

**GANDHI INSTITUTE OF TECHNOLOGY AND MANAGEMENT  
(GITAM)**

**(Deemed to be University, Estd. u/s 3 of the UGC Act 1956)**

**\*VISA KHAPATNAM \* HYDERABAD \* BENGALURU\***

Accredited by NAAC with 'A' Grade



**REGULATIONS & SYLLABUS**

**Bachelor of Pharmacy**

(W.e.f. 2015-16 admitted batch)

**Website: [www.gitam.edu](http://www.gitam.edu)**

**BACHELOR OF PHARMACY (B. Pharm)**  
**REGULATIONS**  
(w.e.f. 2015-16 admitted batch)

**1. ADMISSIONS**

1.1 Admissions into B. Pharm programme of GITAM University are governed by GITAM University admission regulations.

**2. ELIGIBILITY CRITERIA**

2.1 A pass in 10+2 or equivalent examination approved by GITAM University with Physics, Chemistry and Mathematics/ Biology.

2.2 Admissions into B. Pharm will be based on All India Entrance Test (GAT) conducted by GITAM University and the rule of reservation is followed wherever applicable.

**3. CHOICE BASED CREDIT SYSTEM**

Choice Based Credit System (CBCS) is introduced with effect from the admitted Batch of 2015-16 based on UGC guidelines in order to promote:

- Student Centered Learning
- