

UNIT-V

Good Agriculture Practices: Strategies of obtaining improved cultivations of medicinal plants

UNIT-VI

Systematic pharmacognostic study of the following carbohydrates and derived products: Acacia, tragacanth, agar, starch, guar gum, pectin, isabgol and honey.

UNIT-VII

Systematic pharmacognostic study of the following Lipids: Castor oil, cod liver oil, shark liver oil, linseed oil, coca butter, kokum butter, bees wax, wool fat, hyndocarpus oil, spermaceti and olive oil.

UNIT-VIII

Systematic pharmacognostic study of the following volatile oils: Mentha, coriander, cinnamon, lemon oil, nutumug, eucalyptus, ginger, cardmom, tulsi, lemon grass, caraway, cumin, dill, clove, fennel and black pepper

TEXT BOOKS

1 Text Book of PHARMACOGNOSY and PHYTOCHEMISTRY by Prof. B. Duraiswamy Dr. G.S.Kumar, and Prof. K.N.Jayaveer, S.Chand & Co. 2010.
2. Kokate C.K, Purohit AP & Gokhale Pharmacognosy S.B (Nirali) Prakasham New Delhi.
3. Trease and Evans Pharmacognosy, Latest Edition. Elsewier Publication.
4. Tyler, Brady & Robert, Pharmacognosy. Lea and Fesiger, Philadelphia
5. T.E.Wallis, Textbook of Pharmacognosy, Pub by CBS Publishers and distributors, New Delhi.

REFERENCES

1. Atal C.R & Kapur B.M, Cultivation & Utilization of Medicinal Plants.
2. Ayurvedic Pharmacopoeia of India, Pub by Govt. of India.
3. A.A. Farooqi & B.S. Sree Ramu, Cultivation of Medicinal and Aromatic Crops, University Press, Hyderabad.
4. CSIR Publications, Wealth of India.
5. Handa and Kapoor, Text Book of Pharmacognosy. Vallabh, 2008.
6. Gokhale, Pharmacognosy. Nirali Prakasham, Pune.
7. Ali, Pharmacognosy. CBB Publishers
8. Heinrich, Fundamentals of Pharmacognosy and Phytotherapy. Churchill Livingstone.
9. B.P. Pandey, Economic Botany. S.Chand Publishers 2009.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy II –II Semester

T	P	C
4	0	4

(9R01404) PHYSICAL PHARMACY - II

UNIT-I

Solubility and distribution phenomena: Solvent-solute interaction, solubility of gases in liquids, solubility of liquids in liquids, solubility of solids in liquids, distribution of solutes in immiscible solvents.

Introduction to phenomena of diffusion: Fick's first law and second law.

UNIT-II

Complexation: Types, classification, mechanism of complex formation, advantages of complexations. Metal complexes, organic molecular complexes, inclusion complexes, methods of analysis and drug action.

UNIT-III

Kinetics: Introduction to the concept of kinetics and their application in pharmacy. Concept of zero order, first order, and pseudo order reactions. Determination of reaction order. Half life period ($t_{1/2}$), period 90 (t_{90}) and their usefulness. Influence of temperature and Arrhenious theory. Decomposition and stabilization of medicinal agents, accelerated stability testing of drugs and determination of shelf life period.

UNIT-IV

Interfacial Phenomena: Liquid interfaces, measurement of surface and interfacial tensions, adsorption at liquid interfaces. Adsorption isotherms. Surface-active agents and HLB scale. Adsorption at solid interfaces. Electrical properties of interfaces.

UNIT-V

Micromeritics: Particle size and size distribution, methods for determining surface area, methods for determining practicle size, pore size, particle shape and surface area, derived properties of powders.

UNIT-VI

Rheology: Newtons law of flow, Newtonian systems, non-Newtonian systems, thixotropy, measurement and applications in formulations. Determination of viscosity and its applications.

UNIT - VII

Colloids: Introduction, types of colloidal systems, solubilization, Stability of colloids, optical properties, kinetic properties, electrical properties and Donnan Membrane equilibraium.

UNIT-VIII

Coarse Dispersions: *Suspensions*: Types and theories of suspensions, interfacial properties of suspended particles, stability evaluation, settling in suspensions, formulation of suspensions.

Emulsions: Theories of emulsification, physical stability of emulsions, preservation of emulsions, Rheological properties of emulsions and suspensions.

TEXT BOOKS

1. Patrick J. Sinko, Martin's Physical Pharmacy and Pharmaceutical Sciences 5th Edition. Lippincolt Williams.
2. Essentials of physical chemistry & Pharmacy by H.J.Arnikar,S.S.Kadam Orient Longman.
3. CVS Subhramanyam, Physical Pharmacy, Vallabh prakashan.
4. L. Lachman, H. Lieberman The Theory And Practice Of Industrial Pharmacy J. L Kaniz Lee & Febiger Philadelphia, USA

REFERENCE

1. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences
2. M.E. Aulton, Pharmaceutics – The science of dosage form design, 2nd edition Churchill Livingstone.
3. Derle D.V., Essentials of Physical Pharmacy. Pharma Med Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy II –II Semester	**T**	**P**	**C**
	0	**3**	**2**

(9R01405) PHARMACEUTICAL ENGINEERING- II LAB

1. Measurement of flow of fluids and their pressure, determination of Reynold's number and calculation of frictional losses.
2. Evaluation of filter media, determination of rate of filtration and study of factors affecting filtration including filter aids.
3. Particle size measument by Stoke's law and sieve shaker.
4. Determination of Humidity-using Dry Bulb and Wet Bulb thermometers and Psychometric charts.
5 Determination of overall Heat Transfer Coefficient.
6. Determination of rate of evaporation.
7. Extracton of volatile oil by steam distillation.
8. Determination of rate of drying, free moisture content and bound moisture content.
9. Experiments to illustrate the influence of various parameters on construction of drying curves.
10. Experiments to illustrate principles of size reduction, Laws governing energy and power requirements of a size reduction (Ball mill).
11. Experiments to illustrate solid-solid mixing, determination of mixing efficiency using different types of mixers.
12. Analysis of pharmaceutical packaging materials:
    a. Determination of water vapour permeability across the packaging material
    b. Experiment to determine leaching of contents from packaging materials- ampoules and vials.

LIST OF MINIMUM EQUIPMENT REQUIRED

1. Tray dryer
2. Ball mill
3. Seive shaker with set of sieves as per IP
4. Doouble cone blender
5. Propeller type mechanical agitator
6. Homoginiser
7. Buchnar filtration apparatus
8. Vaccum pump
9. Dessicators
10. Energy meter
11. Pemeability cups
12. Andreson's pipette
13. Autoclave
14. Steam distillation still

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy II –II Semester	**T**	**P**	**C**
	0	**3**	**2**

(9R01406) PHARMACEUTICAL ANALYSIS – I LAB

1. Assay of Pharmaceutical compounds
   a. Ammonium chloride by acid-base titration
   b. Copper sulfate by (redox) iodometry
   c. Calcium gluconate by complexometry
   d. Ferrous sulfate (redox) cerric ammonium sulfate titration
   e. Hydrogen peroxide-(redox permanganometry)
   f. Sodium benzoate by non-aqueous titration
   g. Sodium chloride by modified Volhard's method.
   h. Assay of KI- KIO_3 titration
   i. Assay of zinc oxide by acid-base back titration
2. Conductometric titration – Determination of equivalent points HCI Vs NaOH.
3. Potentiometric titration. (Acid vs Base)
4. Potentiometric titration :Determination of strength of unknown solution (HCl VsNaOH)
5. Nephelometric determination of sulfate.
6. Fluorimetric estimation of quinine.
7. Effect of quenching of fluorescence of quinine sulfate by iodide ions
8. Flame photometric determination of Sodium, potassium, calcium and Barium
9. Separation of aminoacid by paper chromatography
10. Separation of constituents by using TLC

LIST OF MINIMUM EQUIPMENT REQUIRED

1. Fluorimeter
2. Flame photometer
3. Abbey's refractometer
4. Nephelometer and turbidometer
5. Conductivity meter
6. Potentiometer
7. Digital electronic balance
8. Adequate glasswares including iodine flasks.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy II –II Semester	**T**	**P**	**C**
	0	**3**	**2**

(9R01407) PHARMACOGNOSY – I LAB

1. Collection of natural herbs and preparation of herbarium/laminated photos for five drugs.
2. Chemical tests for Acacia, tragacanth, agar, starch, guar gum, pectin, honey, castor oil, cod liver oil, shark liver oil, linseed oil, coca butter, bees wax, wool fat, lemon oil and eucalyptus oil
3. Macrosopy and microscopy examination of coriander, cinnamon, nutmeg, ginger, cardamom, tulsi, lemon grass, caraway, cumin, dill, clove, fennel and black pepper
4. Transverse section of coriander, clove, ginger, cardamom, cinnamon, fennel and caraway
5. Cultivation of medicinal plants: Maintainence of one plant in Medicinal garden.

REFERENCES

1. Practical Pharmocognosy (A lab manual) Ist edition 2010 by Dr.B.Duraiswamy, Dr.K.N.Jayaveera-S.Chand
2 Kandhelwal, Practical Pharmocognosy. Nirali Prakasham
3 C.K. Kokate et.al, Practical Pharmocognosy. Nirali Prakasham
4 Iyengar, Practial Pharmocognosy Manipal Press Ltd.

LIST OF MINIMUM EQUIPMENT REQUIRED

1. Microscopes with stage
2. Heating mantle
3. Water baths
4. Adequate glass wares

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy II –II Semester	**T**	**P**	**C**
	0	**3**	**2**

(9R01408*)* PHYSICAL PHARMACY-II LAB

1. Determination of bulk density, true density and percentage porosity.
2. Effect of particle size and effect of glidant on angle of repose.
3. Study of particle size distribution by optical microscopy
4. Determination of particle size by Andreason Pippette.
5. Determination of CMC of a surfactant.
6. Plotting of an adsorption isotherm
7. Determination of partition coefficient

a. Iodine between water and carbon tetrachloride

b. Benzoic acid between benzene and water.

8. Determination of sedimentation volume and degree of flocculation.
9. Determination of Order of reaction – First order.
10. Determination of Second order reaction rate constant.
11. Effect of temperature on solubility of solid in liquid.
12. Effect of addition of Salt/pH/cosolvent on the solubility
13. Surface tension using Stalagmometer.
14. HLB value estimation of surfactants.
15. Viscosity – by Ostwald Viscometer.
16. Determination of globule size.

REFERENCES

1.Physical Pharmaceutics, By Mohanta, and Guru Prasad B.S. Publications

LIST OF MINIMUM EQUIPMENT REQUIRED

1. Ostwald's viscometer
2. Stalgnometer
3. Digital pH meter
4. Microscopes
5. Stage and eyepiece micrometer
6. Digital electronic balance
7. Thermometer
8. Andreason pipetter
9. Adequate glasswares

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy III –I Semester	**T**	**P**	**C**
	4	**0**	**4**

(9R01501) PHARMACEUTICAL BIOCHEMISTRY

UNIT - I

Bio chemical organization of the cell, molecular constitutents of membrane, active & passive transport process, sodium and potassium pumps, osmoregulation and heamostatis.

UNIT – II

Bio-energetics & Redox Reactions: The concept of free energy, laws of thermodynamics.Determination of change in free energy from equilibrium constant & reduction potential. Production of ATP and its biological significance.

Redox reactions, redox potential, the respiratory chain & its role in energy capture & its control. Oxidative phosphorylation & its energetics & E.T.S mechanism of actions.

UNIT – III

Enzymes & Co-Enzymes: Classification, Structure, mechanism of action, properties, factors affecting enzymes action. Activators & de activators of enzymes, enzyme kinetics & enzyme inhibitions, repressions with reference to drug action.

UNIT - IV

Introduction to Bio-Molecules: Structure, classification, cell and biological functions of carbohydrates, proteins, lipids, nucleic acids (DNA & RNA) vitamins & minerals.

UNIT - V

Metabolism of Carbohydrates: Glycolysis, glycogenolysis, gluconeogenesis, Kreb's cycle, HMP & uronic acid pathways, anaerobic respiration in muscle.

UNIT – VI

Metabolism of Proteins: Amino acid structure & classifications, de amination, Trans-amination, de-carboxylation, Urea cycle, Metabolism & examples: Valine, cystine, cystein, tryptophan, tyrocine, methionine.

UNIT – VII

Metabolism of Lipids:

Oxidations : Alpha, Beta, Gama & Omega oxidations of fatty acids, bio-synthesis of fatty acids, cholesterol, ketogenesis.

UNIT – VIII

Introduction to xenobiotic metabolism, detoxification, conjugation, prostaglandins & related products (Ecosanoids).

