ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

B.PHARMACY

For

B.PHARMACY FOUR YEAR DEGREE COURSE
(Applicable for the batches admitted from 2013-14)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533003, ANDHRA PRADESH, INDIA.
Academic Regulations (R13) for B. Pharm. (Regular)

Applicable for the students of B. Pharm. (Regular) from the Academic Year 2013-14 onwards

1. **Award of B. Pharm. Degree:**
   A student will be declared eligible for the award of the B.Pharm Degree if he fulfills the following academic regulations:
   
   1.1 Pursued a course of study for not less than four academic years and not more than eight academic years.
   
   1.2 Register for all the 180 credits and secure all the 180 credits.

2. **Distribution and Weightage of Marks:**
   
   i. The performance of a student in each semester shall be evaluated subject – wise with a maximum of 100 marks for theory and 75 marks for practical subject. The project work shall be evaluated for 200 marks.
   
   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 2 tests. The weightage of Internal marks for 30 consists of Descriptive – 15, Assignment - 05 (Theory, Design, Analysis, Simulation, Algorithms, Drawing, etc. as the case may be) Objective -10 (Conducted at College level with 20 Multiple choice question with a weightage of ½ Mark each). The objective examination is for 20 minutes duration. The subjective examination is for 90 minutes duration conducted for 15 marks. Each subjective type test question paper shall contain **3 questions** and all questions need to be answered. The Objective examination conducted for 10 marks and subjective examination conducted for 15 marks are to be added to the assignment marks of 5 for finalizing internal marks for 30. The best of the two tests will be taken for internal marks. As the syllabus is framed for 6 units, the 1st mid examination (both Objective and Subjective) is conducted in 1-3 units and second test in 4-6 units of each subject in a semester.
   
   iv. The end semester examination is conducted covering the topics of all Units for 70 marks. Part – A contains a mandatory question (Brainstorming / Thought provoking / case study) for 22 marks. Part – B...
has 6 questions (One from each Unit). The student has to answer 3 out of 6 questions in Part – B and carries a weightage of 16 marks each.

v. For practical subjects there shall be continuous evaluation during the semester for 25 internal marks and 50 end examination marks. Of the 25 marks for internal, 15 marks shall be awarded as follows: day to day work 10 and Record-5, and 10 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the teacher concerned and external examiner.

vi. For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 30 marks for internal evaluation (20 marks for day – to – day work, and 10 marks for internal tests) and 70 marks for end examination. There shall be two internal tests in a Semester and the better of the two shall be considered for the award of marks for internal tests.

vii. 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, which shall be evaluated by the Departmental committee consisting of Head of the department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for seminar.

viii. 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 the committee. The committee consists of an external examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be conducted at the end of the IV year. The Internal Evaluation shall be on the basis of two seminars given by each student on the topic of his project and evaluated by an internal committee.

ix. Laboratory marks and the internal marks awarded by the College are not final. The marks are subject to scrutiny and scaling by the University wherever felt desirable. The internal and laboratory marks awarded by the College will be referred to a Committee. The Committee shall 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. The laboratory records and internal test papers shall be preserved in the respective departments as per the University norms and shall be produced to the Committees of the University as and when they ask for.

x. There shall be a Comprehensive Viva-Voce in IV year II semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of (i) Head of the Department (ii) two Senior Faculty members of the Department. The Comprehensive Viva-Voce is aimed to assess the students’ understanding in various subjects he / she studied during the B.Pharm course of study. The Comprehensive Viva-Voce is valued for 100 marks by the Committee. There are no internal marks for the Comprehensive viva-voce.

3. **Attendance Requirements:**
   a. A student is eligible to write the University examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.
   b. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.
   c. Shortage of Attendance below 65% in aggregate shall not be condoned.
   d. A student who is short of attendance in semester may seek re-admission into that semester when offered within 4 weeks from the date of the commencement of class work.
   e. Students whose shortage of attendance is not condoned in any semester are not eligible to write their end semester examination of that class.
   f. A stipulated fee shall be payable towards condonation of shortage of attendance.
   g. A student will be promoted to the next semester if he satisfies the attendance requirement of the present semester and (ii) credits.
   h. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

4. **Minimum Academic Requirements:**
   The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no. 3.
i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or practical subject 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.

ii. A student shall be promoted from first year to second year if he fulfills the minimum attendance requirement.

iii. A student will be promoted from II year to III year if he fulfills the academic requirement of 40% of the credits up to II year I semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II year II semester.

iv. A student shall be promoted from III year to IV year only if he fulfills the academic requirements of 40% of the credits up to III year I semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.

v. A student shall register and put up minimum attendance in all 180 credits and earn all the 180 credits. Marks obtained in all the 180 credits shall be considered for the calculation of percentage of marks.

5. **Course pattern:**
   5.1 The entire course of study is for four academic years, all years on semester pattern.
   5.2 A student, eligible to appear for the end semester examination in a subject, but absent from it or has failed in the end semester examination, may write the exam in that subject when conducted next.
   5.3 When a student is detained for lack of credits/shortage of attendance, he may be re-admitted into the same semester / year in which he has been detained. However, the academic regulations under which he was first admitted, shall continues to be applicable to him.

6. **Award of Class:**
   After a student has satisfied the requirements prescribed for the completion of the program and is 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
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%

From the aggregate marks secured from 180 Credits.

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

7. **Minimum Instruction Days:**
   The minimum instruction for each semester shall be 90 clear instruction days.

8. **WITHHOLDING OF RESULTS**
   If the student has not paid the dues, if any, to the university or if any case of indiscipline is pending against him, the result of the student will be withheld and he will not be allowed into the next semester. His degree will be withheld in such cases.

9. **TRANSITORY REGULATIONS**
   9.1 Discontinued or detained candidates are eligible for readmission as and when next offered.
   9.2 After the revision of the regulations, the students of the previous batches will be given two chances for passing in their failed subjects, one supplementary and the other regular. If the students cannot clear the subjects in the given two chances, they shall be given equivalent subjects as per the revised regulations which they have to pass in order to obtain the required number of credits.
   9.3 In case of transferred students from other Universities, the credits shall be transferred to JNTUK as per the academic regulations and course structure of the JNTUK.

10. **General:**
    10.1 Where the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

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10.2 The academic regulation should be read as a whole for the purpose of any interpretation.

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

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

10.5 The students seeking transfer to colleges affiliated to JNTUK from various other Universities/Institutions have to pass the failed subjects which are equivalent to the subjects of JNTUK, and also pass the subjects of JNTUK on their own without the right to sessional marks which the candidates have not studied at the earlier Institution.
Academic Regulations (R13) for B. Pharm.  
(Lateral Entry Scheme)

Applicable for the students admitted into II year B. Pharm. (LES) from the Academic Year 2014-15 and onwards

1. The Students have to acquire 138 credits from II to IV year of B.Pham program (regular) for the award of the degree.

2. Students, who fail to fulfil the requirement for the award of the degree in 6 Consecutive academic years from the year of admission, shall forfeit their seat.

3. The same attendance regulations are to be adopted as that of B.Pham (Regular).

4. Promotion Rule:
   A student shall be promoted from III year to IV year only if he fulfils the academic requirements of 40% of the credits up to III year I semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.

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

<table>
<thead>
<tr>
<th>Class Awarded</th>
<th>% of marks to be secured</th>
<th>From the aggregate marks secured from 138 Credits from II year to IV year.</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Class with</td>
<td>70% and above</td>
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<tr>
<td>Distinction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First Class</td>
<td>Below 70% but not less than 60%</td>
<td></td>
</tr>
<tr>
<td>Second Class</td>
<td>Below 60% but not less than 50%</td>
<td></td>
</tr>
<tr>
<td>Pass Class</td>
<td>Below 50% but not less than 40%</td>
<td></td>
</tr>
</tbody>
</table>
MALPRACTICES RULES
Disciplinary Action for / Improper Conduct in Examinations

<table>
<thead>
<tr>
<th>Nature of Malpractices / Improper conduct</th>
<th>Punishment</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the candidate:</td>
<td></td>
</tr>
<tr>
<td>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)</td>
<td>Expulsion from the examination hall and cancellation of the performance in that subject only.</td>
</tr>
<tr>
<td>(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.</td>
<td>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.</td>
</tr>
<tr>
<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td>3. Impersonates any other candidate in connection with the examination.</td>
<td>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</td>
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<tr>
<td>1</td>
<td>B.PHARMACY 11</td>
</tr>
<tr>
<td>2</td>
<td>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.</td>
</tr>
<tr>
<td>3</td>
<td>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.</td>
</tr>
<tr>
<td>4</td>
<td>Cancellation of the performance in that subject.</td>
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<td>5</td>
<td>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.</td>
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<td>4.</td>
<td>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.</td>
<td>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. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.</td>
</tr>
<tr>
<td>5.</td>
<td>Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.</td>
<td>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. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.</td>
</tr>
<tr>
<td>6.</td>
<td>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.</td>
<td>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. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.</td>
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</tr>
<tr>
<td>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 misconduct or has the tendency to disrupt the orderly conduct of the examination.</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.</td>
<td>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.</td>
</tr>
<tr>
<td>8.</td>
<td>Possess any lethal weapon or firearm in the examination hall.</td>
<td>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.</td>
</tr>
<tr>
<td>9.</td>
<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td>10.</td>
<td>Comes in a drunken condition to the examination hall.</td>
<td>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.</td>
</tr>
<tr>
<td>11.</td>
<td>Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.</td>
<td>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.</td>
</tr>
<tr>
<td>12.</td>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

**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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Prohibition of ragging in educational institutions Act 26 of 1997

Salient Features

- Ragging within or outside any educational institution is prohibited.
- Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student.

<table>
<thead>
<tr>
<th>Imprisonment up to</th>
<th>Fine Upto</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teasing, Embarrassing &amp; Humiliation</td>
<td>6 Months + Rs. 1,000/-</td>
</tr>
<tr>
<td>Assaulting or Using Criminal force or Criminal intimidation</td>
<td>1 Year + Rs. 2,000/-</td>
</tr>
<tr>
<td>Wrongfully restraining or confining or causing hurt</td>
<td>2 Years + Rs. 5,000/-</td>
</tr>
<tr>
<td>Causing grievous hurt, kidnapping or Abducts or rape or committing unnatural offence</td>
<td>5 Years + Rs. 10,000/-</td>
</tr>
<tr>
<td>Causing death or abetting suicide</td>
<td>10 Months + Rs. 50,000/-</td>
</tr>
</tbody>
</table>

In Case of Emergency CALL TOLL FREE No. : 1800 - 425 - 1288

LET US MAKE JNTUK A RAGGING FREE UNIVERSITY
Ragging

ABSOLUTELY NOT TO RAGGING

1. Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.
2. Ragging entails heavy fines and/or imprisonment.
3. Ragging invokes suspension and dismissal from the College.
4. Outsiders are prohibited from entering the College and Hostel without permission.
5. Girl students must be in their hostel rooms by 7.00 p.m.
6. All the students must carry their Identity Cards and show them when demanded.
7. The Principal and the Wardens may visit the Hostels and inspect the rooms any time.

Jawaharlal Nehru Technological University Kakinada
For Constituent Colleges and Affiliated Colleges of JNTUK

In Case of Emergency CALL TOLL FREE No. : 1800 - 425 - 1288

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## COURSE STRUCTURE

### I Year – I SEMESTER

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>English</td>
<td>3 + 1</td>
<td>--</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Remedial Mathematics/ Remedial Biology</td>
<td>3/2 + 1</td>
<td>--</td>
<td>3/2</td>
</tr>
<tr>
<td>3</td>
<td>Human Anatomy &amp; Physiology – I</td>
<td>3 + 1</td>
<td>--</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Dispensing Pharmacy &amp; Ethics</td>
<td>3 + 1</td>
<td>--</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Pharmaceutical Organic Chemistry-I</td>
<td>3 + 1</td>
<td>--</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>English Communications Skills Lab</td>
<td>--</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Remedial Biology Lab</td>
<td>--</td>
<td>2</td>
<td>0/1</td>
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<tr>
<td>8</td>
<td>Dispensing Pharmacy Lab</td>
<td>3</td>
<td>2</td>
<td></td>
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<tr>
<td>9</td>
<td>Pharmaceutical Organic Chemistry-I Lab</td>
<td>3</td>
<td>2</td>
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<tr>
<td></td>
<td><strong>Total Credits</strong></td>
<td></td>
<td></td>
<td><strong>21</strong></td>
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</table>

### I Year – II SEMESTER

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Human Anatomy &amp; Physiology – II</td>
<td>3 + 1</td>
<td>--</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Pharm. Inorganic Chemistry</td>
<td>3 + 1</td>
<td>--</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Pharm. Organic Chemistry – II</td>
<td>3 + 1</td>
<td>--</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Physical Pharmacy – I</td>
<td>3 + 1</td>
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<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Computer Applications &amp; Biostatistics</td>
<td>3 + 1</td>
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<td>3</td>
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<tr>
<td>6</td>
<td>Human Anatomy &amp; Physiology Lab</td>
<td>--</td>
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<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Physical Pharmacy – I Lab</td>
<td>--</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Computer Applications Lab</td>
<td>--</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><strong>Total Credits</strong></td>
<td></td>
<td></td>
<td><strong>21</strong></td>
</tr>
</tbody>
</table>

### II Year – I SEMESTER

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pharmaceutical Unit Operations - I</td>
<td>3 + 1</td>
<td>--</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Pharmacognosy - I</td>
<td>3 + 1</td>
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<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Physical Pharmacy - II</td>
<td>3 + 1</td>
<td>--</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Pharmaceutical Microbiology</td>
<td>3 + 1</td>
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<td>3</td>
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<tr>
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### II Year – II Semester

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**Total Credits** 21

### III Year – I Semester

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**Total Credits** 21

### III Year – II Semester

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**Total Credits** 24
### IV Year – I SEMESTER

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<td>Chemistry of Natural Products</td>
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### IV Year – II SEMESTER

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SYLLABUS

I Year – I SEMESTER

ENGLISH

T P C
3+1 0 3

DETAILED TEXT-I : Recommended Topics :

1. THE KNOWLEDGE SOCIETY- APJ KALAM (RAVINDRA PUBLISHERS)

   OBJECTIVE: To make the learners rediscover India as a land of Knowledge.

   OUTCOME: The learners will achieve a higher quality of life, strength and sovereignty of a developed nation.

2. MAN’S PERIL (RAVINDRA PUBLISHERS)

   OBJECTIVE: To inform the learner that all men are in peril.

   OUTCOME: The learner will understand that all men can come together and avert the peril.

3. IN LONDON : M.K. GANDHI (RAVINDRA PUBLISHERS)

   OBJECTIVE: To apprise the learner how Gandhi spent a period of three years in London as a student.

   OUTCOME: The learner will understand how Gandhi grew in introspection and maturity.

4. PRINCIPLES OF GOOD WRITING: L.A. HILL (RAVINDRA PUBLISHERS)

   OBJECTIVE: To inform the learners how to write clearly and logically.

   OUTCOME: The learner will be able to think clearly and logically and write clearly and logically.

Text Book: ‘Sure Outcomes’ by Orient Blak Swan Pvt. Ltd Publishers

NON-DETAILED TEXT:
(From Modern Trailblazers of Orient Blackswan)
(Common single Text book for two semesters)
(Semester I (1 to 4 lessons)/ Semester II (5 to 8 lessons))

1. G.D. Naidu
OBJECTIVE: To inspire the learners by G.D. Naidu’s example of inventions and contributions.

OUTCOME: The learner will be in a position to emulate G.D. Naidu and take to practical applications.

2. G.R. Gopinath

OBJECTIVE: To inspire the learners by his example of inventions.

OUTCOME: Like G.R. Gopinath, the learners will be able to achieve much at a low cost and help the common man.

3. Sudhamurthy

OBJECTIVE: To inspire the learners by the unique interests and contributions of Sudha Murthy.

OUTCOME: The learner will take interest in multiple fields of knowledge and make life worthwhile through social service.

4. Vijay Bhatkar

OBJECTIVE: To inspire the learner by his work and studies in different fields of engineering and science.

OUTCOME: The learner will emulate him and produce memorable things.

I Year – I SEMESTER

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Remedial Mathematics – I/ Remedial Biology – I
Remedial Mathematics – I (50 Hrs)
(For Biology stream students)

UNIT I

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

10

UNIT II

Trigonometry: Trigonometric ratios and the relations between them Sin (A+B), Cos (A+B), Tan (A+B) formulae only. Trigonometric ratios of multiple angles-Heights and distances (simple 000 problems there on).

10

UNIT III

Co-ordinate Geometry: Distances between points-Area of a triangle, Co-ordinates of a point dividing a given segment in a given ratio - locus - equation to a straight line in different forms-Angle between straight lines-point of intersection.

10

UNIT IV


05

UNIT V

Integral Calculus: Integration as on inverse process of differentiation, definite integrals, integration by substitution, integration by parts, integration of algebraic function of E^x evolution of area in simple cases.

10
UNIT VI

**Differential equations:** Formation of a differential equation, order and degree, solution of first order differential equations, Laplace transformation.

05

**TEXT BOOKS**

1. Intermediate first Year mathematics
2. Intermediate Second year mathematics, printed and published by Telugu Academy, Himayatnagar, Hyderabad
Remedial Biology – I (40Hrs)
(For Maths stream students)

UNIT I
Classification of plant kingdom: Methods of classification of plants.

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

UNIT III

UNIT IV
Chordates: Phylum Hemichordata
Phylum Chordata (Classes: Pisces, Amphibians, Reptiles, Aves, Mammals)

UNIT V

UNIT VI

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. Botnay for Degree students Vol I & II by B.P. Pandey
B.PHARMACY

I Year – I SEMESTER  

T  P  C 
3+1 0 3 

HUMAN ANATOMY & PHYSIOLOGY - I

UNIT-I

Scope of anatomy and physiology: Structure of cell, its components and their function. Elementary tissues of the human body: Epithelial, connective, muscular and nervous tissues, their sub-types and properties. 

08

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

04


04

LO: To understand different tissues are involved in the formation of organs and perform different functions. For example skeletal muscle produce by way of its contraction and relaxation produce movement of the skeletal, nerves are involved in the transmission of electrical impulses, bones form body frame, muscles produce contraction and help in movement, circulation, digestion and excretion. Epithelial tissues protect and secretes juices.

UNIT-II

Haemopoietic system: 
Composition and functions of blood, Genesis and regulation of red blood cells production, blood groups, transfusion of blood. Leukocytes, properties of white blood cells, reticulo endothelial system, blood coagulation and its mechanism, formation and circulation of lymph. Disorders of blood.

Formed elements of blood:
WBC, RBC and Platelets, Heamopoiesis and blood hormones, Blood groups and their significance, Coagulating factors, Pathways of coagulation and Mechanism of coagulation, Disorders of blood and its components disorders of coagulation. 

08

LO : Blood is involved in oxygen and carbon dioxide transport, maintenance of B.P, defense immunity and excretion.
UNIT III
Cardiovascular system:
Basic anatomy, structure and functions of the heart and blood vessels. Excitatory and conductive system of the heart, action potential in cardiac cycle, nervous regulation of heart. Systemic coronary and hepatic blood circulation, cardiac output, blood pressure in different blood vessels, blood pressure regulations and measurements. ECG of heart. Brief outline of cardiovascular disorders like hypertension, hypotension, atherosclerosis, angina, myocardial infarction, congestive heart failure and cardiac arrhythmias.

08

Lymph and Lymphatic System: Composition, formation and circulation of lymph; disorders of lymph and lymphatic system. Basic physiology and functions of spleen. 03

LO: Heart and blood vessels maintain BP, transport gases, nutrients and waste products. Their function is essential to sustain life.

UNIT IV
Respiratory System: Anatomy of respiratory organs. Functions of respiration, mechanism and regulation of respiration, respiratory volumes and vital capacity. 07

LO: To know above external and internal respiration exchanging of gases, need for oxygen for metabolism of nutrients and generation of energy and is essential for life process.

UNIT V
Digestive System: Anatomy, structure and functions of different parts of gastrointestinal tract, motility of alimentary canal and its regulation. Gastrointestinal secretions, their compositions, function and regulations. Digestion of food in mouth, stomach and small intestine and its absorption. LO: To understand digestion in various parts of GIT, enzymes and secretions involved – their functions.

UNIT VI
Urinary System: Structure and functions of Nephron, formation of urine, renal mechanism for concentrating and diluting the urine, regulation of acid-base balance, knowledge on release of renin from kidney and its functions. Regulations of blood volume and extracellular fluid volume. Disease related to kidney. 05

LO: To understand how urine is formed and various mechanisms involved in formation of urine.
TEXT BOOKS

2. C.C.Chatterjee, Human Physiology.

REFERENCES

1. A.C.Guyton, Text Book of Medical Physiology.
I Year – I SEMESTER  

T P C  
3+1 0 3

DISPENSING PHARMACY & ETHICS

UNIT-I
Dispensing Pharmacy: Principles of dispensing, form of prescription, handling of prescription, source of errors for prescription, care required in dispensing procedures including labelling 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 procedure- posology calculations of doses.
LO : To understand dispensing principles, procedures, calculations involved, doses.

UNIT-II
Principles involved and procedures adopted in dispensing of the following classes of preparations.
(i) Mixtures
(ii) Solutions – A study of the following solutions – Cresol with soap solution IP, Aqueous Iodine solution IP, Strong solution of Iodine IP, weak iodine solution IP, strong solution of Ammonium acetate.
(ii) emulsions (iv) powders (v) lotions & liniments (vi) ointments
LO : To understand principles and procedures involved in the dispensing of various categories of products.

UNIT-III
Dosage forms – Purpose, classification, definitions and general characteristics of the following dosage forms
   Solids : Tablet and capsules.
   Liquid orals : Elixirs, Syrups, Linctus, Suspensions and Emulsions.
   Liquids for external use : Lotions & liniments applications.
   Semi solids : Ointments, Creams, Gels, Suppositories and Pessaries.
LO : To understand dosage forms and their general characteristics.

UNIT-IV
Incompatibilities: Physical, chemical and therapeutic incompatibilities – methods of overcoming and handling of incompatible prescriptions.
LO: To understand incompatibility and methods of overcoming incompatibility.

UNIT-V
Extraction and galenical products: Principle and methods of extraction - preparation of infusions, tinctures, dry, soft and liquid extracts.
LO: To understand extraction and galenical products – Principles and procedures.

UNIT-VI
Pharmacy Ethics as prescribed by PCI.
LO: To understand Ethics related to Pharmacy profession as prescribed by PCI.

TEXT BOOKS
1. Cooper & Gunns Dispensing Pharmacy, CBS, Publ. and Distributors New Delhi.
2. R.M Metha, Dispensing Pharmacy.
3. NK Jain and GD Guptha, Modern Dispensing Pharmacy, Pharma Med Press.

REFERENCES
1. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences.
2. E.A. Rawlkins, Bentley’s Text Book of Pharmaceutics, Elbs publ.
3. Hoover, Dispensing of Medication.
UNIT-I
Structure and reactivity of organic molecules: Polarity of bonds, electronic effects: electromeric effect, inductive effect, mesomeric effect and Hyperconjugation and their influence on the properties of organic molecules; charged species: carbocations and carbanions, their generation, stabilities, rearrangement in the case of carbocations; Free radicals: formation and stability.

LO : Understanding the basic concepts influencing the reactivity of organic molecules, understanding the mechanisms wherever applicable, applications of the above in the interpretation of various properties of organic molecules.

UNIT-II
Alkanes and cycloalkanes: Nomenclature, general methods of preparation, chain and conformational isomerism in the case of alkenes and their relative stabilities, Bayer’s strain theory and Sachse-Mohr theory in the case of cycloalkanes and their limitations.

Alkenes: Nomenclature, general methods of preparation, characteristic electrophilic and free radical addition reactions, orientation of product formation as interpreted by Markonikov’s rule and peroxide effect (Anti-Markonikov’s rule), ozonolysis and allylic substitution.

Alkadienes: Nomenclature, stability of conjugated dienes, 1,2- and 1,4-reactions and their relative stabilities.

Alkynes: Nomenclature, general methods of preparation, characteristic reactions with emphasis on acidity of one alkynes, formation of metal acetylides, stereospecific reduction of alkynes and addition of water involving keto-enol tautomerism

LO : Structures, equations involved in the preparations, mechanism of formation or the reaction, rearrangements if any, discussion on stabilities and applications of the characteristic reactions in synthesis.

UNIT-III
Alkylhalides: Nomenclature, general methods of preparation, significance of nucleophilic substitution of alkylhalides in organic synthesis, mechanisms and salient features of S_N1 and S_N2 reactions with examples including the proof in favor of these reactions, a comparison of S_N1 and S_N2, elimination
reactions (E1 and E2): mechanisms, salient features and orientation of product formation in terms of Saytzeff’s rule and Hoffmann orientation.
LO : Structures, equations involving the methods of preparations and reactions, stabilities and applications of the reactions.

UNIT-IV
Alcohols: Nomenclature, classification, methods of preparation, industrial synthesis of ethanol and methanol, reactions of alcohols involving the replacement of hydroxyl or replacement of the hydrogen of the hydroxyl, iodoform reaction and Lucas test.
Ethers: Nomenclature, Williamson’s synthesis, action of hydroiodic acid on ethers.
LO : Structures, general properties, equations involving the methods of preparation and reactions, mechanisms, reactivities.

UNIT-V
Stereochemistry: Isomerism and its comparison to stereoisomerism, stereoisomers, optical isomers (enantiomers), characteristics of enantiomers (chirality), racemic mixtures, methods of separation of racemic mixtures, optical activity, optical rotation, specific rotation, plane of symmetry and centre of symmetry, diastereomers, their properties and required characteristics with examples as given by Fischer projection formulae; mesoform and its characteristics; Configuration: relative configuration (D and L), absolute configuration (R and S); Geometric isomerism: cis-trans isomerism and E and Z nomenclature.
LO : Stereochemical structures, importance of stereochemistry with respect to drugs as interpreted in terms of reactivity and the properties of chiral drugs.

UNIT-VI
Grignard reagent: Preparation, characteristic nucleophilic addition and substitution reactions, applications in organic synthesis and limitations.
LO : Structure, mechanism and usefulness in synthesis.

TEXT BOOKS

REFERENCES
1. R.L Madan, Organic Chemistry.
ENGLISH COMMUNICATIONS SKILLS LAB

Suggested Lab Manuals:

**OBJECTIVE:** To impart to the learner the skills of grammar as well as communication through listening, speaking, reading, and writing including soft, that is life skills.

**ADVANCED COMMUNICATION SKILLS**

UNIT 6   Body language
UNIT 7   Dialogues
UNIT 8   Interviews and Telephonic Interviews
UNIT 9   Group Discussions
UNIT 10  Presentation Skills
UNIT 11  Debates

**Text Book:**

‘Strengthen your Communication Skills’ Part-B by Maruthi Publications

**Reference Books:**

1. INFOTECH English (Maruthi Publications)
2. Personality Development and Soft Skills (Oxford University Press, New Delhi)
I Year – I SEMESTER

T  P  C
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REMEDIAL BIOLOGY LAB

1. Study of Simple and compound microscopes used in biology.
2. Section cutting, staining and mounting of sections.
3. Histological studies of the leaf, stem and root with description of their stained sections.
4. Description and study of floral characters of the plants representing the families in theory.
5. Observation of permanent slides.
I Year – I SEMESTER

DISPENSING PHARMACY LAB

1. Dispensing of prescriptions falling under the categories; Mixtures, solutions, emulsions, creams, ointments, powders, pastes, lotions, liniments, inhalations, paints, etc.

2. Identification of various types of incompatibilities in a prescription, correlation thereof and dispensing of such prescriptions.

3. Dispensing procedures involving pharmaceutical calculations, pricing of prescriptions and dosage calculations for pediatric and geriatric patients.

4. Dispensing of prescriptions involving adjustment of tonicity.

   A total 50 prescriptions are to be dispensed.
I Year – I SEMESTER

PHARMACEUTICAL ORGANIC CHEMISTRY LAB

Introduction to Equipment & Glassware
Recrystallization method, determinations of Melting point, Boiling Point 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 Nitration: Preparation of μ-Dinitrobenzene from nitrobenzene
4. Oxidation: Preparation of Benzoic acid from Benzyl chloride
5. Esterification: Preparation of n-Butyl acetate from n-Butyl alcohol
6. Etherification: Preparation of α-Naphthyl methyl ether from α-Naphthol
7. Halogenation: Preparation of lodoform from iodation of acetone
8. Extensive Nuclear Substitution: Preparation of Tribromophenol
9. Bromination of Tribromoaniline from Phenol or Aniline

II. Systematic qualitative Analysis (Identification) of Monofunctional Organic Compounds:
Avoid water-soluble compounds, and compounds containing more than one functional group; at least six individual compounds to be analyzed.

REFERENCES
I Year – II SEMESTER

T  P  C
3+1  0  3

HUMAN ANATOMY & PHYSIOLOGY – II (50 Hrs)

UNIT – I
Central Nervous System: Anatomy and physiology of different parts of brain, spinal cord and cranial nerves.
LO: Brain involvement in sensory and motor functions including pain persumption, sleep wake cycle, cognitive skills, memory, behavior and governance.

UNIT – II
Neuron, axon conduction, Neurochemical transmission, reflex action, electroencephalogram, specialized functions of the brain, and their functions.
LO: Chemical Mediators like Acetyl choline, Serotonin, Dopamine, Noradrenaline, glutamic acid, gaba involvement in transmission of impulse and disorders due to their changes.

UNIT - III
Autonomic Nervous System: Physiology and functions of sympathetic and parasympathetic nervous system. Mechanism of neurohumoral transmission in the A.N.S.
LO: Cholinergic system is Essential for life process while adrenergic system is needed to meet emergency by flight or fight. ANS works without rest through life without rest unlike CNS.

UNIT - IV
Endocrine System: Basic anatomy and physiology of pituitary, thyroid, parathyroid, adrenals, testes, ovary and endocrine functions of hormones and functions.
LO: Growth, reproduction and metabolism depend on hormonal activity. Their imbalance leads to disorders and some of them cannot be rectified.
UNIT-V

**Reproductive System:** Male and female reproductive systems and the functions of their hormones. Physiology of menstruation, Spermatogenesis and Oogenesis. 08

LO: Concept of male & female hormones, Characters, sex cell maturity, reproductive period, copulation and pregnancy, parturition, concept of pregnancy, menopause and their care.

UNIT-VI

**Sense organs:** basic anatomy and physiology of Eye, Ear, Nose, Tongue and skin. 10

LO: Sensations are the combined activities of sensory organs and specified areas of the brain.

**TEXT BOOKS**


**REFERENCES**

2. Subrhamanayam and Others, A textbook of Physiology.
UNIT-I
1. Classification of inorganic pharmaceuticals based on their applications and therapeutic uses.
2. Sources of impurities, quality control and test for purity. Limit tests for chlorides, sulphates, iron, arsenic, lead and heavy metals and their pharmacopoeial standards.
LO: Pharmaceutical orientation to inorganic chemistry, definitions, principles, procedures, limits of detection, keeping the impurities in pharmaceutical substances to the minimal level.

UNIT-II
1. Sodium, potassium and calcium replenishers: sodium chloride, compound sodium chloride solution (Ringer solution), potassium chloride, ORS.
2. Calcium replenishers: Calcium chloride, calcium gluconate, dibasic calcium phosphate.
3. Acid-base regulators: sodium bicarbonate, sodium lactate, sodium citrate/potassium citrate, sodium acetate and ammonium chloride.
7. Antidotes: Sodium thiosulphate and sodium nitrite.
LO: Properties, classification, preparation, assay of ammonium chloride, sodium thiosulfate and sodium nitrite, uses.

UNIT-III
1. Adsorbents: Light kaolin, heavy kaolin and activated charcoal.
2. Astringents: Zinc oxide and Bismuth subcarbonate.
3. Protectants: Calamine, zinc oxide, zinc state, talc and titanium dioxide.
5. **Anti-infectives:** Hydrogen peroxide solution, potassium permanganate, silver nitrate (Silver protein), iodine (Solutions of iodine, povidone-iodine) boric acid and yellow mercuric chloride.

LO: Properties, preparation wherever applicable, assay of hydrogen peroxide, potassium permanganate, boric acid, zinc oxide and uses.

**UNIT-IV:**

1. **Laxatives:** Magnesium sulphate and sodium phosphate.
2. **Haematinics:** Ferrous sulphate, Ferrous fumarate, Ferrous gluconate, Ferric ammonium citrate, Iron and dextrose injection.
3. **Suspending agents:** Bentonite and colloidal silica.
4. **Excipients:** Di and tricalcium phosphates, magnesium stearate, talc and calcium carbonate (precipitated chalk).
5. **Colorants:** Titanium oxide and ferric oxide.

LO: Properties, preparations wherever applicable, uses.

**UNIT-V**

**Dental products:**

1. **Fluorides:** Sodium fluoride and stannous fluoride.
2. **Oral antiseptics:** Hydrogen peroxide, Zinc peroxide and mouth washes.
3. **Dentifrices:** Dibasic calcium phosphate, strontium chloride and sodium metaphosphate.
4. **Cements and Fillers:** Zinc oxide.

LO: Properties, preparations wherever applicable, uses.

**UNIT-VI**

**Miscellaneous medicinal agents of inorganic nature:**

Cisplatin (Antineoplastic), lithium carbonate (Antipsychotic), barium sulfate (diagnostic agent), plaster of paris (surgical aid), sodium auorthiomalate (antirheumatic), sodium antimonygluconate (internal parasiticid) and potassium perchlorate (antithyroid).

LO: Structures, properties and uses.

**TEXT BOOKS**

2. Advanced Inorganic Chemistry by Satya prakash, G.D.Tuli

REFERENCES
1. J.H Block, E.Roche, T.O Soine and C.O. Wilson, Inorganic Medical and pharmaceutical Chemistry Lea & Febiger, Philadelphia PA.
2. P. Gundu Rao, Inorganic pharmaceutical chemistry; Vallabh Prakashan, Delhi.
UNIT-I
Benzene: Kekule’s structure, aromaticity, Huckle’s rule, resonance energy, characteristic electrophilic substitution reactions: nitration, halogenations, sulfonation, Friedel-Craft’s alkylation and acylation with limitations, orientation in monosubstituted benzenes.

Polynuclear aromatic hydrocarbons: Nomenclature, methods of preparation of naphthalene, anthracene and phenanthrene, their oxidation and reduction reactions, relative susceptibilities to oxidation as interpreted in terms of sacrifice of resonance energies, electrophilic substitution reactions.

Arylhalides: Nomenclature, comparison of reactivity with respect to alkylhalides, mechanism of nucleophilic substitution (Benzyne concept).

LO: Understanding the properties of aromatic compounds, mechanisms of reactions and their usefulness in organic synthesis, electronic factors influencing orientation.

UNIT-II
Carbonyl compounds: Nomenclature, important methods of preparation, characteristic nucleophilic addition reactions (addition of bisulphate, Grignard reagent, hydrogen cyanide, hydrazine derivatives and alcohols); Aldol condensation, Cannizzaro reaction and Perkin reaction.

LO: General properties, relative reactivities towards nucleophilic addition, mechanisms and applications.

UNIT-III
Carboxylic acids: Nomenclature, important methods of preparation, characteristic reactions (acidity, relative acidities, reduction, H-V-Z reaction, conversion into acid chlorides, amides and esters); methods of preparation of important esters (acetoacetic ester and malonic ester) and their applications in organic synthesis.

LO: General properties, measurement of relative acidities, equations involving the reactions and mechanisms, applications in synthesis.

UNIT-IV
Phenols: Nomenclature, general methods of preparation, industrial synthesis of phenol by Dow process, characteristic reactions (acidity and its
comparison to alcohols and carboxylic acids as interpreted by resonance, ether formation, ester formation, Kolbe reaction, Reimer-Tiemann Reaction, bromination and nitration).

LO: Structures, equations, mechanisms, importance of these reactions in pharmaceutical organic synthesis.

UNIT-V

Amines and Diazonium compounds: Nomenclature, methods of preparation, characteristic reactions (basicity and relative basicities, alkylation and exhaustive alkylation, nitration and orientation), separation of all three classes of amines by Hinsberg’s method; formation of Diazonium compounds, characteristic reactions (replacement by hydrogen, Sandmeyer reaction, replacement by nitrile, and their applications in synthesis and coupling reactions).

LO: Properties, structures, equations, mechanisms, orientations and applications.

UNIT-VI

Name reactions: Beckmann rearrangement, Mannich reaction, Fries rearrangement, Michael addition, Schmidt reaction, Benzoin condensation.

LO: General reaction, structures and mechanism, applications in organic synthesis.

TEXT BOOKS


REFERENCES

1. R.L Madan, Organic Chemistry.
I Year – II SEMESTER

PHYSICAL PHARMACY – I (50 Hrs)

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. LO: To learn intermolecular forces and states of matter, Phase equilibria and 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. LO: To understand laws of Thermodynamics and their Applications

UNIT - III
Physical properties of Drug Molecules: Dielectric constant induced polarization, dipole moment, refractive index and molar refraction, optical rotatory dispersion. LO: To understand the physical properties of drug molecules and their significance.

UNIT - IV
Solutions of Non electrolytes: Concentration expressions, ideal and real solutions, colligative properties, molecular weight determinations. LO: To understand properties of Non electrolytes and their significance.

UNIT - V
UNIT - VI

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).

LO: To know about buffers, buffer isotonic solutions, Methods of adjusting isotonicity and their significance.

TEXT BOOKS

2. C.V.S.Subramanyam, Essentials of Physical Pharmacy, Vallabh Prakashan.
4. S. J Carter, Cooper and Gunn’s Tutorial pharmacy.

REFERENCES

2. Derle Deeliprao, Essentials of Physical Pharmacy
5. Martindale, the Extra Pharmacopoeia; Latest Edition the Royal Pharmaceutical Society
6. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences
8. Bentley’s Text Book of Pharmaceutics by E.A. Rawlins
I Year – II SEMESTER

COMPUTER APPLICATIONS AND BIOSTATISTICS

Unit-I

Overview of computer with general applications: components of computers, computer languages, usage of computers, introduction of operative system.

Introduction to MS-Office: MS- word: Basics, working with files, working with text, formatting paragraphs, styles, lists, tables, graphics, spelling and grammar, page formatting macros and table of contents.

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

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

MS-Access: Data base concepts, screens layouts, creating tables, data sheet record, table relationships, shorting and filtering, query forms, form controls, sub forms, reports, importing, exporting and linking.

LO : The student should be familiar with overview of the computers and MS-office

Unit-II

Information Technology Today: Internet and World Wide Web (www), structure and organization of www, browsers, information searching in www, search engines, pharmaceutical resources in www types of indexing tools and search strategies, Hyper Text Manuscripts Languages (HTML) and e-mail.

LO : Familiarity with internet, WWW, browsing, HTML & e-mails.

Unit-III

Database Management: Concepts and objectives of Database Management systems, advantages of database management systems and examples of DBMS packs (like DBASE III).

LO : Familiarity with Database management

Unit-IV

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.

**Measures of central tendency and variations:** Mean, median, mode, properties and applications, range, standard deviations and standard error of means, coefficient of variation, kurtosis, skewness and confidence (fiducial) limits for mean and proportions.

**LO:** Fundamentals of data / Sample collection and diagrammatic presentation. Measures of central tendency and dispersion.

**Unit-V**

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

**Statistical Quality control:** Statistical Quality control charts like mean and range charts, p-chart, np-chart and c-chart. Applications of Statistical Quality control in pharmaceutical sciences.

**LO:** Correlation and regression quality control charts in pharmacy.

**Unit-VI**

**Statistical inference:** t-test, chi square test and their applications in pharmacy.

**Elements of ANOVA:** One-way and two-way with examples.

**LO:** Application of t-test, Chi square test and approve in the testing the significance of difference or similarity.

**TEXTBOOKS**

2. Information Technology Workshop, 3e, G Praveen Babu, M V Narayana BS Publications.
4. Pranab Kumar Banerjee, “Introduction to Biostatistics”.

**REFERENCE BOOK:**

1. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr. N.B. Venkateswarlu
2. Biostatistics for medical, nursing and pharmacy students by A.Indrayan, L Satyanarayana.
3. Introduction to Information Technology, ITL Education Solutions Ltd., 2nd Ed, PEARSON
I Year – II SEMESTER

HUMAN ANATOMY PHYSIOLOGY LAB

1. Study of compound microscope and precautions to be taken while handling it.
2. Microscopic study of structure of cell and different tissues.
3. To understand and learn Blood withdrawal techniques.
4. Determination of bleeding time, clotting time, blood grouping and Estimation of Hemoglobin in blood.
5. Study of Haemocytometry.
8. Estimation of D.L.C.
10. Study of different systems with the help of charts and models.
11. Recording of body temperature, pulse rate and blood pressure.
12. Determination of vital capacity, experiments on spirometry.
13. Various devices used in family planning like Copper T, Lippe’s loop, diaphragm, condom and oral pills.
I Year – II SEMESTER

PHYSICAL PHARMACY – I LAB

5. Calibration of pH Meter.
7. pH Estimation – Colourimetric method.
8. pH Estimation by Half Neutralization Method.
9. Refractive index of liquids.
15. Preparation of Buffers and Buffer capacity determination.
Identification of the peripherals of a computer.

To prepare a report containing the block diagram of the CPU along with the configuration of each peripheral and its functions. Description of various I/O Devices

A practice on disassemble the components of a PC and assembling them to working condition.

Examples of Operating systems-Dos, Windows, Installation of MS windows on a PC.

Introduction to Memory and Storage Devices, I/O Port, Device Drivers, Assemblers, Compilers, Interpreters, Linkers, Loaders.


Orientation & Connectivity Boot Camp and surfing the Web using Web Browsers: Students should get connected to their Local Area Network and access the Internet. In the process they should configure the TCP/IP setting and demonstrate how to access the websites and email. Students customize their web browsers using bookmarks, search toolbars and pop up blockers.

Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google.

MS Office

Word Orientation: Word as word Processors.

Accessing, overview of toolbars, saving files, Using help and resources, rulers, formatting, Drop Cap, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option

Creating project: Abstract Features to be covered:- Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs.

**MS Excel**

**Excel Orientation:** The mentor needs to tell the importance of MS Excel as a Spreadsheet tool, give the details of the tasks and features that would be covered in each.

Using Excel Accessing, overview of toolbars, saving excel files, Using help and resources.

**Creating a Scheduler** - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text.

**Performance Analysis** - Features to be covered: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting.

**Power Point**

Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting –Images, Clip Art, Tables and Charts in PowerPoint.

Concentrating on the in and out of Microsoft power point. Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

**MS Access:**

Students have to work on creating data bases, tables, storing and organizing data in the data base, querying, Creating Forms and Reports (take appropriate examples.)

**TEXT BOOK:**

2. Information Technology Workshop,3e, G Praveen Babu, M V Narayana BS Publications.
3. Introduction to Information Technology, ITL Education Solutions Ltd., 2nd & 3rd Eds., PEARSON

**REFERENCE BOOK:**

1. Williams, Using Information Technology: Practical Introduction, TMH.

2. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr. N.B. Venkateswarlu.
II Year – I SEMESTER  

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PHARMACEUTICAL UNIT OPERATIONS –I (50 Hrs)

UNIT-I

**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.

LO: To understand fluid flow concepts – Reynold’s number, viscosity, flow meters and valves – measurements of flow and pressure.

UNIT-II

**Material handling systems:**

- a. Liquid handling - different types of pumps.
- b. Gas handling - various types of fans, blowers and compressors.
- c. Solid handling - conveyors

LO: To understand material handling systems – liquid, gas and solid handling.

UNIT-III

**Filtration and Centrifugation:** Theory of filtration, filter aids, filter media, industrial filters including filter press, rotary filter, edge filter, etc. Factors affecting filtration, mathematical problems on filtration, optimum-cleaning cycle in batch filters. Principles of centrifugation, industrial centrifugal filters, centrifugal filters, and centrifugal sedimeters.

LO: To understand theory and equipment of filtration and centrifugation.

UNIT-IV


LO: To know the crystallization theory, crystallization equipment and their applications.
UNIT-V

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.

LO : To know the theory of dehumidification and humidity control, measurement of humidity.

Refrigeration and Air Conditioning:
Principles and applications of refrigeration and air conditioning.

LO : To understand the principles and applications of refrigeration and air conditioning.

UNIT-VI

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

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

LO : To understand the materials of construction, their properties and applications. To know the mechanical, chemical, fire and dust hazards and their prevention.

TEXT BOOKS
1. Prof. K. Samba Murthy, Pharmaceutical Engineering.
2. Badzer & Banchero, Introduction to Chemical Engineering.
3. C.V.S. Subramanayam, Pharmaceutical Unit Operation, VallabhPrakashan
4. S.J. Carter, Cooper and Gunn’s Tutorial Pharmacy 6ed CBS publisher, Delhi.

REFERENCES
1. Perry’s Handbook of Chemical Engineering.
2. Unit Operations by McCabe& Smith.
3. McCabe& Smith, Elements of Chemical Engineering.
5. EA Rawlins, Bently’s Text Book of Pharmaceutics, 8edition, ELBS
6. C.G. Brown, Unit Operations (Indian ed)Asia Publishing House, Bombay
7. Remington’s Pharmaceutical Sciences
II Year – I SEMESTER

PHARMACOGNOSY – I (50 Hrs)

UNIT- I
Definition, history, scope and development of Pharmacognosy. General introduction to alternative systems of medicine like Ayurveda, Siddha, Unani and Homeopathy.

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

LO : To make the students understand that drugs are obtained from different sources and crude drugs, are used in the indigenous systems of medicine.

UNIT-II
Classification of Crude Drugs: Alphabetical, morphological, pharmacological, chemical, taxonomical and chemotaxonomical methods of classification with suitable examples.

LO : To make the students understand that crude drugs can be classified based on several criteria.

UNIT-III
Cultivation, collection, processing, drying and storage of medicinal plants:
• Factors influencing cultivation of medicinal plants.
• Plant hormones and their applications.
• Definitions and examples for polyploidy, mutation and hybridization with reference to medicinal plants.


LO : To understand improve agricultural conditions provide high yield and the methods be standardized to get consistent yields.

UNIT-IV
Adulteration & Evaluation of crude drugs:

Adulteration of crude drugs: Different methods of adulteration of crude drugs and general methods for detection of adulterants. For example
i) Organoleptic ii) Microscopic iii) Physical iv) Chemical and Biological methods of evaluation.
LO: To provide enough knowledge to identify adulterants from genuine products and to provide quality products.

UNIT-V

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

LO: To provide quality products of the above as excipients.

UNIT-VI

Systematic Pharmacognostic study of the following Lipids: Castor oil, cod liver oil, shark liver oil, linseed oil, cocoa butter, kokum butter, bees wax, wool fat, hydrocarpus oil, spermaceti, lard and olive oil.

Systematic Pharmacognostic study of the following volatile oils: Mentha, coriander, cinnamon, lemon oil, nutmeg, eucalyptus, ginger, cardamom, tulsi, lemon grass, caraway, cumin, dill, clove, fennel and black pepper.

LO: To maintain quality in fixed and volatile oils.

TEXT BOOKS

1. Kokate C.K, Purohit AP & Gokhale Pharmacognosy S.B (Nirali)
3. Tyler, Brady & Robert, Pharmacognosy.

REFERENCES

2. Ayurvedic Pharmacopoeia of India, Pub by Govt. of India.
4. CSIR Publications, Wealth of India.
8. Taylor and Evans, Text Book of Pharmacognosy.
II Year – I SEMESTER

PHYSICAL PHARMACY -II (50 Hrs)

UNIT-I

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

LO: To understand the solubility and distribution phenomenon and laws of diffusion.

UNIT-II

LO: To understand kinetic rates, order of reaction, decomposition pathways and methods of stabilization, stability testing methods, accelerated stability analysis.

UNIT-III

LO: To understand theory of interfacial phenomenon, absorption, surfactants and theoretical properties of interfaces.

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

LO: To learn micromeritic characteristics and their applications and significance.
UNIT-V

**Rheology:** Newtonian system, non-Newtonian system, thixotrophy, measurement and applications in formulations. Determination of viscosity and its applications. 08

LO : To understand rheology, types of flow, thixotrophy, its applications and viscosity.

UNIT –VI

**Colloids:** Introduction, types of colloidal systems, solubilization, Stability of colloids, optical properties, kinetic properties, electrical properties and Donnan Membrane equilibriaum. 08

LO : To know colloids – types – properties – stability considerations.

**TEXT BOOKS**

2. CVS Subhramanyam, Physical Pharmacy, Vallabhprakashan.

**REFERENCE**

1. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences
2. M.E. Aulton, Pharmaceutics – The science of dosage form design, 2edition
5. Pharmacopoiea (IP, BP, USP and European).
II Year – I SEMESTER

PHARMACEUTICAL MICROBIOLOGY (50 Hrs)

UNIT – I

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


LO: To understand diversity of microorganisms and their spontaneous generation and use and harmful nature.

UNIT – II

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 constituents. Exponential growth and generation time. Bacterial growth in batch and continuous culture (chemostat and turbidostat) synchronous growth.

Microorganisms and their Environment: Effects and microbial adaptations to environmental conditions – Temperature, oxygen desiccation, extreme cold ionic effect, electricity, osmotic pressure, radiant energy, hydrostatic pressure, mechanical impact, vibration.

LO: To understand that bacterial growth curve consist of rapid growth followed by stabilization and later decline due to exhaustion of nutrients and several parameters affects the above.

UNIT – III

Control of Microorganisms: General Concepts, Inhibition of growth and killing, sterilization and disinfection, antisepsis 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

LO : To understand that moist heat, dry heat, radiation, filtration, chemicals can be used for sterilization and disinfection to provide aseptic condition in the filling areas, operation theatres etc

UNIT – IV


LO : To understand the concept of bacterial resistance to antibiotics and other conditions.

UNIT – V

Epidemiology of Diseases: Study of etiology, diagnosis, source of infection, mode of transmission, immunization methods, prevention and control of the following diseases. Bacillary dysentery, diphtheria, tuberculosis, leprosy, cholera, typhoid, syphilis, gonorrhea, tetanus, food poisoning and infection hepatitis.

LO: To understand that microbes are responsible for causing certain diseases.

UNIT – VI

Application of Microbes in Pharmaceutical Industry


b. Microbial Source & applications of various pharma products like Antibiotics, Vitamins, amino acids, solvents, enzymes & genetic engineered products etc.

LO : To understand that antibiotics/Vitamins can be standardized by microbial assays. And some useful products can be produced as a bacterial metabolites.
TEXT BOOKS
1. Pelczar and Reid, Text Book of Microbiology.
3. N.K. Jain, Pharmaceutical Microbiology.
4. Alcamo, Microbiology.

REFERENCES
4. Tortora A. Gerard, Text Book of Microbiology.
II Year – I SEMESTER

ENVIRONMENTAL SCIENCES

UNIT - I

**Multidisciplinary Nature of Environmental Studies:** Definition, Scope and Importance – Need for Public Awareness. 01

**Natural Resources:** Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over-exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over-utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies - Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources. Case studies. - Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. 09

LO : To know environment, Natural resource, Conservation of national resources

UNIT - II

**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)

10

LO : To understand various Ecosystems Characteristic features, structural functions of each.
UNIT-III


LO: To understand biodiversity-basics principles-Conservation of Biodiversity.

UNIT -IV

Environmental Pollution: Definition, Cause, effects and control measures of :

a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
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.

LO: To know about environmental pollution, types of pollution-Causes-Measures to prevent and solid waste management-techniques/Methods.

UNIT - V


Human population & environment: Population growth, variation among nations, population explosion – family welfare programs. Environment and

LO: To know about social issues in environment, ethics, Acts related to environmental protection and conservation. Human population and environment, Human health issues.

UNIT - VI


LO: Different aspects of human population and environment and their importance.

Text Books:

Reference:
3. Text Book of Environmental Sciences and Technology by M. Anji Reddy, BS Publications.
II Year – I SEMESTER

PHARMACOGNOSY LAB – I

2. Macroscopy & Microscopy of the following:
   a. Any five carbohydrates mentioned in theory.
   b. any five lipids mentioned in theory.
   c. any five volatile oils mentioned in theory.
3. Chemical tests for the following:
   a. Any five carbohydrates mentioned in theory.
   b. any five lipids mentioned in theory.
   c. any five volatile oils mentioned in theory.
4. Cultivation of medicinal plants: Maintenance of one plant in Medicinal garden.

REFERENCES

1. Kandhelwal, Practical Pharmacognosy.
2. C.K. Kokate et.al, Practical Pharmacognosy.
3. Iyengar, Practical Pharmacognosy.
II Year – I SEMESTER

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. Microscopic size analysis.
4. Determination of particle size by Andreason Pippette.
5. Determination of CMC of a surfactant.
6. Adsorption Isotherm.
7. Partition coefficient determination.
8. Determination of sedimentation volume and degree of flocculation.
10. Determination of Second order reaction rate constant.
11. Effect of temperature on solubility of solid in liquid.
13. Surface tension using Stalagmometer.
14. HLB value estimation of surfactants.
15. Viscosity – by Ostwald Viscometer.
16. Preparation of Multiple emulsion - Demonstration.
17. Preparation of Micro emulsion- Demonstration.
18. Determination of Zeta potential - Demonstration.
II Year – I SEMESTER

PHARMACEUTICAL MICROBIOLOGY LAB

1. Study of apparatus used in experimental microbiology.
2. Sterilization techniques and their validations.
3. Preparation of various culture media.
4. Sterilization of glass ware and culture media.
5. Aseptic transfer of culture into different types of medias.
6. Staining methods - Simple staining, Gram’s staining, Acid fast and negative staining.
7. Motility testing by hanging drop method.
8. Enumeration of bacteria by pour plate/spread plate technique.
9. Enumeration of bacteria by direct microscopic count.
10. Isolation of pure cultures by streak plate, spread plate, pour plate.
11. Evaluation of antiseptics and disinfectants, sterility of pharmaceutical products as per IP requirements.
12. Observation of colony characteristics.
13. Bio chemical reactions:
   i) Indole test.
   ii) Methyl red test.
   iii) Vogesproskauer test.
   iv) Starch hydrolysis test.
   v) Fermentation of carbohydrates.
15. Preservation of microorganisms (slant and stab cultures).
II Year – II SEMESTER

PHARMACEUTICAL UNIT OPERATIONS – II

UNIT-I

Heat Transfer: Source of heat, heat transfer, steam and electricity as heating media, 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 equilibria, factors affecting the evaporation, evaporators, film evaporators, single effect and multiple effect evaporators.

LO: To understand evaporation, Phase equilibrium, Theory of evaporation-Evaporators.

UNIT-III

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

LO: Theory of distillation types of rectifiers, their application.

UNIT-IV

Drying: Moisture content and mechanism of drying, rate of drying and time of drying calculations, classification and types of dryers, dryers used in pharmaceutical industries tray dryer, Fluid bed dryer, spray dryer, vacuum oven and freeze-dryer.

LO: Drying, Moisture content, rate of evaporation, types of dryers construction working and Applications.

UNIT-V

Size Reduction: Definition, objectives of size reduction, factors affecting size reduction, laws governing energy and power requirements of a mill, types of mills including ball mill, hammer mill, fluid energy mill etc.
LO: To understand theory of size reduction, factors involved in size reduction, equipments - Construction working and applications - selection of size reduction equipment.

UNIT-VI
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.

TEXT BOOKS
1. S.J. Carter, Cooper and Gunn’s Tutorial Pharmacy, 6th ed., CBS publisher, Delhi.
2. CVS Subhramanyam, Pharmaceutical Engineering.

REFERENCE BOOKS
4. Perry’s Handbook of Chemical Engineering.
5. M.E. Aulton, Pharmaceutics - The science of dosage form design, 2nd ed.
6. E.A. Rawlin’s, Bentley’s Text Book of Pharmaceutics, 8th ed ELBS.
II Year – II SEMESTER  

PHARMACEUTICAL ANALYSIS –I

Unit-I

1. A general introduction to pharmaceutical analysis and general aspects of standardization of pharmaceutical chemicals and formulated products mentioned in Indian pharmacopoeia. Importance of proper sampling and general books for pharmaceutical standards like pharmacopoeias, National formularies.