TEXT BOOKS

1. Pharmaceutical Biochemistry by Dr.K.Tarakaram and Prof.K.N.Jayaveera, S.Chand & Co.,
2. A.L.Lehninger, Principles of Biochemistry; CBS Publishers and distributors.
3. Harper, Biochemistry Mc Graw Hill Medical, 28th Edition.
4. Text Book of Biochemistry by Satyanarayana Oxford University Press.

REFERENCES

1. J.L.Jain, Fundamentals of Biochemistry S.Chand
2. Biochemistry, C.B.Powar & G.R.Chatwa**l;** Himalaya publishing house
3. L.Stryer, Text Book of Bio Chemistry. W.H.Freemann & Co. Ltd. 6th Edition.
4. West, Edward Text Book of Biochemistry; Freeman and company, Sanfransisco.
5. E.E.Conn and PK Stumpf, Outlines of Biochemistry; John Wiley and sons, New york.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy III –I Semester	**T**	**P**	**C**
	4	**0**	**4**

(9R01502) PHARMACEUTICAL MICROBIOLOGY

UNIT - I

Introduction to Microbiology: Origin, scope and discovery of spontanesous generations theory, contributions of Antony Von Lewvonhock, Pasteur, Koch and Lister.

UNIT – II

Diversity of Microorganisms: Prokaryotes versus eukaryotes – eukaryotic and prokaryotic cell structure, three domains of life (bacteria, archea and eurkaryotics). Pharmaceutical significance of protozoa, algae, fungi, bacteria and viruses. Characterisation and identification of microorganisms.

UNIT – III

Nutrition and Growth of Microbes: Nutritional requirements, Types of Nutrient media and growth conditions and Nutritional types based on energy source.

Isolation, cultivation (aerobic & anaerobic) and preservation of microorganisms, physiology of growth, bacterial growth curve, methods for determining bacterial numbers, mass and cell constitutents. Exponential growth and generation time. Bacterial growth in batch and continous culture (chemostat and turbidostat) synchronous growth.

UNIT – IV

Introduction to Microbiology of water, air and Milk. Methods of Quantitative evaluation of microbial contamination. Microbial limit test official in IP.

UNIT – V

Control of Microorganisms: General Concepts, Inhibition of growth and killing, sterilization and disinfection, antisepis and sanitation, mode of action application & limitation of physical agents (moist and dry heat,

radiation and filtration), chemical agents. Various types of disinfectants, factors affecting sterilization and disinfection, evaluation of antimicrobial activity.
Chemotherapantic agents, mode of action and applications, drug resistance. Official methods of sterility testing of pharmaceuticals and biosafety measures.

UNIT – VI

Bacterial Genetics: Genetic recombination in bacteria, DNA replication, transcription and translation. Gene regulation (lac operon and tryptophan operon).Mutations, Mutagenesis, chemical and physical mutagens, isolation and antibiotic resistant mutants.

UNIT – VII

Epidimeology of Diseases: Study of etiology, diagnois, source of infection, mode of transmission, immunization methods, prevention and control of the following diseases. Bacillary dysentery, diphtheria, tuberculosis, leprosy, cholera, typhoid, syphilis, gonerrhoea, tetanus, food poisioning and infective hepatitis.

UNIT – VIII

Application of Microbes in Pharmaceutical Industry

a. ***Microbiological Assays:*** Principles and Methods involved in Assay of Antibiotics, Vitamins, Amino acids & Bio-Sensors in Analysis.

b. ***Microbial Source & applications of various pharmaproducts*** like Antibiotics,vitamins. amino acids, solvents, enzymes & genetic engineered products etc.

TEXT BOOKS

1. Pharmaceutical Microbiology by Dr.K.Tarakaram and Prof.K.N.Jayaveera, S.Chand & Co.,
2. Pelczar and Reid, Text Book of Microbiology Lippineolt Williams & wilkins, 2nd Edition.
3. Anantha Narayan and Jayram Panikar, Text Book of Microbiology, Orient Longman, Delhi, Hyderabad.
4. R.C. Dubey, A textbook of Microbiology S.Chand.

REFERENCES

1 Pharmaceutical microbiology by Kishore Gujar, Himalaya publishing house.
2 Nester, Anderson, Roberts, Pearsall, Microbiology, McGraw-Hill.
3 Hugo.W B, Pharmaceutical Microbiology. PA Publishing Pvt. Ltd.
4 Tortora, Gerard, Text Book of Microbiology. Benjamin Cummings.
5 Prescott and Dunn, " IndustrialMicrobiology" 2nd Ed, Mc Graw hill Book Company Inc.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy III –I Semester	**T**	**P**	**C**
	4	**0**	**4**

(9R01503) PHARMACOGNOSY – II

UNIT I

Definition, general test and detailed pharmacognostic study of the following glycoside containing drugs.

a. **Saponin Glycosides** **:**Glycyrrhiza, Ginseng, Discorea,Sarasaparilla & Senega.
b. **Cardioactive Glycosides** **:**Digitalis, Squill, Strophanthus, Thevetia.
c. **Anthraquinone Glycosides** **:**Aloe, Senna, Rhubarb & Cascara.
d. **Bitter Glycosides** **:**Psoralea, Gentian, Chirata.

UNIT II

Definition, general test and detailed pharmacognostic study of the following Alkaloid containing drugs.

a. **Pyridine – Piperidine derivatives** **:** Tobacco & Lobelia.
b. **Tropane** **:** Belladona, Hyoscyamus, Datura, Coca & Aswagandha.
c. **Quinoline & Isoquinoline** **:** Cinchona, Ipecac, Opium.
d. **Indole** **:** Ergot, Rauwolfia, Vinca, Nux-vomica
e. **Imidazole** **:** Pilocarpus
f. **Steroid** **:** Kurchi, Aswagandha
i. **Alkaloidal amine** **:** Ephedra & Colchicum.
j. **Glycoalkaloid** **:** Solanum
k. **Purine** **:** Coffee, Tea.

UNIT III

Study of Tannins & Tannin containing drugs: Gambir, Black catechu, Myroblan & Arjuna.

UNIT IV

Definination & study of drugs contining resin & resin combinations: Benzoin, Asafoetida, Balsam of Tolu, Podophyllum.

UNIT-V

Biological sources, preparations, identification tests and uses of the following enzymes: Diastase, Papain, Pepsin, Trypsin, Pancreatin.

UNIT-VI

General techniques of biosynthetic studies and basic metabolic pathways.
Brief introduction to biogenesis of secondary metabolites of pharmaceuitcal importance.

UNIT – VII

Natural dyes and their applications in pharmacy.

UNIT –VIII

Study of mineral drugs: Bentonite,Kaolin,Keisulghur and Talc

TEXT BOOKS

1. Text Book of Pharmacognocy and Phytochemistry by Prof. B.Duraiswamy, Dr. G.S.Kumar and Prof. K.N Jayaveera. S.Chand & Co. 2010
2. Kokate C.K , Purohit AP & Gokhale S.B, The Pharmacognosy ; Nirali Prakashan, Pune.
3. Trease, G.E and Evans WC, Pharmacognosy ; Bailliers and Tindall, Easboume UK.
4. Tyler,VC, Brady. L.R & Roberts.J E Pharmacognosy Lea and Febiger, Philadelphia.

REFERENCES

1. Khare C.P, Indian Medicinal plants – An Illustrated dictionary
2. Atal C.R & Kapur B.M, Cultivation & Utilization of Medicinal Plants; RRL Jammu.
3. Wallis, Textbook of pharmacognosy, Pub by CBS Publishers and distributors, New Delhi.
4. Ayurvedic Pharmacopoeia of India, Pub by Govt. Of India
5. Herbal Drug Industry Eastern Publishers., New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy III –I Semester	**T**	**P**	**C**
	4	**0**	**4**

(9R01504) PHARMACEUTICAL TECHNOLOGY – I

UNIT-I

Preformulation: Physicochemical properties like physical form, particle size, shape, density, wetting, dielectric constant, solubility, dissolution, organoleptic additives, hydrolysis, oxidation-reduction, racemization, polymerization etc and their effect on formulation, stability and bioavailability study of prodrugs in solving problems related to stability bio availability in formulations. Stability testing of finished products as per ICH guidelines.

UNIT-II

Liquid dosage forms: Introduction, types of additives used in formulations, vehicles, stabilizers, preservatives, suspending agents, emulsifying agents, solubilizers, colors, flavours and others, manufacturing packaging and evaluation of clear liquids, suspensions and emulsions official in pharmacopoeia.

UNIT-III

Semisolid dosage forms: Definitions, types, mechanisms of drug penetration, factors influencing penetration, semisolid bases and their selection. General formulation of semi solids, clear gels manufacturing procedure, evaluation and packaging.

UNIT-IV

Pharmaceutical aerosols: Definition, propellants general formulation, manufacturing and packaging methods, pharmaceutical applications.

UNIT-V

Opthalmic Preparations: Requirements, formulation, methods of preparation, containers, evaluation.

UNIT-VI

Cosmeticology and Cosmetic Preparations –I: Fundamentals of cosmetic science, structures and functions of skin and hair. Formulation, preparation and packaging of cosmetics for skin, hair.

UNIT-VII

Cosmeticology and Cosmetic Preparations –II: Formulation, preparation & packaging of dentrifices like tooth powders, pastes, gels etc., and manicure preparations like nail polish, lipsticks, eye lashes, baby care products etc.

UNIT-VIII

Suppositories: Ideal requirements of bases, Different types of bases, manufacturing procedure packing and evaluation.

TEXT BOOKS

1. L. Lachman, H.A, Lieberman and J.L. Kanig, Theory & Practice of industrial pharmacy, Lea & Febieger, Philadelphia Latest Edn.
2. CVS. Subramanyam, Pharmaceutical production and management, Vallabh Prakashan, New Delhi 2005.

REFERENCES

1. Shobha Rani, Text of Industrial Pharmacy, Hiremath Orient Longman
2. Sagarin & MS Balsam, Cosmetics Sciences &Technology Vol.1, 2 & 3 Wiley India Pvt. Ltd.
3. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences.
4. E.A.Rawlkins, Bentley's Text Book of Pharmaceutics, Elbs publ
5. HC Ansel Introduction to Pharmaceutical Dosage forms 3rd Indian Ed; K M Varghese & Co., Bombay
6. S.H. Willing, M.M Tucherman and W.S. Hitchings IV, Good Manufacturing Practices for Pharmaceuticals: A Plan for Total Quality Control, Marcel Dekker, Inc., New York 1998.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy III –I Semester	**T**	**P**	**C**
	4	**0**	**4**

(9R01505) PHARMACOLOGY – I

UNIT I

General Pharmacology: Introduction to pharmacology, sources of drugs, dosage forms and routes of administration, mechanism of action, combined effect of drugs, factors modifying drug action, tolerance and dependence, pharmacogenetics. Absorption, distribution and excretion of drugs, principles of discovery and development of new drugs.

UNIT II

Pharmacology of Peripheral Nervous System:

a. Neurohumoral transmission (autonomic and Somatic)
b. Parasympathomimetics, parasympatholytics, sympathomimetics & sympatholytics

UNIT III

Adrenergic Receptor and neuron blocking agents, Ganglionic-stimulants and blocking agents.

a. Neuromuscular blocking agents
b. Local anesthetic agents.

UNIT IV

Pharmacology of Central Nervous System: I

a. Neurohumoral transmission in the C.N.S.
b. General anesthetics.
c. Alcohols and disulfiram.

UNIT V

Pharmacology of Sedatives, hypnotics, anti-anxiety agents and centrally acting muscle relaxants.

UNIT VI

Psychopharmacological agents (antipsychotics) Antidepressants, anti-maniacs and hallucinogens)

UNIT VII

Pharmacology of Anti-epileptic drugs, Anti-Parkinsonian Drugs

UNIT VIII

Analgesics, Antipyretics, Anti-inflammatory and Anti-gout drugs.
Narcotic analgesics and antagonists.
C.N.S. stimulants
Drug Addiction and Drug Abuse.

TEXT BOOKS

1. A Text book of pharmacology and toxicology by Prof.K.V.S.R.G.Prasad, Prof. B.M.Vrusharbendra Swamy and prof K.N.Jayaveera, S.Chand & Co.,
2. Sathoskar, Pharmacology and pharmaco therapeutics Vol. 1 & 2, Publ by Popular Prakashan, Mumbai.
3. Bertram. G. Katzung, Basic and clinical pharmacology, 9th Edn; Prentice Hall International.
4. Tripathi, Essentials of Medical Pharmacology, Jaypee Brother's, Latest Edition.

REFERENCE BOOKS

1. J.G. Hardman and Lee E. Limbard, Good Mann & Gilmann, The Pharmacological basis of therapeutics, Mc Graw hill, Health Professions Dvn.
2. H.P Rang, M. M. dale & J.M. Ritter, Pharmacology, Churchill living stone, 4th Ed.
3. J. Crossland, Lewis's Pharmacology, Church living stone.
4. Ruth Woodrow, Essentials of Pharmacology for Health Occupations. Delmar Cenage Learning.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy III –I Semester	**T**	**P**	**C**
	0	**3**	**2**

(9R01506) PHARMACEUTICAL BIOCHEMISTRY LAB

Experiments:

To prepare standard buffers (citrate, phosphate & carbonate) and measure the pH.
Titration curve for amino acids.
Separation of amino acids by two dimensional paper chromatography & gel electrophoresis.
Identification of carbohydrates
Identification of amino acids.
Identification of lipids.
Estimation of glucose in urine and blood.
Estimation of creatinine in urine.
Estimation of creatinine and urea in blood.
Estimation of cholesterol in blood.
Estimation of Serum protein.
Estimation of bile pigments in serum.
Estimation of alkaline phosphatase, SGOT, SGPT in serum
Effect of temperature on the activity of alpha-amylase.

Text Books:

1. Biochemical Techniques (A Practical Approach) by Prof.K.N.Jayaveera and Dr.K.Tarakaram, Himalaya publishing House, Mumbai.

LIST OF MINIMUM EQUIPMENT REQUIRED

1. Colorimeter
2. Table top centrifuge
3. Digital balance

4. Physical/chemical balance
5. pH meter
6. Water bath
7. Folin-Wu tubes
8. Autoanalyser
9. Adequate glasswares

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy III –I Semester	**T**	**P**	**C**
	0	**3**	**2**

(9R01507) PHARMACEUTICAL MICROBIOLOGY LAB

1. Introduction to equipment and glassware used in microbiology laboratory.
2. Preparation of various culture media.
3. Sterilization techniques and their validations.
4. Aseptic transfer of culture into different types of media.
5. Characterisation of microbes by staining methods (simple gram's, acid fast and negative staining and spore staining) and motility testing by hanging drop method.
6. Enumeration of bacteria by pour plate/spread plate technique.
7. Enumeration of bacteria by direct microscopic count.(Neubauer's chamber)
8. Isolation of pure cultures by streak plate, spread plate and pour plate. Evaluation of antiseptics and disinfectants by phenol coefficient method(R/w), sterility test for bulk powders and water for injection (IP).
9. Observation of colony/culture characters.
10. Bio chemical reactions:
    i) Indole test.
    ii) Methyl red test.
    iii) Voges proskauer test.
    iv) Starch hydrolysis test.
    v) Fermentation of carbohydrates and gelatin liquefaction.
11. Construction of bacterial growth curve for *E.coli*.
12. Anti-microbial assay by cup and plate method and turbidometric method

Text Books:

1. Biochemical Techniques (A Practical Approach)by Prof.K.N.Jayaveera and Dr.K.Tarakaram, Himalaya publishing House, Mumbai.Biochemical Techniques

LIST OF MINIMUM EQUIPMENT REQUIRED

1. Auotoclave
2. Hot air oven
3. BOD incubator
4. Refrigerator
5. Laminar air flow
6. Colony counter
7. Zone reader
8. UV- Spectrophotometer
9. Microscopes with stage and oil immersion objectives
10. Balances
11. Glass glides
12. Sterility testing units
13. Neubaur's chamber

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy III –I Semester	**T**	**P**	**C**
	0	**3**	**2**

(9R01508) PHARMACOGNOSY- II LAB

1. Quantitative microscopy:
   a) Ratio values, stomatal index, palisade ratio, vein-islet number.
   b) Determination of dimension of starch grains and length of fibres using eyepiece micrometer and camera lucida method.
   c) Determination of purity of ginger powder using lycopodium spore method.

Chemical tests:
Asafoetida, benzoin, catechu, Aloes, Caffeine.

Study of morphology of drugs:
Strophanths, squill, rhubarb, cascara, ginseng, senna, cinchona, nux-vomica, ergot, rauwolfia, ephedra, kurchi, vinca.

Study of powder microscopy:
Digitalis, squill, senna, rhubarb, liquorice, cinchona, ipecac, lobelia, rauwolfia, kurchi.

Transverse section of following drugs:
Rauwolfia, senna, ephedra, nux-vomica, digitalis, arjuna, cinchona.

LIST OF MINIMUM EQUIPMENT REQUIRED

1. Microscopes with stage
2. Stage micrometer
3. Eyepiece micrometer
4. Camera lucida
5. Heating mantle
6. Water baths
7. Adequate glasswares

Text Books:

Practical Pharmacognosy CA Lab manual 1st Edition by Dr.B.Durai Swamy and Dr. K.N.Jayaveera, S.Chand & Co., 2010.

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B. Pharmacy III –I Semester	**T**	**P**	**C**
	0	**3**	**2**

(9R01509) PHARMACEUTICAL TECHNOLOGY - I LAB

1. Preparation, evaluation and packaging of
   a. Solutions: Paracetamol syrup, codeine phosphate linctus
   b. Suspensions: Milk of magnessia,
   c. Emulsions: Cod liver oil emuslion,
   d. Ointments: Benzoid acid ointment
   e. Suppositories: Boric acid,
   f. Aerosols: Solbutamol
   g. Eye drops: Gentamycin.
   h. Eye ointments: Chloramphenicol.
   i. Cream: Cetrimide
2. Formulation of various types of cosmetics:
   a. Lipstics
   b. Toothpowder and toothpaste
   c. Shampoo
   d. Cold cream and vanishing cream

LIST OF MINIMUM EQUIPMENT REQUIRED

1. Ointment slabs and spatula
2. Mortor and pestles
3. Suppository moulds
4. Lipstick moulds
5. Magnetic stirrer
6. Emulsifier
7. Thermometer
8. Adequate glasswares.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy III –II Semester	**T**	**P**	**C**
	4	**0**	**4**

(9R01601) MEDICINAL CHEMISTRY – I

UNIT – I

Basic considerations of Drug activity: Physico chemical properties of drug molecules in relation to biological activity – Solubility, lipophilicity, partition-coefficient, Ionization, hydrogen bonding, Chelation, redox potential and surface activity. Bioisosterism and steric features of drugs, drug distribution and protein binding: Introduction to Pro and soft drug approach in drug design.

UNIT – II

Mechanisms of Drug action: Introduction, Enzyme stimulation, Enzyme inhibition, Sulfonamides and Membrane – active drugs

Drug metabolism and inactivation: Introduction, Biotransformations, Metabolic reactions, and Conjugation reactions and factors affecting drug metabolism.

Note: Introduction, definition, nomenclature, chemical classification, structure, synthesis, general mechanism, mode of action, SAR including physicochemical and stereo chemical aspects, metabolism and therapeutic uses of the drugs from each category shall be studied for the following units. An outline of synthetic procedure of only the drugs, which are official as per Indian Pharmacopoeia and British Pharmacopoeia and mentioned in each category.

UNIT – III

Drugs acting on CNS: ***A brief study of the chemistry of neurotransmitters***.

Hypnotics and Anxiolytics	– Phenobarbital, diazepam, alprazolam, glutethimide
Anti-psychotics	– Chlorpromazine, haloperidol, clozapine, oxypentine.

Anti-epileptics	– Phenytoin, valproic acid, carbamazepine, ethosuximide, meprobamate
Anti-depressants	–Imipramine, fluoxetine, doxepine, sertraline.

UNIT - IV

Local anesthetic and General anesthetic agents: Benzocaine, procaine, bupuvacaine and lidocaine, halothane, thiopental sodium and ketamine.

UNIT – V

Drugs affecting adrenergic mechanism: Introduction to adrenergic receptors, catabolism

Indirect acting sympathomimetics: Amphetamine, ephedrine, salbutamol, pseudoephedrine, dobutamine, dopamine.

UNIT – VI

Drugs affecting cholinergic mechanism:

Introduction to cholinergic system

Cholinergics	- Carbachol, bethanichol
Anticholinesterase	- Neostigmine, pyridostigmine
Antidotes for ach inhibitors	- PAM (pralidoxime)
Cholinergic blockers	- Propantheline, dicycloamine.
Neuromuscular blockers	- Galamine, succinyl choline.

UNIT – VII

Anti-adrenergics:

α-blockers	- Phenoxybenzamine, prazosine, tolazoline
ß – blockers	- Propranolol, atenolol, labetelol.

UNIT – VIII

Anti-cholinergics: Atropine, ipratropium bromide, dicyclomine, bipyridine, propantheline

TEXT BOOKS

1. William O. Foye, Textbook of Medicinal Chemistry, Lea Febiger, Philadelphia.
2. An Introduction to Medicinal Chemistry by Graham. L. Patrick, Oxford University publishers.
3. JH Block & JM Beale (Eds), Wilson & Giswold's Text book of organic Medicinal Chemistry and pharmaceutical chemistry, 11th Ed, Lipcolt, Raven, Philadelphia, 2004
4. Rama Rao Nadendla, Medicinal Chemistry; Mc Millan Publishers.

REFERENCES

1. C. Hansch, Comprehensive medicinal chemistry, Vol 1 – 6 Elsevier pergmon press, Oxford
2. D. Abraham (Ed), Burger Medicinal chemistry ad Drug discovery, Vol. 1 & 2. John Wiley & Sons, New York 2003, 6th Ed.
3. M. Atherden, Bentley and Driver's Textbook of Pharmaceutical Chemistry Ed: l.Oxford University Press, Delhi.
4. Daniel lednicer, Strategies for Organic Drug Synthesis and Design, John Wiley, N. Y. 1998.
5. D. Lednicer, Organic drug synthesis, Vol, 1 – 6, J.Wiley N.Y.

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B. Pharmacy III –II Semester	**T**	**P**	**C**
	3	**0**	**3**

(9R01602) PHARMACEUTICAL TECHNOLOGY - II

UNIT-I

Capsules: Advantage and disadvantages of capsule dosage forms, material for production of hard and soft gelatin capsules, sizes of capsules, capsule filling, soft processing problems in capsule manufacturing, importance of base absorption and minimum/gm factors in soft capsules, quality control, stability testing and storage of capsule dosage forms.

UNIT-II

Microencapsulation: Types of microencapsulation and importance of microencapsulation in pharmacy, microcapsulation by coacervation phase separator, multi orifice centrifugal separation. Spray drying, spray congealing, polymerization complex emulsion, air suspension technique, and pan coating techniques, evaluation of microcapsules.

UNIT-III

Tablets: Introduction to different types of tablets, formulation of chewable tablets, sublingual tablets, medicated lozenges, effervescent tablets, sugar coated, film coated and enteric coated tablets. Granulation technology on large-scale by various techniques. Physics of tablet making. Types of tablet compression machinery and the equipments employed evaluation of tablets.

UNIT-IV

Coating of Tablets: Types of coating, coating materials and their selection, formulation of coating solution, equipment for coating, coating processes, evaluation of coated tablets.

UNIT-V

Parenteral Products

a. Preformulation factors, routes of administration, water for injection, treatment apyrogenicity, non-aqueous vehicles, isotonicity and methods of its adjustment.
b. Formulation details, container and closures and selection.
c. Prefilling treatment, washing and sterilization of containers and closures, preparation of solution and suspensions, filling and closing of ampules, vials, infusion flulids, lyophillization & preparation of sterile powders, equipment for large-scale manufacture and evaluation of parenteral products.

UNIT-VI

Aseptic techniques, sources of contamination and method of prevention. Design of aseptic area, laminar flow benches, services and maintenance.

UNIT-VII

Packaging of Pharmaceutical products: Packaging components, types, specifications and methods of evaluation as per I.P. Factors influencing choice of containers, package testing, legal and other official requirements for containers,packing testing.

UNIT-VIII

Methods of packing of solid, liquid and semi-solid dosage forms, Factors influencing packing material, stability aspects of packaging.

TEXT BOOKS

1. L. Lachman, H.A, Lieberman and J.L. Kanig, Theory & Practice of industrial pharmacy, Lea & Febieger, Philadelphia Latest Edn.
2. CVS. Subramanyam, Pharmaceutical production and management, Vallabh Prakashan, New Delhi 2005.