2. Computation of analytical results, significant numbers, rejection of doubtful values with reference to volumetric and gravimetric analysis, sources of errors and calibration of analytical equipment used in volumetric and gravimetric analysis.

LO: To understand the concept of standardization by gravimetric and volumetric methods.

Unit-II

3. Acid-Base titrations: theoretical basis of neutralization reactions including electrolytic dissociation, application of law of mass action, relative strength of acids and bases, hydrolysis of salts and buffer solutions, theory of neutralization indicators and factors involved in the selection of indicators for different types of acid-base titrations. Procedures involved in different types of titrations using strong acid, week base, strong base, week base and back titration with blank determination. Assay of Boric acid Sodium bicarbonate, Borax, calcium hydroxide, zinc oxide, calcium carbonate, Acetyl salicylic acid, Formaldehyde, NaOH in presence of sodium carbonate.


LO: To understand the concept of standardization by aqueous and non-aqueous titrations.
Unit-III


LO : To understand the concept of standardization by oxidation – reduction methods.

Unit-IV


7. Complexometric titrations: basic principles of complexometric analysis including theories of complex ions, chelating agents, properties of metal complexes with particular reference to EDTA. Basic principles of complexometric analysis including theories of complex formation. Werner’s coordination number and structure of complex ions, chelating agents, properties of metal complexes with particular reference to EDTA, various examples of titrations of metal ions using disodium acetate, indicators and end point detection using indicators and by physical methods, masking and demasking agents, pharmaceutical applications of complexometry with particular reference to I.P. Assay of calcium gluconate injection/tablets, Calcium lactate and Assay of Aluminium sulphate.

LO : To understand that standardization can be done for some compounds by precipitation titrations.

Unit-V

8. A detailed study of gravimetric analysis including principles involved, critical factors and typical methods involving precipitation, coagulation, digestion, filtration and incineration procedures with suitable examples. Advantages and disadvantages, sources of errors and their elimination in gravimetric analysis.
Determination of sulphate as barium sulphate, Estimation of magnesium as magnesium pyrophosphate, Determination of thiamine as silico tungstate.

LO: To understand that standardization can be done for some compounds by gravimetric method.

Unit-VI


10. Gas analysis: principles of gas analysis use of hempel’s gas burette and pipette, nitrometer, haldome’s and orset’s gas analysis apparatus and their operations. Examples of gas analytical methods of pharmaceutical significance.

LO: To understand that moisture in drugs can be determined by Karl-Fisher titration.

TEXT BOOKS:

1. Indian Pharmacopoeia
2. Practical Pharmaceutical Chemistry by A.H. Becket and Stenlake.
3. Quantitative Inorganic Analysis by A.I. Vogel.
II Year – II SEMESTER

PHARMACOGNOSY – II (50 Hrs)

Definition, general tests and detailed pharmacognostic study of the following drugs.

UNIT I

Glycoside containing drugs:

a. Saponin Glycosides: Glycyrrhiza, Ginseng, Discorea, Sarasaparilla & Senega.
b. Cardioactive Glycosides: Digitalis, Squill, Strophanthus & Thevetia.

LO: To understand that Glycosides are isolated from plant sources and have varied action based on aglycone part.

UNIT II

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
a. Alkaloidal amine: Ephedra & Colchicum
b. Glycoalkaloid: Solanum

LO: To understand that Alkaloids of different structures are synthesized by different plants and possess varied activities based on structure.

UNIT - III

Study of Tannins & Tannin containing drugs: Gambir, Black catechu, Myrobalan&Arjuna. Study of resins & drugs containing resins: Benzoin, Asafoetida, Balsam of Tolu, Podophyllum.
LO: To understand that Tannins and Resins and their combination products are produced by different plants.

UNIT-IV 02

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

LO: To understand that different enzymes of useful nature are produced by plants.

UNIT-V 10

Biogenesis of Phytopharmaceuticals:
General techniques of biosynthetic studies and basic metabolic pathways.
Brief introduction to biogenesis of secondary metabolites of pharmaceutical importance.
Biosynthesis of -Tropane, Quinoline, Opium and Indole alkaloids, Steroids and Anthraquinone glycosides.

LO: To understand that Compounds of varied chemical nature are produced by plants (chemodiversity).

UNIT – VI 04

Study of plant fibers like cotton, cotton wood pulp, jute, hemp and flax used in surgical dressing and related products.
The applications of natural dyes like turmeric, henna, saffron, cochineal and marigold in pharmacy.

LO: Plants exhibit a lot of diversity in producing fibres useful for fabrics as well as Dyes to colour them.

TEXT BOOKS
3. Tyler, Brady & Robert, Pharmacognosy.

REFERENCES
3. Ayurvedic Pharmacopoeia of India, Pub by Govt. Of India.
II Year – II SEMESTER

MEDICINAL CHEMISTRY-I

UNIT-I
Heterocyclic compounds:
1. Five and six membered ring systems with heteroatoms: Furan, pyrrole, thiophene, pyridine, imidazole, pyrazole, oxazole, isoxazole, thiazole and pyrimidine.
2. Fused ring systems with heteroatoms: Quinolines, isoquinolines, acridine, benzimidazole and phenothiazine.

LO: Nomenclature (numbering), one or two methods of preparation, important reactions, mechanisms and examples of drugs having the above ring systems.

UNIT-II
1. Drug activity and physico-chemical properties: solubility, partition coefficient, hydrogen bonding, chelation, surface activity, bioisosterism, optical and geometrical isomerism, prodrugs and soft drugs.

LO: Concepts involving receptors, drug-receptor interaction forces, mechanisms, equations, structures, advantages.

UNIT-III
Drugs acting on CNS:
1. Hypnotics and anxiolytics: Phenobarbital, diazepam and alprazolam.
3. Antiepileptics: phenytoin, carbamazepine, valproate sodium.
5. General anaesthetics: ketamine, halothane and thiopental sodium.

LO: Definition, scope, classification, mode of action, Structure-Activity Relationship (SAR) wherever applicable, therapeutic uses and synthesis of compounds as given above under each class.
UNIT-IV
1. **Adrenergic drugs**: Amphetamine, salbutamol, ephedrine, phenylephrine and dopamine.
2. **Adrenergic blockers**: Prazosine, tolazoline, Propranolol, atenolol
3. **Cholinergic drugs**: Carbachol, bethanichol.
4. **Anticholinergics**: propantheline, dicyclomine.
5. **Neuromuscular blockers**: succinyl choline.

LO: Definition, scope, classification, mode of action, Structure-Activity Relationship (SAR) wherever applicable, therapeutic uses and synthesis of compounds as given above under each class.

UNIT-V
1. **Analgesics and Non-steroidal anti-inflammatory agents (NSAIDs)**: paracetamol, aspirin, ibuprofen, indomethacin, diclofenac.
2. **Narcotic analgesics**: mepridine, methadone.
3. **Local anaesthetics**: benzocaine, procaine, lignocaine and dibucaine

LO: Definition, scope, classification, mode of action, Structure-Activity Relationship (SAR) wherever applicable, therapeutic uses and synthesis of compounds as given above under each class, an understanding of morphinans, its agonists and antagonists.

UNIT-VI
1. **Oral antihyperglycemic agents**: tolbutamide, gliclazide, glipizide, glibenclamide, metformin and pioglitazone.
2. **Thyroid drugs**: methimazole, propylthiouracil.
3. **H1-receptor antagonists**: diphenhydramine, chlorpheniramine, chlorcyclizine, cetirizine.
4. **H2-receptor antagonists**: ranitidine
5. **Proton pump inhibitors**: Omeprazole, rabeprazole, lansaprazole.

LO: Definition, scope, classification, mode of action, Structure-Activity Relationship (SAR) wherever applicable, therapeutic uses and synthesis of compounds as given above under each class, an understanding of morphinans, its agonists and antagonists.

TEXT BOOKS


4. Rama Rao Nadendla, Medicinal Chemistry.

REFERENCES


UNIT-I

Concepts of health & disease: Disease causing agents and prevention of disease. 05

Classification of food requirements, balanced diet, nutritional deficiency disorders, their treatment and prevention, specifications for drinking water.


LO : To understand that disorder is a physiological change while disease is caused by infecting organisms. Prevention is better than cure concept. First aid for emergency conditions before the patient is moved for medical treatment.

UNIT – II

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

LO : Problems of over population in providing basic amenities and measures to be adopted for control.

UNIT-III

Basic Principles of cell injury and adaptation: 10

i) Causes, pathogenesis and morphology of cell injury.

ii) Abnormalities in lipoproteinemia, glycogen infiltration and glycogen storage disease.

iii) Cellular adaptations, atrophy, hypertrophy.

iv) Disturbances of growth of cells

v) General biology of tumors

vi) Differences between benign and malignant tumors

vii) Classification of tumors

viii) Etiology and pathogenesis of cancer

ix) Patterns of spread of cancer.

LO : Different phases of cell growth and disorders, to understand normal and tumor cells.
UNIT-IV

Inflammation & Repair:

A) i. Pathogenesis of acute inflammation
   ii. Chemical mediators in inflammation
   iii. Pathogenesis of chronic inflammation

B) i. Wound healing mechanisms and
   ii. Factors affecting wound healing.

C) Pain and its types.

LO: To understand that several substances are involved in producing inflammation and to understand different reasons for causing pain.

UNIT-V

Diseases of Immunity:

i) Introduction to T and B cells
ii) MHC proteins or transplantation antigens
iii) Immune Tolerance

A) Hypersensitivity
i. Hypersensitivity type I, II, III, IV.
ii. Biological significance of hypersensitivity.
iii. Allergy due to food, chemicals and drugs

B) Auto-Immunity
i. Mechanism of autoimmunity.
ii. Classification of autoimmune diseases in man.
iii. Transplantation and allograft reactions, mechanism of rejection of allograft.
iv. Acquired Immuno Deficiency Syndrome (AIDS).

LO: To understand about allergy and body’s resistance against diseases (Natural and adoptive immunity).

UNIT-VI

Pathophysiology of Cardiac disorders:

Shock, stroke, hypertension, Angina, Myocardial infarction, Congestive
cardiac failure, Atherosclerosis.

**Pathophysiology of Common Disorders:**
Diabetes Mellitus, Peptic ulcer, Alcoholic liver diseases, Acute and chronic renal failure, Asthma, Parkinsonism, Schizophrenia, Depression and Mania.

**Infectious diseases:**
Infective hepatitis, STD – Syphilis, Gonorrhrea, HIV; Pneumonia, Typhoid, UTI, Tuberculosis, Leprosy, Malaria, Dysentery (Bacterial and amoebic).

LO: Abnormalities of cardiovascular system, metabolism, respiration, behavior and diseases caused by microorganisms and disorders caused by smoking and alcoholism.

**TEXT BOOKS**
4. General Pathology – Y M Bhende, S G Deodhare, SS Kelkar
5. Essentials of Pathophysiology for Pharmacy. Martin M. Zdanowicz. Published by Pharma Med Press.

**REFERENCE BOOKS**
2. Joseph Dipiro, Patho Physiology and applied therapeutics.
II Year – II SEMESTER

PHARMACEUTICAL UNIT OPERATIONS - LAB

1. Measurement of flow of fluids and their pressure, determination of Reynolds’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. Experiments to demonstrate applications of centrifugation.
6. Determination of rate of evaporation.
8. Determination of rate of drying, free moisture content and bound moisture content.
9. Experiments to illustrate the influence of various parameters on the time of drying.
10. Experiments to illustrate principles of size reduction, Laws governing energy and power requirements of a size reduction.
11. Experiments to illustrate solid-solid mixing, determination of mixing efficiency using different types of mixers.
II Year – II SEMESTER

PHARMACEUTICAL ANALYSIS – I LAB

Acid-base titrations:
1. Standardization of HCl
2. Standardization of H₂SO₄
3. Standardization of NaOH
4. Assay of boric acid
5. Assay of sodium bicarbonate
6. Assay of borax
7. Assay of calcium hydroxide
8. Assay of zinc oxide
9. Assay of calcium carbonate
10. Assay of acetyl salicylic acid
11. Assay of formaldehyde

Redox titrations:
13. Standardization of iodine
14. Standardization of KMnO₄
15. Assay of ferrous sulphate
16. Assay of hydrogen peroxide
17. Assay of sodium nitrate
18. Estimation of ascorbic acid with 2,6-dichlorophenol indophenols
19. Assay of mercuric chloride
20. Assay of sodium metabisulphite

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

Complexation titrations:
25. Standardization of EDTA
26. Assay of calcium Gluconate injection/tablets
27. Assay of aluminium sulphate

**Non-aqueous titrations:**
   28. Assay of thiamine hydrochloride
   29. Any other assay involving perchloric acid

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

**Limit tests:**
   33. Limit test for chlorides
   34. Limit test for sulphates
   35. Limit test for iron
II Year – II SEMESTER

PHARMACOGNOSY – II LAB

1. Study of Microscopy, Macroscopy and powder characters of any three to four crude drugs under each type.


3. Identification test for two enzymes papain and casein.

4. Chemical tests for Asafoetida, Benzoin, Tannic acid, Pale catechu, Black catechu, Aloes, Digitalis, Senna and Quinine.

5. Quantitative microscopy:
   a. Ratio values: Stomatal number and Stomatal Index.
   b. Determination of dimension of starch grains and fibre lengths using eye piece micrometer and camera lucida methods.
   c. Determination of purity of ginger powder using lycopodium spore method.

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

7. Identification of markers of different phytoconstituents like glycrrhiza, aloe and cinchona by chromatographic techniques.
UNIT - I
Introduction to Biochemistry: Outlines of the biochemistry organization of cell organelle, Molecular constituents of cell membrane, active and passive transport processes across the cell membranes.
LO: Introduction, essentials of biochemistry with respect to pharmacy, cell, structure and functions.

UNIT - II
Brief chemistry of carbohydrates
Carbohydrate metabolism: Brief chemistry, Glycolysis, Citric acid cycle (TCA cycle), HMP shunt, Glycogenolysis, Gluconeogenesis, Glycogenesis. Metabolic disorders of carbohydrate metabolism.
LO: Introduction to metabolism. Structure, cycles, biological significance and metabolic disorders.