REFERENCES

1. Shobha Rani, Text of Industrial Pharmacy, Hiremath Orient Longman

2. Sagarin & MS Balsam, Cosmetics Sciences &Technology Vol.1, 2 & 3 Wiley India Pvt. Ltd.
3. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences.
4. E.A.Rawlkins, Bentley's Text Book of Pharmaceutics, Elbs publ
5. HC Ansel Introduction to Pharmaceutical Dosage forms 3rd Indian Ed; K M Varghese & Co., Bombay.
6. S.H. Willing, M.M Tucherman and W.S. Hitchings IV, Good Manufacturing Practices for Pharmaceuticals: A Plan for Total Quality Control, Marcel Dekker, Inc., New York 1998.

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B. Pharmacy III –II Semester	**T**	**P**	**C**
	4	**0**	**4**

(9R01603) PHARMACOLOGY – II

UNIT-I

Pharmacology of Cardiovascular System - Hypertension & congestive heart failure

h. Digitalis and cardiac glycosides
i. Antihypertensive drugs.
j. Drugs used in the therapy of shock.

UNIT-II Pharmacology of Drugs used in coronary artery disease

UNIT-III Pharmacology of drugs used arrythmias

UNIT-IV

Drugs acting on hematopoietic system

a. Anti-coagulants, Anti-platelets & Thrombolytics.
b. Hematinics.

UNIT-V

Drugs acting on urinary system

a. Fluid and electrolyte balance
b. Diuretics

UNIT-VI

Autacoids

a) Histamine, 5-HT and their antagonists.
b) Prosstoglandins, Thromboxanes and leukotriene
c) Pentagastrin, cholecystikinin, angiotensin, bradykinin and substance P.

UNIT-VII

Harmone and Harmone antagonists

a) Insulin, Oral hypoglaceamics agents

b) Thyroid and antithyroid drugs
c) Adrenocortical steroids and their analogues
d) Uterine stimulants and relaxants

UNIT-VIII

Drugs Acting on the Respiratory System

a. Anti-asthamatic drugs including bronchodilators.
b. Anti-tussives and expectorants.
c. Respiratory stimulants.

TEXT BOOKS

1. A Text book of pharmacology and toxicology by Prof.K.V.S.R.G.Prasad, Prof. B.M.Vrusharbendra Swamy and prof K.N.Jayaveera, S.Chand & Co.,
2. Sathoskar, Pharmacology and pharmaco therapeutics Vol. 1 & 2, Publ by Popular Prakashan, Mumbai.
3. Bertram. G. Katzung, Basic and clinical pharmacology, 9th Edn; Prentice Hall International.
4. Tripathi, Essentials of Medical Pharmacology, Jaypee Brothers, Letest Edition.

REFERENCE BOOKS

1. J.G. Hardman and Lee E. Limbard, Good Mann & Gilmann, The Pharmacological basis of therapeutics, Mc Graw hill, Health Professions Dvn.
2. H.P Rang, M. M. dale & J.M. Ritter, Pharmacology, Churchill living stone, 4th Ed.
3. J. Crossland, Lewis's Pharmacology, Church living stone.
4. Ruth Woodrow, Essentials of Pharmacology for Health Occupations.

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B. Pharmacy III –II Semester	**T**	**P**	**C**
	4	**0**	**4**

(9R01604) CHEMISTRY OF NATURAL DRUGS

UNIT – I

Alkaloids: Definition of alkaloids, pseudoalkaloids and protoalkaloids. General methods of extraction and isolation. Properties of alkaloids. Tests for alkaloids.

Opium alkaloids: Structural features of Morphine molecule – Peripheral groups. Modification of structure and effect on analgesic activity – SAR of morphine and morphine-like analgesics.

Narcotic antagonists: Nalorphine, Levallorphan. Anti-tussive agents: Noscapine, Dextromethorphan. Smooth muscle relaxants: Papaverine and related compounds like ethaverine, Dioxyline. Structures and uses of these compounds.

Tropane alkaloids: Structures of Atropine/hyoscyamine, Hyoscine, Hydrolytic products of these – Tropine and Scopine. Relationship between tropine & pseudotropine. Biological actions and uses of tropane alkaloids. Homatropine.

UNIT – II

Rauwolfia alkaloids: Structures and uses of Reserpine, Rescinnamine, Deserpidine, ajmaline, syrosingapine. Hydrolysis of reserpine and rescinnamine. Mechanism of action of reserpine.

Ergot alkaloids: Classification, structures, hydrolytic products, pharmacological actions, therapeutic uses and toxicity. Synthetic derivatives: Methylergonovine (Methylergometrine), L S D, ethysergide.

UNIT – III

Terpenoids: Volatile oils: Definition of terpenoids, Classification, isoprene, special isoprene and gem-dialkyl rules.

Citrals: Sources and structures, isomerism in citral, citral-a (Geranial), citral-b (Neral). Reduction of citral to citronellal, citronellol, geraniol and

nerol. Oxidation of citral to geranic acid. Cyclodehydration of citral to p-cymene. Conversion of citrals – a and b into alfa-terpeneol and ionones.
Alfa – Terpeniol: Sources and structure. Conversion into p-cymene, 1,8 – terpene, terpinolene, dipentene, dipentene dihydrochloride. Preparation of alfa-terpeneol from limonene/dipentene, 1,8-Terpin and pinene.

UNIT – IV
Carvone: Sources and structure. Conversion into Carvacrol. Reduction of Carvone with different reagents. Synthesis from Limonene/Dipentene and alfa – Terpeneol.
Menthol and menthone: Sources, structures and uses. Oxidation of menthol to menthone. Conversion of menthol into thymol.
1,8-cineole: Sources and structure. Preparation from Cis-terpin. Mention of 1,4-cineole.
Camphor: Source, properties, commercial method of preparation from α-pinene and uses. Oxidation to camphoric acid and camphoronic acids, conversion into p-cymene. Reduction of camphor to Borneol & isoborneol. Source, structures, uses of isoborneol. Oxidation of borneols to camphor.

UNIT – V
Steroids: Introduction: Brief history of development of steroid industry. Sources of steroidal drugs – diosgenin, cholesterol, stigmasterol and ergosterol – their structures. Marker's synthesis of progesterone. Nomenclature of steroids, stereochemistry and numbering the ring system. Colour reactions of steroids. Selenium distillation of steroids.

UNIT – VI
Steroidal Anti-Inflammatory drugs: Classification, structures, SAR, uses & toxicity.
Cardiac glycosides: structures of glycosides from Digitalis, Strophanthus, Squill and Bufa. Enzymatic and acid hydrolytic reactions of the glycosides. Mechanism of action, SAR, therapeutic uses and toxicity.
Bile acids: Names, structures and functions.

UNIT – VII
Hormones: Sex Hormones: Male and female sex hormones.
Estrogens – estradiol, estrone, estriol. Structures and their interconversion.

Structures of synthetic estrogens. Therapeutic uses and side effects. Progesterone and selected progestins – structures, uses and side-effects. Preparation of progesterone from diosgenin. A note on Steroid contraceptive agents and regimens. Androgens – Testosterone and derivatives. Structure and biological activities & uses. Hormones of Thyroid: Thyroxine and triiodothyronine – structure and functions.

UNIT – VIII

Adrenal Cortex Hormones:

Mineralocorticoids: Aldosterone, Deoxycorticosterone, Fludrocortisone – structures, biological activity and uses. Aldosterone antagonist Spiranolactone.

Glucocorticoids: Cortisone & Hydrocortisone – Structure, biological actions, uses.

Hormones of Pancreas:

Insulin – introduction, structural features – some sequence differences in insulins of some species like humans, pork, beef. Metabolic effects of insulin. A note on insulin preparations. Glucagon – Structure and Physiological role.

NOTE:

1. Structure elucidation of compounds is not included in the syllabus.
2. Structural features like the basic nucleus; presence of substituent groups will be discussed.
3. Simple reactions like hydrolysis, selenium dehydrogenation, oxidation, reduction etc., will be taught wherever applicable.

TEXT BOOKS

1. Text Book of Pharmacognosy and Phytochemistry by Prof. B. Duraiswamy, Dr. G.S. Kumar and Prof. K.N.Jayaveera. S.Chand & Co 2010
2. JB Harborne, Phyto Chemical methods. Springer.
3. I L Finar, Organic chemistry, Vol. 1 & 2, the English language book society, London, New Delhi.

4. O.P.Agarwal, Natural products by. Vol.1 & 2, Goel publications – Meerut.

REFERENCES

1. RT Morrison and R.N BOYD, Organic chemistry, Allyn and Bacon, inc., boston
2. Me –Wolf, ed., Burger's medicinal chemistry, J. Wiley & sons, NY.
3. F.G. Mann & B. Saunders, Practical Organic chemistry Longmans green & Co. Ltd., UK.
4. RM. Acheson, an introduction to the chemistry of heterocyclic compounds, Interscience NY.
5. Duquesn & others, Practical pharmacognocy, CBS Publ.

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B. Pharmacy III –II Semester	**T**	**P**	**C**
	3	**0**	**3**

(9R01605) PHARMACEUTICAL JURISPRUDENCE

UNIT-I

Introduction

a. Pharmaceutical Legislations - A brief review
b. Drugs & Pharmaceutical Industry - A brief review
c. Pharmaceutical Education - A brief review.
d. Pharmaceutical ethics & policy

An elaborate study of the following

UNIT-II

Pharmacy Act 1948

UNIT-III

Drugs and Cosmetics Act 1940 and Rules 1945

UNIT-IV

Medicinal & Toilet Preparations (Excise Duties) Act 1955

UNIT-V

Narcotic Drugs & Psychotropic Substances Act 1985 &A.P. N. D. P.S Rules 1986

UNIT-VI

Drugs (Prices Control) Order 1995.

UNIT-VII

Drugs and Magic Remedies (Objectionable Advertisements) Act 1954 and Rules 1955.

UNIT-VIII

A study of the salient features of the following.

a. Prevention of Cruelty to animals Act 1960.
b. AP State Shops & Establishments Act 1988 & Rules 1990.
c. Factories Act 1948.
d. WTO, GATT and The Indian Patents Act 1970
e. Pharmaceutical Policy 2002.

Note: The teaching of all the above Acts should cover the latest amendments.

TEXT BOOKS

1. B.M.Mithal, Text book of Forensic Pharmacy, publ by Vallabh Prakashan
2. Prof. Suresh Kumar J.N, Text book of Forensic Pharmacy by. Frontline Publications
3. C.K.Kokate & S.B.Gokhale, Textbook of Forensic Pharmacy, Pharmabook, Syndicate.

REFERENCE BOOK

1. Bare Acts and Rules Publ by Govt of India/state Govt from time to time.
2. Pharmaceutical policy of India
3. Notification from NPPA
4. Vijay Malik, Drugs & Cosmetics act 1940 and Rules, Eastern Law House Co. Delhi, Kolkata.
5. K.Sampath, Pharmaceutical Jurisprudence (Forensic Pharmacy) Jai Publishers.

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B. Pharmacy III –II Semester	**T**	**P**	**C**
	0	**3**	**2**

(9AHS601) ADVANCED ENGLISH COMMUNICATION SKILLS LAB

1. Introduction

The Advanced English Language Skills Lab introduced at the 3rd year B.Tech level is considered essential for the student for focusing on his/her career. At this stage it is imperative for the student to start preparing for the ever growing competition in the job market. In this scenario, in order to be on par with the best, he/she needs to improve his/her Communication and soft skills

This course focuses on the practical aspects of English incorporating all the four (LRSW) skills relevant to the requirements of the prospective employers in view of globalization. The proposed course will enable the students to perform the following:

- Intensive reading to improve comprehension and communication
- Attentive listening for better understanding
- Write project/research/technical reports
- Write Resume' to attract attention
- Discuss ideas / opinions for better solutions
- Face interviews confidently
- Gather information, organize ideas, and present them effectively before an audience
- To help the students cultivate the habit of reading passages from the computer monitor, thus providing them with the required ability to face computer-based competitive exams such GRE, TOEFL,CAT, GMAT etc.

2. Objectives:

Keeping in mind the previous exposure of the student to English, this lab focuses on improving the student's proficiency in English at all levels. The lab intends t**o** train students to use language effectively, to participate in group discussions, to help them face interviews, and sharpen public speaking skills and enhance the confidence of the student by exposing him/her to various situations and contexts which he/she would face in his/her career

3 Syllabus

The following course content is prescribed for the Advanced Communication Skills Lab:

Reading Comprehension -- Reading for facts, guessing meanings from context, speed reading, scanning, skimming for building vocabulary(synonyms and antonyms, one word substitutes, prefixes and suffixes, idioms and phrases.)

Listening Comprehension-- Listening for understanding, so as to respond relevantly and appropriately to people of different backgrounds and dialects in various personal and professional situations.

Technical Report Writing—Types of formats and styles, subject matter, organization, clarity, coherence and style, data-collection, tools, analysis

Resume' Writing—Structure, format and style, planning, defining the career objective, projecting one's strengths, and skills, creative self marketing, cover letter

Group Discussion-- Communicating views and opinions, discussing, intervening. providing solutions on any given topic across a cross-section of individuals,(keeping an eye on modulation of voice, clarity, body language, relevance, fluency and coherence) in personal and professional lives.

Interview Skills—Concept and process, pre-interview planning, mannerisms, body language, organizing, answering strategies, interview through tele and video-conferencing

Technical Presentations (Oral)— Collection of data, planning, preparation, type, style and format ,use of props, attracting audience, voice modulation, clarity, body language, asking queries.

4. Minimum Requirements

The English Language Lab shall have two parts:

The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.

The Communication Skills Lab with movable chairs and audio-visual aids with a P.A System, a TV, A digital stereo-audio and video system, Camcorder etc

System Requirement (Hardware Component):

Computer network with LAN with a minimum of 60 multimedia systems with the following specifications:

P-IV Processor, Speed-2.8 GHz, RAM_512 MB minimum, Hard Disk-80 GB, Headphones

Prescribed Software: GLOBARENA

Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):

1. **Technical writing and professional communication, Huckin and Olsen** Tata Mc Graw-Hil 2009.
2. **Speaking about Science**, A Manual for Creating Clear Presentations **by Scott Morgan and Barrett Whitener, Cambridge University press, 2006**
3. **Books on** TOEFL/GRE/GMAT/CAT/ IELTS **by Barron's/DELTA/Cambridge University Press.**

4. **Handbook for Technical Writing** by David A McMurrey & Joanne Buckely CENGAGE Learning 2008
5. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
6. **The ACE of Soft Skills** by Gopal Ramesh and Mahadevan Ramesh, Pearson Education, 2010
7. **Cambridge English for Job-Hunting** by Colm Downes, Cambridge University Press, 2008
8. **Resume's and Interviews** by M.Ashraf Rizvi, Tata Mc Graw-Hill, 2008
9. **From Campus To Corporate** by KK Ramachandran and KK Karthick, Macmillan Publishers India Ltd, 2010
10. **English Language Communication : A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.
11. **Managing Soft Skills** by K R Lakshminarayan and T.Muruguvel, Sci-Tech Publications, 2010
12. **Business Communication** by John X Wang, CRC Press, Special Indian Edition,2008

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B. Pharmacy III –II Semester	**T**	**P**	**C**
	0	**3**	**2**

(9R01606) MEDICINAL CHEMISTRY – I LAB

I. Synthesis of some medicinal compounds and their analogues.

i. Barbituric acid from Diethyl Malonate.
ii. Phenytion from Benzoin or Benzil.
iii. Paracetomol from *para*- nitro phenol or *para*- aminophenol.
iv. Diphenyl quinaoxaline.
v. Butamben
vi. Sulfanilamide from acetanilide
vii. Isoniazid from γ-picoline.
viii. Antipyrine from ethyl aceto acetate.
ix. Benzocaine from PABA.
x. 4-hydroxy coumarin from resorcinol

II. Monograph analysis of the following compounds

i. Acetazolamide
ii. Aminopyrine
iii. Ascorbic acid
iv. Caffiene
v. Sulfanilamide
vi. Paracetamol
vii. Atropine sulfate
viii. Aspirin
ix. INH

REFERENCES

1. Practical Medicinal Chemistry (Synthesis & Analysis) by Prof. K.N.Jayaveera; S.M.Enterprises.
2. A.I. Vogel, Text Book of Practical Organic Chemistry, 5th Edition. Pearson Prentice Hall.

3. F.G. Mann & B.C. Saunders, Pratical Organic Chemistry, 4th Edition. Pearson Publishers.

LIST OF MINIMUM EQUIPMENT REQUIRED

1. Water bath
2. Suction pumps
3. Analytical/physical balance
4. Triple beam balance
5. Reflux flask with condenser
6. Hot plates
7. Refrigerator
8. Mechanical and magnetic stirrer with thermostat
9. Distillation unit
10. Oven
11. Adequate glasswares

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B. Pharmacy III –II Semester	**T**	**P**	**C**
	0	**3**	**2**

(9R01607) PHARMACEUTICAL TECHNOLOGY – II LAB

1. Manfacturing of tablets:
   a. Ordinary compressed tablets by wet granulation.
   b. Tablets prepared by direct compression
   c. Soluble tablets/dispersible granules
   d. Cheweble tablets
   e. Effervescent tablets.
2. Evalaution of tablets (Weight variation, hardness, friability, disintegration and dissolution)
3. Formulation and filling of hard gelatin capsules.
4. Parenterals:
   a. Manufacturing of parenterals (Ampule sealing (Pull sealing and tip sealing))
   b. Evaluation of parenterals (Clarity test, pyrogen free test (LAL), sterility test and leaking test).

LIST OF MINIMUM EQUIPMENT REQUIRED

1. Hot air oven
2. Roche's friabilator
3. Pfizer's hardness and Monsanto hardness meter
4. Tablet punching machine
5. Mortar and pestle
6. Sieves with different grades
7. Empty ampoules
8. Clarity test apparatus
9. Ampoule filling machine
10. Ampoule sealing machine
11. Digital balance
12. Disintegration apparatus
13. Dissolution apparatus
14. Adequate Glasswares
15. LAL test diagnostic kit

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy III –II Semester	**T**	**P**	**C**
	0	**3**	**2**

(9R01608) PHARMACOLOGY – II LAB

1. Introduction to Experimental Pharmacology

Preparation of different solutions for experiments.
Drug dilutions, use of molar and w/v solutions in experimental Pharmacology.
Common laboratory animals and anesthetics used in animal studies.
Commonly used instruments in experimental pharmacology.
Some common and standard techniques.
Bleeding and intravenous injection, intragastric administration.

2. Experiments on intact preparations:

Study of different routes of administration of drugs in mice/rats.

3. Experiments in Central Nervous system:

Recording of spontaneous motor activity,locomotor activity, anti-depressant, stereotype, analgesia, anticonvulsant activity, anti-inflammatory activity,

4. To study the effect of autonomic drugs on rabbit's eye
5. To study the effects of various agonists and antagonists and their characterisation using isolated preparations like frog's rectus abdominus muscle and isolated ileum preparation of rat& guinea pig.

Experiments on Isolated Preparations:

i. a. To record the concentration response curve (CRC) of acetylcholine using rectus abdominus muscle preparation of frog.
b. To study the effects of physostigmine and d-tubocurarine on the crc of acetylcholine using frog rectus abdominus muscle preparation of frog.
c. To record the CRC of 5-HT on rat fundus preparation.
d. To record the CRC of histamine on guineapig ileum preparation.

ii. a. To study the inotropic and chronotropic effects of drugs on isolated frog heart.
b. To study the effects of drugs on normal and hypodynamic frog heart.

6 Experiments pertaining to analgesia, anti-convulsant activity, anti-nflammatory activity.

NOTE: CPCSEA approval to obtained for experiments on animals

Text Book:

1. Experimental Pharamcology and Toxicology By Dr.B.M.Vrushabendra Swamy and Prof.K.N.Jayaveera, S.Chand & Co.,

LIST OF MINIMUM EQUIPMENT REQUIRED

1. Sherrington's kymograph machine
2. Sherrington's drum
3. Student organ bath
4. Aerators
5. Dissection trays and boards
6. Hemostatic artery forceps
7. Hypodermic syringes and needles of size 18, 24 and 26G
8. Standard graphs of various drugs
9. Actophotometer
10. Analgesiometer (Eddy's hotplate and radian heat method)
11. Convulsometer
12. levers, canula
13. Plethysmograph
14. Rotarod apparatus
15. Pole climbing apparatus

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy III –II Semester	**T**	**P**	**C**
	0	**3**	**2**

(9R01609) CHEMISTRY OF NATURAL DRUGS LAB

1. Preparation of different alkaloid testing reagents like Dragendroff, Mayer' Wagner's, etc. and testing some alkaloids and plant extracts using these reagents.
2. Identification of alkaloids by specific colour tests.
3. Tests for steroids, steroidal glycosides and cardiac glycosides. Liberman- Burchard test, Salkowski reaction, Kedde reaction, etc.
4. Tests for flavanoids and their glycosides. Shinoda Test (Mg /Hcl test), $Fecl_3$ test.
5. TLC end examination of alkaloids, steroids, steroidal glycosides and cardiac glycosides.
6. Identification of natural products.
7. Extraction of caffeine from tea leaves.
8. Extraction of lactose from milk.
9. Extraction of nicotine from tobacco.
10. Extraction of piperine from black pepper.
11. Extraction of lycopene from tomatoes.
12. Extraction of beta - carotene from carrots.
13. Volatile oil production by steam distillation (***Demonstration only)***

TEXT BOOKS

1. Practical Pharamacognosy by Prof.B.Durai Swamy and Prof.K.N.Jayaveera. S.Chand & Co.,
2. Indian Pharmacopoeia – 1996.
3. Wagners, Plant Drug Analysis, Springer.
4. C.K. Kokate, Practical Pharmacognosy, Nirali Prakasham.

LIST OF MINIMUM EQUIPMENT REQUIRED

1. Soxhlet extraction apparatus
2. Heating mantle
3. Steam distillation apparatus
4. TLC kit
5. Water bath
6. Hot plates
7. Oven
8. Adequate glasswares.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy IV –I Semester	**T**	**P**	**C**
	4	**0**	**4**

(9R01701) PHARMACEUTICAL ANALYSIS – II

UNIT – I

Visible, UV & IR Spectrophotometry: Principle, Electron Transition, Beer-Lamberts Law & Deviations, Chromophores, Instrumentation – Construction of Single Beam and Double Beam Spectrophotometers, Applications.

UNIT - II

NMR and Mass Spectrometry: Basic Principle, Instrumentation and Applications.

UNIT - III

Basic Principles and applications of differential thermal analysis (DTA) and differential scanning colorimetry (DSC).

Basic Principles and applications of atomic absorption spectroscopy , Flame photometry and XRD.

UNIT – IV

Optical rotatory dispersion (ORD) and Circular dichroism: General Principle and Applications.

Radio Immuno Assay & Enzyme Linked Immuno Sorbate Assay.

UNIT - V

Flurimetry: Introduction, Theory, Flourscene and chemical structure, factors affecting the intensity of flurescene. Study of working principles of the instrument use for flourescense analysis. Applications in Pharmaceutical analysis

UNIT – VI

Gas Chromatography

UNIT - VII
HPLC and HPTLC.

UNIT – VIII
Electrophoresis: Scope, Different types Electrophoresis and applications.

TEXT BOOKS

1. Instrumental approach to chemical analysis by A.K.Srivastav, P.C.Jain, S.Chand & Co.,
2. R.M. Silvesterin and G.C. Bassler.Spectrometric Identification of Organic Compounds. John Wiley & Sons.
3. AH Beckett & Stenlake, Text book of Practical Pharmaceutical chemistry, Vol.I&II Continum International Publishing Group, Althone.
4. AI Vogel, Quantitative Chemical Analysis ELBS/ Longman, London..
5. Robert D. Braun, Introduction to Instrumental Analysis. Pharma Med Press.
6. Skoog,West and Holler Principles of Instrumental Analysis; Saunders college Publishing, London.

REFERENCES

1. Hobart. H. Willard and others, Instrumental methods of analysis, CBS publ and Distributors New Delhi.
2. Settle, Handbook of Instrumental Techniques for Analytical Chemistry. Prentice Hall.
3. P.D. Sethi, Quantitative analysis of Drugs and Pharmaceuticals. CBS Publishers.
4. K. A. Connors, A Textbook of pharmaceutical analysis, Wiley Interscienc, NY.
5. A.M. Knevel & F.E. Digengl, Jenkin's quantitative pharmaceutical chemistry, Mc Graw Hill Book Co., NY.
6. Pharmacopoeia (IP, BP, USP, PhI, Eu. PhI).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy IV –I Semester	**T**	**P**	**C**
	3	**0**	**3**

(9R01702) BIOPHARMACEUTICS AND PHARMACOKINETICS

UNIT-I

Introduction to Biopharmaceutics and Pharmacokinetics and their role in formulation development and clinical setting

UNIT-II

Biopharmaceutics: Passage of drugs across biological barrier (passive diffusion, active transport, facilitated diffusion and pinocytosis) factors influencing absorption – physiochemical, physiological and pharmaceutical.

UNIT-III

Drug distribution in the body, Factors influencing distribution.

UNIT-IV

Plasma protein binding, binding sites, factors influencing protein binding

UNIT-V

Pharmacokinetics

Significance of plasma drug concentration measurement.