UNIT - III
Lipids, Proteins and nucleoproteins: Principles involved in biological oxidation.
Lipid metabolism: Brief chemistry, Oxidation of saturated (β - Oxidation), Ketogenesis and Ketolysis; Biosynthesis of Fatty acids, Lipids; Metabolism of cholesterol; Hormonal regulation of Lipid Metabolism. Defective metabolism of Lipids.
LO: Introduction to metabolism. Structure, cycles, biological significance and metabolic disorders.

UNIT - IV
Protein Metabolism: Protein turnover. Ketabolism of Amino acids (Transamination, deamination, de-carboxylation). Urea cycle and it’s metabolic disorders. Outlines of the Metabolism and regulation of Protein synthesis.
LO: Introduction to metabolism. Structure, cycles, biological significance and metabolic disorders.

UNIT - V
1. Enzymes: Classification, mode of action, factors affecting enzymes action, Coenzymes.
2. Brief outline of Energy rich compounds, Phosphate metabolism and detoxification mechanisms of the body.

LO: Introduction, properties, classes, biochemical role and mode of action.

UNIT - VI
1. Cell division and metastasis.
3. Detoxification mechanisms and their biological significance.

LO: Introduction, basic concepts, structures, properties, significance and uses.

TEXT BOOKS
2. Harper, Biochemistry
4. J.L Jain, Fundamentals of Biochemistry
5. Satyanarayana, Text Book of Biochemistry
7. Conn, Outlines of biochemistry

REFERENCES
1. L.Stryer, Text Book of Bio Chemistry.
6. Conn, Outlines of Biochemistry.
7. Plummer, Practical Bio Chemistry.
8. Denniston, Topping & Caret; General, Organic, and Biochemistry, McGraw-Hill.
Medicinal Chemistry-II

UNIT - I
1. **Introduction to principles of chemotherapy**, chemotherapeutic index, drug resistance.
2. **Sulphonamides**: Sulfisoxazole, Sulphamethazole and Sulphathiazole.
3. **Antitubercular agents**: PASA, Isoniazid, Ethambutol
4. **Antileprotic agents**: Dapsone
   
   **LO**: Definition, current status, classification, mode of action, Structure-Activity Relationship (SAR) wherever applicable, therapeutic uses and synthesis of compounds as given above under each class.

UNIT - II
1. **Antimalarials**: Chloroquine, Primaquine and Pyrimethamine
2. **Anthelmintics**: Diethyl Carbamazine Citrate, Mebendazole, Tinidazole,
3. **Antiamoebic agents**: Metronidazole and Diloxanide furoate.
4. **Antifungal agents**: Clotrimazole, Fluconazole and Tolnaftate.
   
   **LO**: Definition, current status, classification, mode of action, Structure-Activity Relationship (SAR) wherever applicable, therapeutic uses and synthesis of compounds as given above under each class.

UNIT - III
1. **Antiviral agents**: Acyclovir, Zidovudine, Idoxuridine and Amantadine.
2. **Cytostatic agents**: Chlorambucil, Cyclophosphamide, Carmustine, 5-Flouro Uracil and Mercaptopurine
   
   **LO**: Definition, current status, classification, mode of action, Structure-Activity Relationship (SAR) wherever applicable, therapeutic uses and synthesis of compounds as given above under each class.

UNIT - IV

**Antibiotics:**
1. **Penicillins**: Ampicillin, Amoxycillin
2. **Cephalosporins:** structures of important Cephalosporins (not synthesis)
3. **Tetracyclins:** Oxytetracycline, Doxycycline
4. **Aminoglycosides:** Streptomycin and Neomycin (structures).
5. **Miscellaneous:** Chloramphenicol, Rifampicin (only structure)

**LO:** Chemistry, structures of currently used drugs, classification, mode of action, Structure-Activity Relationship (SAR) wherever applicable, therapeutic uses and synthesis of compounds as given above under each class.

**UNIT - V**

**Water soluble vitamins:** structures of B1, B2, B6, B12, Nicotinic acid, Nicotinamide, Folic acid and Ascorbic acid.

**LO:** Chemistry, structural features, classification, mode of action, Structure-Activity Relationship (SAR) wherever applicable, therapeutic uses, biological role.

**UNIT - VI**

**Fat soluble vitamins:** structures of Vitamin A, Retinoic acid, Vitamin D, Ergosterol

**LO:** Chemistry including reactions, structural features, interconversions, classification, mode of action, Structure-Activity Relationship (SAR) wherever applicable, therapeutic uses, biological role.

**TEXT BOOKS**

4. Sri Ram, Medicinal Chemistry.
5. Rama Rao Nadendla, Medicinal Chemistry.
REFERENCES
7. D. Lednicer, Organic drug synthesis, Vol. 1 – 6, J.Wiley N.Y.
III Year – I SEMESTER

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, recemization, polymerization, e.t.c. and their effect on formulation, stability and bioavailability study of prodrugs in solving problems related to stability & bioavailability in formulations. Stability testing of finished products as per ICH guidelines.

LO: To understand performulation parameters and their significance, methods, stability testing protocols, ICH guidelines.

UNIT - II

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

LO: To understand liquid dosage formulations, additives, manufacturing, evaluation, packaging procedures, official preparations.

UNIT - III


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

LO: To understand semisolid and suppositories preparations, their formulations, methods of preparations, evaluations and packaging.

UNIT - IV

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

Opthalmic Preparations: Requirements, formulation, methods of preparation, containers, evaluation.
LO: To understand aerosols, ophthalmic preparations, their formulation, types, preparations, packaging and evaluation methods.

UNIT - V
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.
LO: To understand cosmetics science, functions of skin and hair, cosmetic properties and their formulations, preparations and evaluation methods.

UNIT - VI
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.
LO: To understand formulation, preparations and packaging of various cosmetics preparations.

TEXT BOOKS

REFERENCES
1. Shobha Rani, Text of Industrial Pharmacy, Hiremath Orient Longman.
2. Sagarian & MS Balsam, Cosmetics Sciences &Technology Vol.1, 2 & 3
4. E.A.Rawlkins, Bentley’s Text Book of Pharmaceutics, Elbs publications.
5. HC Ansel Introduction to Pharmaceutical Dosage forms

www.jntuking.com
III Year – I SEMESTER

PHARMACOLOGY – I

UNIT - I

General Pharmacology: Introduction to pharmacology, sources of drugs, dosage forms and routes of administration, mechanism of action, Structural activity and relationship (SAR), factors modifying drug action, tolerance and dependence; Pharmacogenetics; Enzyme Induction & Inhibition; Absorption, distribution metabolism and excretion of drugs; Principles of drug discovery and development of new drugs.

LO: Knowledge imparting basic concepts of Pharmacology, mechanism of action of drugs, SAR, Pharmacokinetics and drug discovery.

UNIT - II

Pharmacology of Autonomic Nervous System:
Neurohumoral transmission in peripheral nervous system (autonomic and Somatic).
Parasympathomimetics & parasympatholytics, sympathomimetics & sympatholytics.
Ganglionic-stimulants and blocking agents, skeletal muscle relaxants.

LO: To understand the basics of physiology and neurotransmitters and their roles. To gain knowledge on the drugs acting on ANS and muscle relaxants.

UNIT - III

Drugs acting on Central Nervous System:
Neurohumoral transmission in the C.N.S, General anesthetics, Alcohols and Disulfiram, Sedatives, hypnotics, & anti-anxiety agents.

LO: To understand the role of neurotransmitters in the CNS and pharmacology of various classes of drugs acting on CNS.

UNIT - IV

Analgesics, Antipyretics, Anti-inflammatory and Anti-gout drugs, Narcotic analgesics & antagonists, Pharmacology of Local Anaesthetics

LO: To have knowledge on the pathophysiology on Analgesia, pyretics, inflammation, gout and drugs used in the above treatment.
UNIT - V
Antipsychotics & Lithium, Antidepressants, Pharmacology of Anti-epileptic drugs,
Pharmacological management of Parkinsonism & other movement disorders, C.N.S. stimulants, Drug Addiction & Drug Abuse.
LO : To impart knowledge on pathophysiology of various disease conditions of the above topics and pharmacology of drugs.

UNIT - VI
Drugs Acting on the Gastrointestinal Tract
LO : To impart knowledge on pathophysiology and conditions relating to peptic ulcers and emesis and to understand the pharmacology of drugs used in GIT disorders.

TEXT BOOKS

REFERENCE BOOKS
3. J. Crossland, Lewis’s Pharmacology, Church living stone.
III Year – I SEMESTER

PHARMACEUTICAL MANAGEMENT

UNIT - I
Features of Business Organisations & New Economic Environment:
LO: To understand business organization – types – functions.

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.
LO: To understand production management and organization – Planning and control – Layout – Product development.

UNIT - III
Work Study - Basic procedure involved in Method Study and Work Measurement-Statistical Quality Control: $\bar{X}$ chart, R chart, $c$ chart, $p$ chart, (simple Problems), Acceptance Sampling, Deming’s contribution to quality.
LO: To understand principles of work study – Methods – Control charts – Principles – Contribution – Quality concepts.

UNIT - IV

UNIT - V
Pharma Industry: Growth of Pharma Industry in India – current status and its role in building national economy 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.

LO: To understand Pharma industry – Structure – Manufacturing of drugs and Pharmaceuticals – Exports and imports.

UNIT - VI
Insurance and Pharma: Various types of insurance including marine and health insurance.
Pharmaceutical associations and societies, statutory councils governing the profession. General Principles of medical detailing.

LO: To understand insurance – types – health insurance – association and society governing pharmacy profession.

TEXT BOOK
1. Aryasri and Subbarao, Pharmaceutical Administration, TMH.
2. Smarta, Strategic Pharma Marketing.
3. G.Vidya Sagar, Pharmaceutical Industrial Management.

REFERENCES
III Year – I SEMESTER  

PHARMACEUTICAL BIOCHEMISTRY LAB

Experiments:

1. To prepare standard buffers (citrate, phosphate & carbonate) and measure the pH.
2. Titration curve for amino acids.
4. The separation of lipids by T.L.C.
5. Identification of carbohydrates
14. Estimation of alkaline phosphatase in serum
III Year – I SEMESTER

PHARMACEUTICAL TECHNOLOGY – I LAB

A total of atleast 50 preparations are to be prepared belonging to various categories.
Preparation, evaluation and packaging of solutions, suspensions and emulsions, ointments. Suppositories, aerosols, eye drops, eye ointments etc. Formulation of various types of cosmetics for skin, hair, dentrifices and manicure preparations.
III Year – I Semester  

MEDICINAL CHEMISTRY LAB

I. Synthesis of some medicinal compounds and their analogues.
   i. Barbituric acid from Diethyl Malonate.
   ii. Phenytoin from Benzoin or Benzyl.
   iii. Paracetamol from \textit{para}- nitro phenol or \textit{para}- aminophenol.
   iv. 1,4- di hydro pyridine from ethyl aceto acetate.
   v. Quinazolinone from anthranilic acid via benzoxazinone.
   vi. Sulfanilamide from acetanilide
   vii. Isoniazid from \textgreek{gamma}-picoline.
   viii. Antipyrine from ethyl aceto acetate.
   ix. Benzocaine from \textit{para}- nitro benzoic acid.

II. Qualitative estimation of some functional groups.
   i. Halogens (Strepheno’s method).
   ii. Hydroxyl groups (Acetylation method)
   iii. Methoxyl groups (Zeissel’s method)
   iv. Carboxyl groups (Silver salt method).

REFERENCES
III Year –I I SEMESTER

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.

LO : To understand Capsule formulation, Types, Manufacturing and evaluation – Quality Control – Stability testing-storage.

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.

LO : To understand microencapsulation – Applications, Methods of Preparations. evaluation – Applications of Microcapsules.

UNIT - III
Tablets: Formulation of different types of tablets, granulation technology on large-scale by various techniques, types of tablet compression machinery and the equipments employed evaluation of tablets.

LO : To understand tablet formulations, additives- manufacturing methods- equipment-Evaluation of quality & Control.

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 fluids,
   lyophilization & preparation of sterile powders, equipment for large-scale manufacture
   and evaluation of parenteral products.

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

LO : To understand Formulations, Preformulations, additives, Manufacturing methods, containers, Packaging, evaluation of Parenterals – quality control. Types of sterile powders, aseptic processing facilities.

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

LO : To understand Packaging components- types, specifications and evaluation methods of packaging materials and containers- legal and official requirements.

TEXT BOOKS
2. HC Ansel introduction to Pharmaceutical Dosage forms .

REFERENCES

1. Sagarian & MS Balsam, Cosmetics Sciences & Technology, Vol. 1, 2 & 3
2. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences
3. E.A. Rawlkins Bentley’s Text Book of Pharmaceutics, Elbs publ
8. Good Manufacturing Practices – Schedule M. Read With The Drugs And Cosmetic Rules 1945
III Year – I I SEMESTER

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.

LO : To understand principles of fermentation technology - types of bioreactor – optimization of fermentation process – principles of effluent treatment.

UNIT - II
Specific Fermentations: Selection of organism, fermentation & purification of various antibiotics, vitamins, aminoacids, organic acids, solvents like Penicillin, Streptomycin, Tetracycline, Erythromycin, Riboflavin, Cynacobalamin, Glutamic Acid, Lysin, Citric Acid, Lactic Acid, Alcohol, Acetone etc.

LO : To understand Fermentations of various types of industrial and medicinal compounds.

UNIT - III
Microbial Transformations: Types, Methods of bioconversions & Application in Pharma Industry, Steroidal transformation.
Recombinant DNA Technology: Introduction to R-DNA technology and genetic engineering, steps involved, isolation of enzymes, vectors, recombination and cloning of genes.
Production of bio technology derived therapeutic proteins like humulin, humatrop, activase, intron a, monoclonal antibodies by hybridoma technique, recombivax HB (Hepatitis B).

LO : To understand types, methods and applications of bioconversion – principles and production technology of recombinant DNA technology with examples.

UNIT – IV
Immunology & Immunological Preparations: Principles of Immunity, Humoral immunity, cell mediated immunity, antigen – antibody reactions, hypersensitivity and its applications.
Active & passive immunizations vaccine preparation, standardization & storage of BCG, cholera, smallpox, polio, typhus, tetanus toxoid, immunoserum & diagnostic agents.