Compartment model: Definition and scope.

Pharmacokinetics of drug absorption – Zero order and first order absorption rate constant using Wagner Nelson and Loo-riegelman method.

Volume of distribution and distribution coefficient.

Comparative kinetics : One compartment and two compartment models. Determination of Pharmacokinetic parameters from plasma and urine data after drug administration by oral parenteral and other routes.

Curve fitting (Method of Residuals) Regression procedures.

Clearance concept, Mechanism of Renal clearance, clearance ratio, determination of renal clearance.

Non-linear pharmacokietics with special reference to one compartment model after I.V.Drug administration, Michales Mente Equation, detection of non-linearity (Saturation mechanism).

UNIT-VI

Clinical pharmacokinetics

Definition and scope

Dosage adjustment in patients with and without renal and hepatic failure.

Pharmacokinetic drug interactions and its significance in combination therapy.

UNIT-VII

Bioavailability and bioequivalance.

Measures of bioavailability, C-max, T-max and Area Under the Curve (AUC)

Design of single dose bioequivalance study and relevant statistics.

Overview of regulatory requirements for conduction of bio-equivalence studies.

UNIT-VIII

Bio availability and bio equivalence including evaluation testing protocols.

a. In vitro dissolution studies for solid dosage forms methods, interpretation of dissolution data in vitro, in vivo correlations.
b. Bioavailability testing protocol and procedures.
c. In vivo methods of evaluation – statistical treatment.

TEXT BOOKS

1. Venkateshulu, Fundamentals of Biopharmaceutics and Pharmacokinetics, Pharma Book Syndicate.
2. Milo Gibaldi, Biopharmaceutics and clinical pharmacokinetics 4/Edn. Pharma Book Syndicate.Hyderabad
3. DM Brahmankar and SB Jaiswal, biophamaceutics and pharmacokinetics- a treatise, vallabh prakasham, Delhi,
4. L. Shargel and ABC Yu, textbook of applied biopharmaceutics & pharmacokinetics, 4th edn, Appleton – centuary – crofts, Connecticut, 2004.
5. P.L. Madan, Biopharmaceuticas and Pharmacokinnetics, Jaypee Bros.

REFERENCES

1. Remington's pharmaceutical sciences, Mac Pub. Co., Easton Pensylvania.
2. Modern pharmaceutics by banker Marcel Dekker Inc., NY
3. L. lachman, H.A.Lieberman, JL. Kanig, the theory aad practice of industrial pharmacy, Varghese publ house, Mumbai.
4. AR. Gennerio Remington: the science andpractice of pharmacy, vol 1 &2 Lippincott Williams & wilkins, Philadelphia, 2004.
5. Robert E notary, Biopharmaceutics and pharmacokinetics – an introduction, arcel dekker inc., NY

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy IV –I Semester	**T**	**P**	**C**
	4	**0**	**4**

(9R01703) PHARMACOLOGY – III

UNIT-I

Drugs Acting on the Gastrointestinal Tract

a. Antacids, Antisecretory and Anti-ulcer Drugs
b. Laxatives and antidiarrhoeal drugs
c. Appetite Stimulants and Suppressants.
d. Emetics and anti-emetics
e. Miscellaneous; Carminatives, demulcents, protectives, adsorbents, astringents, digestants, enzymes and mucolytics.

UNIT-II

Chemotherapeutic agents and their applications:

a. General principles of chemotherapy.
b. Sulphonamides and co-trimoxazole.
c. Antibiotics: Betalactams, monolactums.

UNIT-III

Chemotherapeutic agents and their applications: Tetracyclines, aminoglycosides, chloramphenicol, macrolides, quinolones, flouroquinolones, polypeptide antibiotics.

UNIT-IV

Chemotherapy of tuberculosis & leprosy.

UNIT-V

Chemotherapy of fungal diseases,viral diseases,urinary tract infections and sexually transmitted diseases.

UNIT-VI

Chemotherapy of malignancy and immunosuppressive Agents.

UNIT-VII

Principles of Toxicology: Definition of poison, general principles of treatment of poisoning with particular reference to barbiturates opioids, organophosphorous and atropine poisoning. Heavy metals and heavy metals antagonisits.

UNIT-VIII

Principles of bioassys. Errors in bioassys. Study of bioassay methods for the following drugs

a. Digitalis, **b**. D – tubocaratine, **c**. Oxytocine , **d**. hCG.

TEXT BOOKS

1. A Text book of pharmacology and toxicology by Prof.K.V.S.R.G.Prasad, Prof. B.M.Vrusharbendra Swamy and prof K.N.Jayaveera, S.Chand & Co., 2010.
2. Sathoskar, Pharmacology and pharmaco therapeutics Vol. 1 & 2, Publ by Popular Prakashan, Mumbai.
3. Bertram. G. Katzung, Basic and clinical pharmacology, 9th Edn; Prentice Hall International.
4. Tripathi, Essentials of Medical PharmaCOLOGY, Jaypee Brother's Latest Edition.

REFERENCE BOOKS

1. J.G. Hardman and Lee E. Limbard, Good Mann & Gilmann, The Pharmacological basis of therapeutics, Mc Graw hill, Health Professions Dvn.
2. H.P Rang, M. M. dale & J.M. Ritter, Pharmacology, Churchill living stone, 4th Ed.
3. J. Crossland, Lewis's Pharmacology, Church living stone.
4. Ruth Woodrow, Essentials of Pharmacology for Health Occupations. Delmas Cengage learning.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy IV –I Semester	**T**	**P**	**C**
	4	**0**	**4**

(9R01704) MEDICINAL CHEMISTRY – II

UNIT – I

Antibiotics: Brief historical background, definition, requirements for a substance to be considered as an antibiotic and classification of antibiotics.

Penicillins: Historical background and biological sources. Structures of different penicillins.

Nomenclature: Numbering and naming according to the CA and USP systems, as derivatives of penam, penicillanic acid and as penicillins (trivial system).

Reactions: Hydrolysis of penicillin by cold and hot dilute mineral acid, alkali, enzymatic hydrolysis with Pencillinase, amidase and methanolysis followed by aqueous mercuric chloride.

Classification: Oral and parenteral, based on spectrum of activity and resistance to β-lactamase, as natural, biosynthetic and semi-synthetic.

General method of synthesis of pencillins from 6-APA, SAR, mechanism of action, therapeutic uses, toxicity. A note on β-lactamase inhibitors.

UNIT – II

Cephalosporins: Historical background and biological sources. Structures of some important Cephalosporins and Cephamycins. Acid hydrolysis of Cephalosporin C. Comparison of 6-APA and 7-ACA, penam and cepham.

Classification: Generations of cephalosporins Oral and parenteral, SAR and Advantages over penicillins.

UNIT – III

Tetracyclins: Biological sources, structures of the important tetracyclines, important structural units and the three acidity constants in the tetracycline molecule, Amphoteric nature, epimerisation, chelation with metals, mechanism of action, spectrum of activity, SAR and toxicity.

UNIT – IV

Aminoglycosides: Structure of streptomycin, acid hydrolysis, mechanism of action, therapeutic uses and toxicity. Dihydrostreptomycin and its importance. A mention of other aminoglycoside antibiotics.

A brief account of chloramphenicol, macrolide and polypeptide antibiotics and Rifampicin (Structures not included).

UNIT – V

Vitamins: ***Introduction and Classification***.

Fat-soluble vitamins: Vitamins A– Structure, Physiological role and uses, Tretinoin (Retinoic acid), Isotretinoin.

UNIT – VI

Fat-soluble vitamins: Vit D – Structures – Physiological role and uses, preparation of ergocalciferol from ergosterol, and cholecalciferol from 7-dehydrocholesterol.

UNIT – VII

Fat-soluble vitamins: Vit E – Structures of α, β and γ - tocopherols – Physiological role and uses.

Fat-soluble vitamins: Vitamin Ks – Vit K_1, K_2, K_3 and K_4 – Structures – Physiological role and uses.

UNIT – VIII

Water soluble vitamins: Structures, physiological role and uses of Vit B_1, B_2, B_6, B_{12}, Nicotinic acid and amide, Cyanocobalamine, folic acid and Ascorbic acid.

Some important reactions of water soluble vitamins like: The oxidation of thiamine to thiochrome, the oxidation of nicotine to nicotinic acid, the amidation of nicotinic acid to nicotinamide, the degradation of riboflavine to lumiflavine and lumichrome, the reduction of folic acid to dihydro and tetrahydro folic acids in the biological system, the oxidation of Ascorbic acid to dehydroascorbic acid.

NOTE:

1. Structure elucidation of compounds is **not** included in the syllabus.
2. Structural features like the basic nucleus, presence of substituent groups will be discussed.
3. Simple reactions like hydrolysis, selenium dehydrogenation, oxidation, reduction etc., will be taught wherever applicable.

TEXT BOOKS

1. William O. Foye, Textbook of Medicinal Chemistry, Lea Febiger, Philadelphia.
2. An Introduction to Medicinal Chemistry by Graham. L. Patrick, Oxford University publishers.
3. JH Block & JM Beale (Eds), Wilson & Giswold's Text book of organic Medicinal Chemistry and pharmaceutical chemistry, 11th Ed, Lipcott, Raven, Philadelphia, 2004
4. Rama Rao Nadendla, Medicinal Chemistry; Mc Millan Publishers.

REFERENCES

1. C. Hansch, Comprehensive medicinal chemistry, Vol 1 – 6 Elsevier pergmon press, Oxford
2. D. Abraham (Ed), Burger Medicinal chemistry ad Drug discovery, Vol. 1 & 2. John Wiley & Sons, New York 2003, 6th Ed.
3. M. Atherden, Bentley and Driver's Textbook of Pharmaceutical Chemistry Ed: l.Oxford University Press, Delhi.
4. Daniel lednicer, Strategies for Organic Drug Synthesis and Design, John Wiley, N. Y. 1998.
5. D. Lednicer, Organic drug synthesis, Vol, 1 – 6, J.Wiley N.Y.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy IV –I Semester	**T**	**P**	**C**
	3	**0**	**3**

(9R01705) PHARMACY ADMNISTRATION

UNIT – I

Features of Business Organisations & New Economic Environment:
Characteristic features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Changing Business Environment in Post-Liberalisation scenario.

UNIT – II

Manufacturing Management: Goals of Production Management and Organisation – Production, Planning and Control – Plant location - Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), New Product Development.

UNIT – III

Work Study -Basic procedure involved in Method Study and Work Measurement-Statistical Quality Control: $\overline{X}$ chart, R chart, *c* chart, *p* chart, (simple Problems), Acceptance Sampling, Deming's contribution to quality.

UNIT – IV

Organisation of Distribution and Marketing: Functions of Marketing, Marketing Mix, Marketing Strategies based on Product Life Cycle., Channels of distribution – Factors influencing channels of distribution, sales organization and sales promotion.

UNIT - V

Pharma Industry: Growth of Pharma Industry in India – current status and its role in building national economiy and national health – Structure of Pharma Industry in India – PSUs in Pharma Industry –Progress in the manufacture of basic drugs, synthetic and drugs of vegetable origin. Export and import of drugs and pharmaceuticals – Export and import Trade.

UNIT – VI

Insurance and Pharma: Various types of insurance including marine and health insurance.

UNIT – VII

Pharmaceutical associations and societies, statutory councils governing the profession. General Principles of medical detailing.

UNIT – VIII

Principles of drug store and community pharmacy administration: Drug store planning and layout, sales promotion and salesmanship in drug store. Accounting records in drug stores.

TEXT BOOK

1. Aryasri and Subbarao, Pharmaceutical Administration, TMH.
2. Smarta, Strategic Pharma Marketing
3. G.Vidya Sagar, Pharmaceutical Industrial Management. PBS/BS Publication 2005.

REFERENCES

1. Subbarao Chaganti, Pharmaceutal Marketing in India – Concepts and Strategy Cases, Pharma Book Syndicate.
2. O.P.Khanna, Industrial Management, Dhanpatrai, New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy IV –I Semester	**T**	**P**	**C**
	0	**0**	**2**

(9R01706) INDUSTRIAL TRAINING AND SEMINAR

a. Industrial Pharmacy
b. Clinical Pharmacy/Pharmacology
c. Pharmacognosy/Med. Chem.
d. Pharmaceutical Analysis/Quality assurance
e. Pharmaceutical Marketing
f. Pharmaceutical Biotechnology

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy IV –I Semester	**T**	**P**	**C**
	0	**3**	**2**

(9R01707) PHARMACEUTICAL ANALYSIS – II LAB

Experiments

1. Interpretation of UV, NMR and Mass Spectra.
2. Determination of λ- max of ciprofloxacin (UV)
3. Determination of λ- max of $KMnO_4$ (Visible)
4. Determination of λ- max by Evan's blue and isobestic point.
5. Determination of moisture content by karl-Fishcer apparatus.
6. Assay of ibuprofen -UV-spectro photometry.
7. Assay of paracetomol-UV-spectro photometry.
8. Assay of riboflavin-Colorimetric method.
9. Assay of rifampicin -Colorimetric method.
10. Assay of Thiamine by Fluorimetry
11. Determination of quinine by Fluorimetry.
12. Paper electrophoresis of amino acids.
13. Gel electrophoresis (***Demonstration Only***).
14. HPLC ***(Demonstration Only***).

LIST OF MINIMUM EQUIPMENT REQUIRED

1. Fluorimeter
2. UV-Spectrophomenter
3. TLC kits
4. Electrophoresis equipment
5. Digital balace
6. Chromatographic columns
7. Colorimeter
8. KF titrator
9. Adequate glasswares

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy IV –I Semester	**T**	**P**	**C**
	0	**3**	**2**

(9R01708) BIOPHARMACEUTICS& PHARMACOKINETICS LAB

1. Experiments designed for the estimation of various pharmacokinetic parameters with given data
2. Analysis of biological specifications for drug content and estimation of the pharmakinetic parameters.
3. In vitro evaluation of different dosage forms for drug release
4. Absorption studies – *in vitro*.
5. Statistical treatment of pharmaceutical data.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy IV –I Semester	**T**	**P**	**C**
	0	**3**	**2**

(9R01709) PHARMACOLOGY – III LAB

1. Experiments on Isolated Preparations:
   a. To calculate the PA_2 value of atropine using acetylcholine as an agonist on rat ileum preparation.
   b. To calculate the PA_2 value of mepyramine or chlorampheniramine using histamine as agonist on guinea pig ileum.
   c. To find out the strength of the given sample on (e.g. Acetycholine, Histamine, 5-HT. Oxytocin etc.) Using a suitable isolated muscle preparation by
      i. Matching Assay
      ii. Two point Assay
      iii. Three point Assay

2. Pharmacology of the Gastrointestinal Tract
   To study the anti-secretory and anti-ulcer activity
      I. Pylorus ligation induced ulcer in rats
      II. Etanol induced ulcers
3. Simulated Experiments.
      a. Effects of drugs on isolated frog's heart.
      b. Effects on BP, HR, RR of dog
      c. Effectos on drugs on locomotor activity of rat
      d. Effect of drug on rabbit eye
      e. Effect of drug on ciliary motility of frogs esophagus
      f. Ileum- DRC and matching assay
      g. Mouse- evalauation of analgesic activity by hotplate method

Text Books:

1. Practical Pharmacology and toxicology by Dr.B.M.Vrushabendra Swamy & Prof K.N.Jayaveera; S.Chand & Co.,

LIST OF MINIMUM EQUIPMENT REQUIRED

1. Sherrington's kymograph machine
2. Sherrington's drum
3. Student organ bath
4. Aerators
5. Dissection trays and boards
6. Hemostatic artery forceps
7. Hypodermic syringes and needles of size 18, 24 and 26G
8. Levers, canulas.
9. Computer with LCD
10. Website: Expharm.virtulave.net

NOTE: CPCSEA approval to obtained for experiments on animals

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy IV –I Semester	**T**	**P**	**C**
	0	**3**	**2**

(9R01710) MEDICINAL CHEMISTRY – II LAB

Estimations of the following.

1. Ascorbic acid.
2. Vitamin B1.
3. Penicillin and its derivatives.
4. Riboflavin
5. Niacinamide
6. Pyrodoxine hydrochloride
7. Folic acid
8. Cyanocobalamine
9. Cephalexin
10. Alkaloid (by non-aqueous titration).
11. Ibuprofen by volumetric method
12. Aspirin by volumetric method
13. Degradation of ephedrine to benzoic acid
14. Assay of benzocaine/procaine by diazotization

REFERENCES

1. Practical Medicinal Chemistry (Synthesis & Analysis) by Prof. K.N.Jayaveera; S.M.Enterprises.
2. A.I. Vogel, Text Book of Practical Organic Chemistry, 5th Edition. Pearson, Prentice Hall.
3. F.G. Mann & B.C. Saunders, Pratical Organic Chemistry, 4th Edition. Pearson Publishers.

LIST OF MINIMUM EQUIPMENT REQUIRED

1. Water bath
2. Suction pumps
3. Analytical/physical balance
4. Triple beam balance
5. Reflux flask with condenser
6. Hot plates
7. Refrigerator
8. Mechanical and magnetic stirrer with thermostat
9. Distillation unit
10. Oven
11. Adequate glasswares

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy IV –II Semester	**T**	**P**	**C**
	3	**0**	**3**

(9R01801) NOVEL DRUG DELIVERY SYSTEMS & REGULATORY AFFAIRS

UNIT-I

Oral Control Drug Delivery Systems: Fundamentals, Dissolution Contolled, Diffusion Controlled, Ion Exchange Resins, Osmotic based systems, pH Independent Systems and altered density systems.

UNIT – II

Transdermal Drug Delivery Systems: Fundamentals, types of TDDS, Materials Employed and Evaluation of TDDS.

UNIT - III

Mucoadhesive Delivery Systems: Mechanism of bioadhesion, mucoadhesive materials, forumulation and evaluation of mucoadhesive-based systems.

UNIT – IV

Targeted Drug Delivery Systems: Fundamentals and applications, formulation and evaluation of liposomes, resealed erythrocytes and nano particles.

UNIT-V

Introduction Drug Regulatory Agencies: Indian CDSCO, US FDA, Canadian HPFBI, and Australian TGA

Introduction to NDA & ANDA Submissions of USFDA

UNIT-VI

Introduction to quality assurance activities related to warehouse control, manufacturing control, packaging control and quality control.

UNIT-VII

Introduction to Good Manufacturing Practices: Schedule – M (India), CFR 21 Part 210 and 211 of US FDA.

UNIT-VII

Introduction to Validations: Process validation (prospective, retrospective & concurrent), analytical method validation (accuracy, precision, specificity, linearity, range, robustness etc.), cleaning validation (sampling procedure and acceptance criteria)

TEXT BOOKS

1. Novel Drug Delivery System by Dr. Y.Sudhakar and Prof.K.N.Jayaveera; S.Chand Co.,
2. N.K. Jain, Advances in Control & Novel drug delivery , CBS Publishers.
3. L. Lachman, H.A, Lieberman and J.L. Kanig, Theory & Practice of industrial pharmacy by, Lea & Febieger, Philadelphia Latest Edn.

REFERENCES

1. Leon Shargel Isadore Kanfer, Generic Drug Product Development, Solid Oral Dosage Forms, Marcel Dekker.
2. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences
3. E.A Rawlkins, Bentley's Text Book of Pharmaceutics, Elbs publ
4. HC Ansel, Introduction to Pharmaceutical Dosage forms 3rd Indian Ed; K M Varghese & Co., Bombay
5. S.H. Willing, M.M Tucherman and W.S. Hitchings IV, Good Manufacturing Practices for Pharmaceuticals: A Plan for Total Quality Control, Marcel Dekker, Inc., New York
6. Gilbert S. Banker and Christopher T Rhodes, Modern Pharmaceutics, IVth ed, marcel dekker, usa, 2005.
7. Yiew Chien, novel drug delivery systems, 2nd ed, marcel dekker 2003.
8. Robert. A. Nash, Pharmaceutical Process Validation, 3rd Ed Marcel Dekker, 2003.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy IV –II Semester	**T**	**P**	**C**
	3	**0**	**3**

(9R01802) PHARMACEUTICAL BIOTECHNOLOGY

UNIT - I

Fermentation Technology: Isolation, Selection, Screening of Industrial important microbes, Strain improvement. Types, design & operation of Bioreactor. Types of fermentations, optimization of fermentation process, Principle and Procedure involving in downstream process and effluent treatment.

UNIT - II

Specific Fermentations: Selection of organism, fermentation & purification of various antibiotics like penicillin, streptomycin, tetracyclin, erythromycin, vitamins like riboflavin and cyanocobalamine, organic acids like lactic acid, alcohol, acetone etc.

UNIT - III

Microbial Transformations: Types, Methods of bioconversions & Application in Pharma Industry, Steroidal transformation.

UNIT – IV

Recombinant DNA Technology: Introduction to r-dna technology and genetic engineering, steps involved, isolation of enzymes, vectors, recombination and cloning of ggenes.

Production of bio technology derived therapeutic proteins like humulin, humatrop, activase, intron a, monoclonal antibodies by hybridoma technique, recombivax HB(hepatitis b).

UNIT – V

Immunology & Immunological Preparations: Principles of Immunity, Humoral immunity, cell mediated immunity, antigen – antiboby reactions, hypersensitivity and its applications.

Active & passive immunizations vaccine preparation, standardization & storage of BCG, cholera, smallpox, polio, typhus, tetanus toxoide, immuno serum & diagnostic agents.

UNIT – VI

Enzyme Technology: Techniques of immobilization of enzymes, factors affecting enzyme kinetics, advantages of immobilization over isolated enzymes.

Study of enzymes such as hyaluronidas, penicillinase, streptokinase, streptodornase, amylase, protease etc. immobilization of bacteria & plant cells.

UNIT - VII

Introduction, role, collection, process & storage of blood products, plasma substitutes and sutures & ligatures like whole human blood, human normal ig, dextran, catgut etc.

UNIT – VIII

Introductory study & applications of bioinformatics, proteomics and genomics.

TEXT BOOKS

1. Pharmaceutical biotechnology by Dr.K.Tarakaram and Prof.K.N.Jayaveera, S.Chand & Co.,
2. Wulf Crueger and Anneliese Crueger, Biotechnology, 2nd Ed, Publ-Panima publication co-operation, New Delhi.
3. P. F. Stanbury & A. Whitaker, Principles of fermentation technology, Pergamon Press
4. J. D. Watson, Recombinant DNA technology. 2nd Edition, W.H. Freemann1992.

REFERENCES

1. Prescott and Dunne, "Industrial Microbiology" MC Graw Hill Book Company
2. K. Kielsliched "Biotechnology" Vol 6, Verlegchemic, Switzerland.
3. PF Standury & A. Whitaker, "Principles of fermentation Technology" Pergamon Press, Oxford
4. A. Wiseman, Handbook of enzyme biotechnology. 3rd Edition Elis Horwood

5. Alexander N. Glazer & Hiroshi Nikaido, Microbial biotechnology, W. H. Freeman Co.
6. Attwood.T.K, Introduction to Bio Informatics. Pearson Education, South Asia,2007.
7. Casida, Industrial microbiology. New Age International 1968, 1st Edition.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy IV –II Semester	**T**	**P**	**C**
	3	**0**	**3**

(9R01803) MEDICINAL CHEMISTRY – III

Note:

***A study of the following classes of drugs including introduction, classification with examples of structures, mechanism of action, SAR and metabolism. Synthesis of compounds specified against each class is to be studied* for the following UNITS**

UNIT – I

Drugs acting on Cardio-vascular diseases:

General account of cardiovascular diseases

Antihypertensives Methyldopa, amlodipine, enalapril, losartan.

UNIT – II

Anti-arrhythmics – Procainamide

Diuretics – Acetazolamide, hydrochlorthiazide, furosemide

Anticoagulants, Anti-anginals and Coronary vasodilators – Isosorbide dinitrate, verapamil, diltiazem

UNIT – III

Antihyperlipidemics (Hypocholesteremic drugs)- Clofibrate. A brief account on statins

General account on pancreatic and thyroid hormonal malfunctions.

Antidiabetics – Phenformin, Glipizide including a brief account on PPAR inhibitors, Meglitinide analogues,

α-Glucosidase inhibitors – Acarbose, Miglitol

Drugs affecting Thyroid Function: Methimazole, Propylthiouracil, Insulin preparations

UNIT – IV

Analgesics and NSAIDS (Non-steroidal anti-inflamatory agents):

i. Introduction and types of pain and inflammation
ii Classification and systematic development of analgesics of morphine, mild analgesics and strong analgesics: Meperidine and Methadone
iii. NSAIDS – Aspirin, paracetamol, oxyphenbutazone, ibuprofen, indomethacin, diclofenac and meloxicam
iv. A brief account on Cox-2 inhibitors and Nimsulide.

UNIT – V

Chemotherapeutic Agents:

Sulpha drugs -Sulphadiazine, Suphasalzine, Trimethoprim, Sulphamethoxazole
Anti viral Drugs -Acyclovir, Zidovudine
Antifungal Agents -Fluconazole and Itraconazole.