LO: To understand principles of Immunology, Antigen- Antibody reactions – applications, active and passive immunizations – study of various vaccines and sera.

UNIT – V

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.

LO: To understand techniques, applications and productions enzymes of medicinal importance.

UNIT - VI

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

Introductory study & applications of bioinformatics, proteomics and genomics.

LO: To understand Blood products – collection processing, storage and uses of various blood products.

TEXT BOOKS

1. Wulf Crueger and Anneliese Crueger, Biotechnology, 2nd Ed, Publ-Panima publication co-operation, New Delhi.
2. P. F. Stanbury & A. Whitaker, Principles of fermentation technology, Pergamon Press
3. B.P. Nagori & Roshan Issari, Foundations in Pharmaceutical Biotechnology
5. S. S. Kori, Pharmaceutical biotechnology.
REFERENCES
3. K. Kielsliched “Biotechnology” Vol 6, Verlegchemic, Switzerland.
5. OP Ward” Fermentation Technology, Principles, Processes products” Open University press, Milton Keynes, UK.
6. A. M. Campbelli, Monoclinical antibody technology.
7. A. Wiseman, Handbook of enzyme biotechnology.
8. J. D. Watson, Recombinant DNA technology.
III Year – I I SEMESTER

PHARMACOLOGY – II

UNIT - I
Pharmacology of Cardiovascular System – Drugs used in congestive heart failure & Stimulants
Drugs used in cardiac arrhythmias, Anti-hypertensives, Drugs used in the treatment of Angina pectoris,
Drugs used in the therapy of shock.
LO: To acquire knowledge on CVS and its regulatory mechanisms, pathophysiology related to CVS diseases and disorders and Pharmacology of drugs used in the Cardio vascular diseases.

UNIT - II
Drugs acting on hematopoietic system
Anti-coagulants, Anti-platelets, Thrombolytics & hematinics.
Drugs acting on urinary system
Fluid and electrolyte balance, Diuretics & Antidiuretics.
LO: Grasping knowledge on pathophysiology of blood and blood forming organs, kidney – urine formation and the Pharmacology of drugs.

UNIT - III
Drugs acting on Endocrine system
Pancreatic hormone and Anti-Diabetic drugs, Thyroid & Anti-thyroid drugs, Gonadal hormones & Inhibitors, Adrenocortico steroids & Adrenocortical antagonists, Hypothalamic & Pituitary Hormones.
LO: Grasping knowledge on Physiological role of Endocrine glands and its pathological conditions and the Pharmacology of drugs used.

UNIT - IV
Autocoids: Histamine, Serotonin (5-HT) & their antagonists, Prostaglandins & leukotrienes, Pentagastrin, cholecystokinin, angiotensin, vasoactive peptides.
LO: To acquire knowledge on Autocoids, synthesis, metabolism and their Pharmacology.

UNIT - V
Drugs Acting on the Respiratory System
Anti-asthamatic drugs including bronchodilators, Anti-tussives & expectorants, Respiratory stimulants.

LO: Impart knowledge on respiratory diseases and the Pharmacology of drugs.

UNIT - VI
Chemotherapeutic agents and their applications: General principles of chemotherapy,
Sulphonamides and co-trimoxazole, Antibiotics : Penicillins, cephalosporins, Beta lactams,
Chemotherapeutic agents and their applications: Tetracyclines aminoglycosides, chloramphenicol, erythromycin, quinolones and miscellaneous antibiotics.
Chemotherapy of tuberculosis & leprosy.
Chemotherapy of fungal diseases, viral diseases, urinary tract infections and sexually transmitted diseases.
Chemotherapy of malignancy and immune suppressive Agents.
LO: To gain knowledge on Chemotherapeutics and various classes of drugs used for infection and diseases.

TEXT BOOKS
4. Tripathi, Textbook of Pharmacology, JAYPEE.
5. Leilani Grajeda, Understanding Pharmacology: A physiological Approach

REFERENCES
3. J. Crossland, Lewis ‘s Pharmacology, Church living stone.
III Year – I I SEMESTER

MEDICINAL CHEMISTRY-III

UNIT I
A general introduction to advances in medicinal chemistry with emphasis on the principles of combinatorial chemistry, high throughput screening and QSAR studies.
LO: General concepts, principles, procedures, advantages, equations and methodologies.

UNIT II
1. Types of receptors, interaction forces
2. Preliminary aspects of molecular modeling studies: docking, pharmacophore modeling
LO: General concepts, principles, procedures, advantages and methodologies.

UNIT III
1. Steroidal anti-inflammatory agents: classification, structures, SAR, uses and toxicity
2. Bile acids: classification, structures and functions
LO: Acquaintance with steroidal structures, features, properties, uses, mode of action.

UNIT IV
2. Cardiac glycosides: classification, structures and structural features, mode of action and therapeutic uses.
LO: Introduction to cardiovascular diseases, uses, mode of action.

UNIT V
1. Antihypertensives: classification, mode of action, SAR, currently used drugs and synthesis of Methyldopa, Clonidine, Losartan.
2. **Antianginals and coronary vasodilators**: classification, mode of action, SAR and uses, synthesis of Isosorbide dinitrate.

**LO**: Introduction to cardiovascular diseases, uses, mode of action.

**UNIT VI**

1. **Diuretics**: Definition, classification, mode of action, SAR of different classes, uses and synthesis of Acetazolamide, Ethacrynic acid and Hydrochlorthiazide.

**LO**: Introduction, structures, methodology of synthesis, advantages.

**TEXT BOOKS**


**REFERENCES**


2. Lippincott Williams and Wilkins: Remington Pharmaceutical Sciences


5. C. Hansch, Comprehensive medicinal chemistry, Vol 1 – 6 Elsevier pergmon press, oxford


7. D. Lednicer, Organic drug synthesis, Vol, 1 – 6, J.Wiley N.Y.
III Year – I I SEMESTER

REGULATORY AFFAIRS, IPR & PATENTS

Unit-I
Preformulations and Formulation Development – Regulatory requirements in Preformulations and Formulation Development of Solid, liquid and Semisolid dosage.
LO : To understand preformulations – protocols – regulatory – requirements – Formulation Development of Solid, liquid and Semisolid dosage.

Unit-II
Manufacturing- Regulatory requirements related to manufacturing- manufacturing formula, Records, Validations involved-GMP
LO : To understand regulatory requirements related to manufacturing, validation – types, Validation of process, equipment, raw materials, excipients.

Unit-III
Regulatory requirements of packaging materials- Evaluation of Packaging materials.
Stability – Regulation for Stability testing of API, Solid and liquid dosage form as per ICH guidelines.
LO : To understand regulatory requirements of packaging materials, evaluation of packaging materials, stability testing as per ICH.

Unit – IV
Clinical Trials : Phase –I, II, III & IV studies – Regulations involved
LO : To understand regulatory requirements of Clinical Trials, Phase –I, II, III & IV studies.

Unit- V
LO : To understand IPR with examples.
Unit- VI
Patents: patenting laws and Regulations – Procedures for obtaining and writing a patent – Examples.
LO : To understand patents, patent laws, procedures with examples.

References :
1. Quality Assurance guide by organization of Pharmaceutical Procedures of India
3. How to Practice GMPs By P.P.Sharma, Vandhana Publications, Agra.
5. Pharmaceutical Preformulations by J.J.Wells.
7. Basic principles of Clinical Research and methodology by Guptha.
At least 25 Pharmaceutical preparations related to the topics are to be prepared

1. Experiments to illustrate preparation, stabilization, physical, chemical and biological evaluation of pharmaceutical products like capsules, tablets, parenterals, microcapsules etc.
2. Evaluation of materials used in pharmaceutical packaging.
1. To calculate the $pA_2$ value of mepyramine or chlorampheniramine using histamine as agonist on guinea pig ileum.
2. To record the CRC of 5-HT on rat fundus preparation.
3. To record the CRC of histamine on guinea pig ileum preparation.
4. To study the inotropic and chronotropic effects of drugs on isolated frog heart.
5. To study the effects of drugs on isolated normal and hypodynamic frog heart.
6. Experiments pertaining to analgesia. (Only demonstration).
7. Experiments pertaining to anti-convulsant activity. (Only demonstration).
8. Experiments pertaining to anti-inflammatory activity (Only demonstration).
9. To study the effect of drugs on rat ileum.
10. To determine the hypoglycemic activity of drugs (second generation anti-diabetic drugs) on rabbits / albino rats. (Only demonstration).
III Year –II SEMESTER

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. Antibiotic assay by cup plate method.
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.
10. Isolation of mutants by gradient plate technique.
11. Preparation of bacterial vaccine.
13. Extraction of DNA.
IV Year –I SEMESTER

PHARMACEUTICAL ANALYSIS – II

UNIT – I
LO: To understand principles, instrumentations and working of UV and its Spectrophotometers – applications with examples.

UNIT - II
LO: To understand principles, instrumentations, applications with examples of NMR, ESR, Mass spectrometry.

UNIT - III
Basic Principles and applications of differential thermal analysis (DTA) and differential scanning colorimetry (DSC).
Basic Principles and applications of Atomic absorption spectroscopy, XRD, Emission spectroscopy and Raman spectroscopy.
Optical rotatory dispersion (ORD) and Circular dichroism: General Principle and Applications.
Radio Immuno Assay & Enzyme Linked Immuno Sorbate Assay.
LO: To understand basic principles and applications of DTA, DSC, XRD, Atomic absorption, Emission, Raman, ORD and Radio Immuno Assay.

UNIT – IV
Chromatography: Column chromatography, Paper chromatography, TLC, Ion exchange chromatography, Gel chromatography.
LO: To understand principles and procedures of various types of chromatography with examples.

UNIT – V
GLC, HPLC, HPTLC
LO: To understand principles, instrumentations and applications of GLC, HPLC, HPTLC.

UNIT – VI
LCMS and Electrophoresis: Scope, Different types Electrophoresis and applications.
LO: To understand principles, instrumentations and applications of LCMS and Electrophoresis.

TEXT BOOKS
3. Al Vogel, Quantitative Chemical Analysis.
7. B.K. Sharma, Instrumental and Chemical Analysis, Goel Publ House, Hyderabad.

REFERENCES
1. Settle, Handbook of Instrumental Techniques for Analytical Chemistry.
3. P.D. Sethi, Quantitative analysis of Drugs and Pharmaceuticals.
IV Year –I SEMESTER  

BIOASSAYS & TOXICOLOGY

**Unit I:**
Basic principles of Bioassays, merits and demerits, methods of bioassays. 
Test for pyrogens and test for freedom undue toxicity. 
LO: To gain knowledge on bioassays and its applications, its importance and need in the present context.

**UNIT II**
Bioassays of digoxins, posterior pituitary extract, Insulin and tetanus antitoxin. 
LO: Principles and procedures involved in bioassays and their limitations.

**UNIT III**
History, scope of toxicology, principles of toxicology, mechanisms and risk assessment, biotransformation of xenobiotics and toxicokinetics. 
LO: To grasp knowledge on scope, principles, mechanisms and risk assessment.

**UNIT IV**
LO: To get an overview on acute, sub-acute and chronic toxicity studies, Carcinogenicity and chemical carcinogenesis in humans.

**UNIT V**
Target Organ Toxicity:
- Toxic responses of the blood.
- Toxic responses of the liver.
- Toxic responses of the kidney.
- Toxic responses of heart and vascular system.
General Principles of Poisoning: Signs, symptoms, treatment of acute and chronic poisoning due to heavy metals, snake venom.

LO: To acquire knowledge on toxic responses of target organs, poisoning and its treatment strategies.

UNIT VI

Toxic Agents:
- Toxic effects of pesticides.
- Toxic effects of metals.
- Toxic effects of solvents and vapours.
- Toxic effects of plants.

LO: To learn about intoxication produced by various toxicants.

Text Books:
1. Casarett&Doull’s Toxicology The Basic Science of Poisons, Seventh edition. Editor- Curtis D. Klaassen, Ph.D.
5. Basis of Toxicology Testing Edited by Douald J Ecobichon.
UNIT-I
Carbohydrates: Classification and general properties. Knowledge of structure including Stereo Chemistry of glucose. General treatment of pharmaceutically important carbohydrates-maltose, lactose, starch, cellulose and dextrin.
LO: Introduction, basic understanding, structures, features, stabilities and uses.

UNIT-II
LO: Introduction, basic understanding, structures, features and uses.

UNIT-III
1. Purines and xanthine derivatives: Structure and synthesis of uric acid, Theobromine, theophylline, and caffeine. General aspects of nucleoproteins and nucleic acids,
LO: Introduction, basic understanding, structures, methodologies, significance and uses.

UNIT-IV
Terpenes: Occurrence, general methods of isolation and classification, chemistry of citral, limonene, $\alpha$-terpeneiol, carvone, camphor and menthol.
LO: Introduction, basic understanding, structures, chemistry and structural features, important degradative reactions, uses.

UNIT-V
Alkaloids: Classification, general methods of isolation, general methods of structural determination, chemical tests for alkaloids, Chemistry and uses of Ephedrine, Nicotine, Papaverine and Atropine.
LO: Introduction, basic understanding, structures, chemistry and structural features, important degradative reactions, uses.

UNIT-VI
1. Vitamins: Classification, chemistry, physiological role and uses of Thiamine, Riboflavin and Ascorbic acid. Skeletal structures of vitamins official in I.P.

LO: Introduction, basic understanding, structures, chemistry and structural features, important degradative reactions, uses.

TEXT BOOKS
2. JB Harborne, Phyto Chemical methods.

REFERENCES
1. RT Morrison and R.N BOYD, Organic chemistry, Allyn and Bacon, inc., boston
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 Pharmacognosy, CBS Publ.
UNIT-I

Hospital Pharmacy: Organization and structure, organization of a hospital and hospital pharmacy, responsibilities of a hospital pharmacist, pharmacy and therapeutic committee, 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.

LO: To understand Hospital Pharmacy – organisation structure - Budget preparation and implementation hospital formulary, organization of drug store, purchase and inventory control, patient COUNSELLING, role of pharmacist in community health care and education.