UNIT – VI

Anti tubercular agents :Isonicotinic acid hydrazide and ethambutol,
Anti leprotic agents :Dapsone, clofazemine
Antiamoebics :Metronidazole, diloxanide furoate

UNIT - VII

Anthelmintics :Diethylcarbamazine citrate, pyrantel pamoate, mebendazole, albendazole
Antimalarial drugs :Chloroquine, primaquine and pyrimethamine, norflaxacin and ciprofloxacin

UNIT – VIII

Anticancer Drugs :Chlorambucil, busulphan, procarbazine, carmustine, 5-flurouracil, 5-mercaptopurine methotrexate, vinca alkaloids – vinblastin,vincristine

TEXT BOOKS

1. William O. Foye, Textbook of Medicinal Chemistry, Lea Febiger, Philadelphia.
2. An Introduction to Medicinal Chemistry by Graham. L. Patrick, Oxford University publishers.
3. JH Block & JM Beale (Eds), Wilson & Giswold's Text book of organic Medicinal Chemistry and pharmaceutical chemistry, 11th Ed, Lipcott, Raven, Philadelphia, 2004
4. Rama Rao Nadendla, Medicinal Chemistry; Mc Millan Publishers.

REFERENCES

1. C. Hansch, Comprehensive medicinal chemistry, Vol 1 – 6 Elsevier pergmon press, Oxford
2. D. Abraham (Ed), Burger Medicinal chemistry ad Drug discovery, Vol. 1 & 2. John Wiley & Sons, New York 2003, 6th Ed.
3. M. Atherden, Bentley and Driver's Textbook of Pharmaceutical Chemistry Ed: l.Oxford University Press, Delhi.
4. Daniel lednicer, Strategies for Organic Drug Synthesis and Design, John Wiley, N. Y. 1998.
5. D. Lednicer, Organic drug synthesis, Vol, 1 – 6, J.Wiley N.Y.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy IV –II Semester	**T**	**P**	**C**
	3	**0**	**3**

(9R01804) PHARMACOGNOSY – III

UNIT – I

Evaluation of crude drugs.

Adulteration of curde durgs and their detection by

i) Organoleptic
ii) Microscopic
iii) Physical
iv) Chemical and Biological methods of evaluation

UNTI - II

Phytochemical Screening: Identification & isolation of plant constituents, identification and estimation of various functional groups in phytoconsitituents.

UNIT – III

Introudction, classfication and study of different chromatographic methods and their applications in evaluation of crude drugs.

UNIT – IV

Plant Tissue Cultue: History, types, media requirements, methodology for establishment of cultures, growth measurements and applications.

UNIT – V

Study of traditional drugs: Common and vernacular names, sources, chemical constituests and uses of kantakari, malkanguni, shatavari, sankhapushphi, tylophora, bilva, kalijeeri, rasna, apamarga, gokhru, gudhuchi, bach, amla, methi, guggul, kalimusli, punarnava, chitrak and brahmi.

UNIT – VI

Herbal Formulations

a. General introduction to alternative systems of medicine like Ayurveda, Siddha, Unani and Homoeopathy.
b. Methods of preparation of formulations in Ayurveda like churnas, lehyas, tailas, bhasmas, asavas and arishta.

UNIT – VII

Herbal Formulations

a. ***General introduction to cosmeceuticals role of herbs in cosmetics***: Study of the following drugs. Amla, henna, cyperus, soap nut, aloe vera, turmeric, sandal wood, bitter organge peel
b. ***Definition and study of Neutraceuticals***: Garlic, spirulina, soya and royal jelly.

UNIT – VIII

Introduction and importance of herbal medicine, herbal cosmetics and herbal drug industry.

TEXT BOOKS

1. Text Book of Pharmacognosy and Phytochemistry by Prof. B.Duraiswamy Dr. G.S.Kumar and Prof K.N. Jayaveera. S.Chand & Co 2010
2. Kokate C.K , Purohit AP & Gokhale S.B, The Pharmacognosy ; Nirali Prakashan, Pune.
3. Trease, G.E and Evans WC, Pharmacognosy ; Bailliers and Tindall, Easboume UK.
4. Tyler,VC, Brady. L.R & Roberts.J E Pharmacognosy Lea and Febiger, Philadelphia.

REFERENCES

1. Khare C.P, Indian Medicinal plants – An Illustrated dictionary
2. Atal C.R & Kapur B.M, Cultivation & Utilization of Medicinal Plants; RRL Jammu.
3. Wallis, Textbook of pharmacognosy, Pub by CBS Publishers and distributors, New Delhi.
4. Ayurvedic Pharmacopoeia of India, Pub by Govt. Of India
5. Herbal Drug Industry Eastern Publishers., New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy IV –II Semester	**T**	**P**	**C**
	4	**0**	**4**

(9R01805) CLINICAL PHARMACY AND THERAPEUTICS

UNIT – I

Introduction to Clinical Pharmacy

UNIT – II

Basic concepts of Pharmacotherapy

i. Clinical Pharmacokinetics and individualization of Drug Therapy.
ii. Special precautions in drugs usage during infancy and in the elderly (Pediatrics & Geriatrics).
iii. Special precautions in drugs usage during pregnancy & lactation
iv. Adverse Drug Reactions
v. The Basics of Drug Interactions
vi. Interpretation of Clinical laboratory Tests.

UNIT – III

Important Disorders of Organ Systems and their Management:

a. ***Cardiovascular Disorders***: Hypertension, congestive heart failure, angina, acute myocardial infarction, cardiac arrhythmias
b. ***CNS Disorders***: Epilepsy, parkinsonism, schizophrenia depression

UNIT – IV

a. ***Respiratory Disease:*** Asthma.
b. ***Gastrointestinal Disorders:*** Peptic Ulcer Disease, Ulcerative Colitis, Hepatitis, and Cirrhosis.

UNIT –V

a. ***Endocrine Disorders:*** Diabetes mellitus and Thyroid Disorders.
b. ***Infectious Diseases****:* Tuberculosis, Urinary Tract Infefction, Enteric Infections,

UNIT – VI

Upper Respiratory Infections.

a. ***Hematopoietic Disorders***: Anemias.
b. ***Joint and Connective Tissue Disorders***: rheumatic diseases, gout and Hyperuricemia.
c. ***Neoplastic Diseases***: Acute leukaemias, Hodgkin's disease

UNIT – VII

Therapeutic Drug Monitoring

UNIT – VIII

Concept of Essential Drugs and Rational Drug use.

TEXT BOOKS

1. Katzung, B.G.Basic and Clinical Pharmacology, Prentice hall, International.
2. Laurence, DR and Bennet PN. Clinical Pharmacology, Scientific book agency
3. Dr. D.R Krishna, V. Klotz, Clinical pharmaco kinetics, Publ Springer Verlab
4. M Rowland and T N Tozer, "Clinical Pharmacokinetics" 2nd ed Lea & Febiger, NY.

REFERENCES

1. Lippincott Williams and Wilkins: Remington Pharmaceutical Sciences, 20th Edition.
2. Stockley's "Drug Interaction" by Karen Baxter 8th Edition, Pharmacentical press.
3. Grahame smith and Aronson, Clinical pharmacology and drug therapy
4. Richard A Helms, Text Book of Therapeutics Drug and Disease Management 8th Edition Lippin Colt Williams & Wilkins.
5. Herfindal E T and Hirschman JL, Williams and Wilkins, Clinical Pharmacy and therapeutics, Lippincolt Williams & Wilkins.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy IV –II Semester	**T**	**P**	**C**
	0	**3**	**2**

(9R01807) NOVEL DRUG DELIVERY SYSTEMS AND REGULATORY AFFAIRS LAB

1. Preparation and Evaluation of Matrix Tablets
2. Formualtion and Evaluation of Film Coated Tablets.
3. Formualtion and Evaluation of Enteric Coated Tablets.
4. Prepartion and Evaluation of Transdermal Drug Delivery Systems.
5. Formulation and Evaluation of Mucoadhesive Delivery Systems.
6. Evaluation of Market SR Formualtions.
7. Preparation and Evaluation of Alginate Beads.
8. Analytical Method Validation.
9. Assignment on Product development and filing to various regulatory agencies , FDA,MCC, EMEA,TGA.Etc (Ref.: www.fda.gov)

LIST OF MINIMUM EQUIPMENT REQUIRED

1. Coating pans and machine
2. Fluidised bed dryer/spray dryer
3. Vaccum dryer
4. Humidifier and de-humidifier
5. Mechanical shifter
6. Adequate glasswares
7. Mechanical and magnetic stirrer with thermostat
8. Analytical/physical balance

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy IV –II Semester	**T**	**P**	**C**
	0	**3**	**2**

(9R01808) PHARMACEUTICAL BIOTECHNOLOGY LAB

1. Isolation of antibiotic producing microorganism from soil.
2. Enzyme immobilization by Ca-alginate method.
3. Determination of minimum inhibitory concentration of the given antibiotic.
4. Collection, Processing, Storage and fractionation of blood.
5. Standardization of Cultures.
6. Microbiological assay of Antibiotics / Vitamins.
7. Production of alcohol by fermentation techniques.
8. Comparison of efficacy of immobilized cells.
9. Isolation of mutants by gradient plate technique.
10. Preparation of bacterial vaccine.
11. Preparation of blood products / Human normal immunoglobulin injection.
12. Extraction of DNA and RNA and their extimations by colorimetry.
13. Separation techniques: Various types of Gel Electro Phoresis, Centrifugation.

Text Books:

1. Biochemical Techniques (A Practical Approach)by Prof.K.N.Jayaveera and Dr.K.Tarakaram, Himalaya publishing House, Mumbai

LIST OF MINIMUM EQUIPMENT REQUIRED

1. Mictropipettes
2. Eppendorf's tubes
3. Ultra centrifuge
4. Dessicators

5. Gel electrophoresis unit
6. Small scale bioreactor
7. Syringes
8. laminar flow bench
9. Autoclave
10. Hot air oven
11. BOD incubator
12. Rotary shaker
13. Anerobic jar
14. Colorimeter
15. Adequate glassware

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy IV –II Semester	**T**	**P**	**C**
	0	**3**	**2**

(9R01809) MEDICINAL CHEMISTRY – III LAB

Assay of some drugs from their formulations:

1. Sulpha methoxazole (anti bacterial)
2. Glibenclamide (hypoglycemic agent)
3. Metronidazole (antiprotozoal)
4. Ibuprofen (analgesic, antiinflammatory)
5. Furosemide (diuretic)
6. Isoniazid (anti tubercular)
7. Aspirin (analgesic, antipyretic, antiinflamatory and antithrombotic)
8. Phenytoin (anticonvulsant)
9. Phenobarbitol (sedative and hypnotic)
10. Diethylcarbamizine (antihelmintic)
11. Salbutamol (antiasthamatic)
12. Phenyl butazone (anti inflammatory)
13. compound benzoic acid (anti fungal)

REFERENCES

1. Practical Medicinal Chemistry (Synthesis & Analysis) by Prof. K.N.Jayaveera; S.M.Enterprises.
2. I.P. – 1996.
3. P.D.Sethi – Quantative Analysis of Drugs in Pharmaceuticals. Formulations, CBS Publishers.
4. B.P. - 2004.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Pharmacy IV –II Semester	**T**	**P**	**C**
	0	**3**	**2**

(9R01810) PHARMACOGNOSY – III LAB

1. Determination of proximate values
   a. Moisture content
   b. Ash value
   c. Extractive values.

2. Identification test for enzymes (diastase, papain, pepsin, trypsin and pancreatin)

3. Isolation and separation of phytopharmaceutical
   a. aloin from aloe
   b. caffeine from tea leaves
   c. ammonium glycerrhizinate from liquorice
   d. Quinine from cinchona
   e. Androgophalides from aswagandha
   f. Calium sennoside from senna leaves/cascara.

4. Estimation of caffeine, aloin and quinine, curcumin

5. Evaluation of crude drugs by powder microscopy
   a. Ashwagandha
   b. Kalmegh
   c. Vasaka
   d. Punarnava
   e. Gokhru
   f. Tinospora cardifolia
   g. Chirata

TEXT BOOKS:

1. Practical Pharmacognosy by Dr.B.Durai Swamy and Prof K.N.Jayaveera, S.Chand & Co.,

LIST OF MINIMUM EQUIPMENT REQUIRED

1. Water bath
2. Hotplates
3. Soxhlet extractor
4. Microsocpes
5. Glass slides
6. Muffle furnace
7. Incinerator
8. Crucible
9. Colorimeter
10. Analytical balance
11. Heating mantle
12. Adequate glasswares