UNIT-II

The pharmacy procedural manual, drug distribution, dispensing to out-patients, in-patients and ambulatory Patient - dispensing of ancillary and controlled substances, drug information center.

LO: To understand The pharmacy procedural manual, drug distribution, dispensing to out-patients, in-patients and ambulatory Patient - dispensing of ancillary and controlled substances, drug information center.

UNIT-III

Records and Reports: Prescription filling, drug profile, patient medication profile, cases on drug interaction and adverse reactions, idiosyncratic cases etc.

LO: To understand Prescription filling, drug profile, patient medication profile, cases on drug interaction and adverse reactions, idiosyncratic cases.

UNIT-IV

Introduction to community Pharmacy

- Community pharmacy Practice — definition.
- The role of the community pharmacy and its relationship to other local health care providers and services to nursing homes and clinics.
• Professional responsibilities of community pharmacist (FIP & WHO Model).
• Prescribed medication order - interpretation and legal requirements

**LO:** To understand Community pharmacy – role and relationship, professional responsibilities and prescribed medication order.

**UNIT-V**
**Communication skills - communication with prescribers and patients**

**Over-the-counter (OTC) Drugs**

• Rational use of common OTC medications (Vitamins and tonics, iron preparations, analgesics, NSAIDs, cough mixtures, anti-diarrhoeal preparations)

**LO :** To understand communication with prescribers and patients, Rational use of common OTC medications.

**UNIT-VI**
1. **Primary health care in community pharmacy**
   Family planning, First aid, Participation in primary health programs, Smoking cessation, Screening programs, Nutrition, Responding to common ailments

2. **Community pharmacy management**
   Financial, materials, staff, infrastructure requirements, drug information resources, in community pharmacies, computer applications in community pharmacy, Education and training

3. **Home Medicines Review (HMR) program: introduction and guidelines**

   **LO :** To understand Family planning, First aid, Participation in primary health programs, Smoking cessation, Screening programs, Nutrition, Responding to common ailments and Community pharmacy management and Home Medicines Review (HMR).

**Text Books**
1. Hospital Pharmacy - Hassan WE. Lee and Febiger publication.
2. Textbook of hospital pharmacy - Aliwood MC and Blackwell. Reference books (Latest editions)
5. Relevant review articles from recent medical and pharmaceutical literature.
6. Cooper & Gunns Dispensing Pharmacy, CBS, Publ. and Distributors New Delhi.
8. JS Quadry, Hospital Pharmacy.
10. Lorria & William, Essential dosage calculations.

REFERENCES
1. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences.
2. William Hassan, Hospital Pharmacy.
3. R.M Metha, Dispensing Pharmacy.
4. E.A. Rawlinson, Bentley’s Text Book of Pharmaceutics, Elbs publ.
5. Hoover, Dispensing of Medication.
6. NK Jain, Health Education and Community Pharmacy by, CBS, Publ. and Distributors New Delhi.
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

LO : To understand Pharmaceutical Legislations, Drugs & Pharmaceutical Industry, Pharmaceutical Education and Pharmaceutical ethics & policy.

UNIT-II
Pharmacy Act 1948 and Drugs (Price control) order.

LO : To understand rules prescribed order, Pharmacy act, Drugs (Price control) order.

UNIT-III
Drugs and Cosmetics Act 1940 and Rules 1945

LO : To understand rules, schedules of Drugs and Cosmetics Act in detail.

UNIT-IV
Medicinal & Toilet Preparations (Excise Duties) Act 1955
Narcotic Drugs & Psychotropic Substances Act 1985 & A.P. N. D. P.S Rules 1986

LO : To understand and procedures under medicinal and toilet preparations act and Narcotic Drugs & Psychotropic Substances Act.

UNIT-V

LO : To understand the rules and procedures under drugs and magic remedies.

UNIT-VI
A study of the salient features of the following.
c. Factories Act 1948.
d. WTO, GATT and The Indian Patents Act 1970

LO: To understand the salient features of the above.

TEXT BOOKS

REFERENCE BOOK
1. Bare Acts and Rules Publ by Govt of India/state Govt from time to time.
2. AIR – reported judgments of Supreme Court of India and other High Courts.
3. Pharmaceutical policy of India
4. Notification from NPPA
5. Vijay Malik, Drugs & Cosmetics act 1940 and Rules, Eastern Law House Co. Delhi, Kolkata.
IV Year –I SEMESTER  

PHARMACEUTICAL ANALYSIS – II LAB

Experiments

1. Interpretation of IR Spectra.
2. Determination of \( \lambda \)- max of a drug.
3. Determination of concentration of glycerine by Abbe’s refractometer.
8. Ascending paper chromatography.
10. Two dimension chromatography
11. Thin layer chromatography.
12. Column chromatography (**Demonstration Only**).
14. Gel electrophoresis (**Demonstration Only**).
15. HPLC (**Demonstration Only**).
IV Year –I SEMESTER

BIOASSAYS & TOXICOLGY LAB

To find the potency of test sample using a suitable isolated tissue

1. Matching point assay
2. Two-point assay
3. Three point assay
4. To calculate the \( p^{A2} \) value of Atropine using Acetyl Choline as an agonist on rat Ileum.
5. To find the acute toxicity of the given test drug (Digoxin, Nicotine, Aspirin, Paracetamol).
6. Test for Pyrogen
7. Test for freedom from undue toxicity
8. 4 point bioassay
9. Toxic responses of liver against chemical induced intoxication (Paracetamol, CCl\(_4\)).
CHEMISTRY OF NATURAL PRODUCTS LAB

1. Preparation of different alkaloids testing reagents like Dragendorff, Mayer, Wagner’s, etc., and testing some alkaloids and plant extracts using these reagents.
2. Identification of alkaloids by specific colour tests.
3. Test 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), Fecl₃ test.
5. TLC and examination of alkaloids, steroids, steroidal glycosides and cardiac glycosides.
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 β-carotene from carrots.
13. Volatile oil production by steam distillation (demonstration only).

TEXT BOOKS

1. Indian Pharmacopoeia-1996.
2. Weagners, Phytochemical methods of Drug Analysis.
3. C.K.Kokate, Practical Pharmacognosy.
UNIT - I
Introduction to Biopharmaceutics and Pharmacokinetics and their role in formulation development and clinical setting

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

**LO:** To understand Biopharmaceutics, Pharmacokinetics and their applications – absorption mechanisms, factors, their application with examples.

UNIT - II
Drug distribution in the body, Factors influencing distribution.
Plasma protein binding, binding sites, factors influencing protein binding

**LO:** To understand drug distribution, protein binding – factors.

UNIT - III
**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.

**LO:** To understand the significance of plasma drug concentrations, compartment models - kinetics, parameters.

UNIT - IV
**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 pharmacokinetics with special reference to one compartment model after I.V. Drug administration, MichalesMente Equation, detection of non-linearity (Saturation mechanism).

LO: To understand pharmacokinetic models, Linear and Non-Linear kinetics, mechanisms and method of assessments.

UNIT - V
Clinical pharmacokinetics
Definition and scope
Dosage adjustment in patients with and without renal and hepatic failure.
Pharmakokinetic drug interactions and its significance in combination therapy.
LO: To understand clinical pharmacokinetics and their significance, drug interactions – Adjustment of dose.

UNIT - VI
Bioavailability and Bioequivalence.
Measures of bioavailability, C-max, T-max and Area Under the Curve (AUC)
Design of single dose bioequivalence study and relevant statistics.
Overview of regulatory requirements for conduction of bio-equivalence studies.
Bio availability and bio equivalence including evaluation testing protocols.
  b. Bioavailability testing protocol and procedures.
LO: To understand bioavailability, bioequivalence, concepts, assessments, design, regulation, invitro dissolution methods, Invitro-invivo correlation.

TEXT BOOKS
3. DM Brahmankar and SB Jaiswal, biophamaceutics and pharmacokinetics- a treatise, vallabhprakasham, Delhi.

REFERENCES
2. Modern pharmaceutics by banker Marcel Dekker Inc., NY
3. L. Iachman, H.A. Lieberman, J.L. Kanig, the theory and practice of industrial pharmacy, Varghese publ house, Mumbai.
5. Robert E notary, Biopharmaceutics and pharmacokinetics – an introduction, arceldekkerinc., NY
IV Year –II SEMESTER

CLINICAL PHARMACY, THERAPEUTICS AND PHARMACOVIGILANCE

UNIT - I
General concept: Clinical Pharmacokinetics, Drug interactions, Adverse Drug Reactions, Parenteral Nutritions.
LO: To understand several concepts of clinical pharmacokinetics, Drug interactions and Adverse Drug Reactions

UNIT - II
LO: To understand the concepts of Pharmacoeconomics, Pharmacogenomics, TDM, Posology etc.

UNIT - III
Drug therapy in Gastro intestinal, hepatic, renal, cardio vascular and respiratory disorders.
Drug therapy for Neurological and Psychological disorders.
Drug therapy in infections of Respiratory systems, Urinary system, Infective Meningitis, TB, HIV, Malaria and Filaria.
LO: To understand drug therapy of above mentioned disorders.

UNIT - IV
Drug therapy for Thyroid and Para Thyroid disorders, Diabetes mellitus, menstrual cycle disorders, menopause and male sexual dysfunction.
LO: To understand the drug therapy of Endocrine disorders.

UNIT - V
Drug therapy for Malignant disorders like Leukemia, Lymphoma and solid tumors.
Drug therapy for Rheumatic, eye and skin disorders.
LO: To understand drug therapy of above mentioned disorders.
UNIT - VI
Pharmacovigilance: Definition, history, importance, scope and outcomes.
Stake holders and their role in Pharmacovigilance.
Data reporting form, banned drug – regulatory considerations.
LO: To understand importance of Pharmacovigilance role in clinical practice as described above.

TEXTBOOKS
4. Clinical Pharmacy by Dr. H. P. Tipnis, Dr. Amrita Bajaj; Career Publications.

REFERENCES
1. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences.
UNIT - I
Controlled and sustained release: Factors to be considered – Principles involved in their design – regulatory considerations.
LO: To understand Controlled and sustained release: Factors to be considered – Principles involved in their design – regulatory considerations.

UNIT - II
LO: To understand fundamentals, Dissolution Controlled, Diffusion Controlled, Ion Exchange Resins, Osmotic based systems, pH Independent Systems and altered density systems.

UNIT - III
Transdermal Drug Delivery Systems: Fundamentals, types of TDDS, Materials Employed and Evaluation of TDDS.
LO: To understand fundamentals, types of TDDS, Materials Employed and Evaluation of TDDS.

UNIT - IV
LO: To understand mechanism of bioadhesion, mucoadhesive materials, formulation and evaluation of mucoadhesive-based systems.

UNIT - V
LO: To understand fundamentals and applications, formulation and evaluation of liposomes, resealed erythrocytes and nano particles.
UNIT - VI
Study of polymers for controlled release – Classification, study of biodegradable polymers & hydrogels – their applications.
LO: To understand classification, study of biodegradable polymers & hydrogels – their applications.

TEXT BOOKS
1. N.K. Jain, Control Drug Delivery Systems by

REFERENCES
2. Sagarian& MS Balsam, Cosmetics Sciences &Technology.Vol.1, 2 & 3
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
UNIT - I
Concept of Quality assurance, philosophy of GMP, CGMP and GLP.
LO: To understand Concept of Quality assurance, philosophy of GMP, CGMP and GLP.

UNIT - II
Organization and personnel, responsibilities, training hygiene - Premises: Location, design, plant layout, construction, maintenance and sanitations, environmental control, sterile areas, control of contamination.
LO: To understand organization and personnel, responsibilities, training hygiene - Premises: Location, design, plant layout, construction, maintenance and sanitations, environmental control, sterile areas, control of contamination.

UNIT - III
LO: To understand selection, purchase specifications, maintenance, clean in place, sterilize in place - Raw materials: Purchase specifications, maintenance of stores, selection of vendors, controls and raw materials.

UNIT - IV
Manufacture and controls on dosage forms, manufacturing documents master formula, batch formula records, standard operating procedures, quality audits of manufacturing processes and facilities - In process quality control on various dosage forms: sterile, biological products and non-sterile, standard operating procedures for various operations like cleaning, filling, drying, compression, coating. Packaging and labeling controls.
LO: To understand manufacture and controls on dosage forms, manufacturing documents master formula, batch formula records, standard operating procedures, quality audits of manufacturing processes and facilities - In process quality control on various dosage
forms: sterile, biological products and non-sterile, standard operating procedures for various operations. Packaging and labeling controls.

UNIT - V
Quality Control Laboratory: Responsibilities, good laboratory practices, routine controls, instruments, protocols, non-clinical testing, controls on animal house, data generation and storage, quality control documents, retention samples, records, audits of quality control facilities - Finished products release: quality review, quality audits and batch release document.

LO: To understand responsibilities, good laboratory practices, routine controls, instruments, protocols, non-clinical testing, controls on animal house, data generation and storage, quality control documents, retention samples, records, audits of quality control facilities - Finished products release: quality review, quality audits and batch release document.

UNIT - VI
Distribution and Distribution records: Handling of returned goods, recovered materials and reprocessing Complaints and recalls, evaluation of complaints, recall procedures, related records and documents.

LO: To understand handling of returned goods, recovered materials and reprocessing. Complaints and recalls, evaluation of complaints, recall procedures, related records and documents.

TEXT BOOKS
3. GMP-Mehra.
4. Pharmaceutical Process validation by Berry and Nash

REFERENCE BOOKS
2. How to practice GMP’s – P.P.Sharma
3. The Drugs and Cosmetic Act 1940- Vijay Malik.
5. SOP Guidelines by D.H.Shah.
6. Quality Assurance Guide by OPPI.
IV Year –II SEMESTER

BIOPHARMACEUTICS AND PHARMACOKINETICS LAB

1. Experiments designed for the estimation of various pharmacokinetic parameters with given data.
4. Absorption studies – *in vitro* and *in vivo*.
5. Statistical treatment of pharmaceutical data.
IV Year –II SEMESTER  
PROJECT WORK  
T   P   C  
0   0   4  

IV Year –II SEMESTER  
PROJECT SEMINAR  
T   P   C  
0   0   4  

IV Year –II SEMESTER  
COMPREHENSIVE VIVA  
T   P   C  
0   0   2  

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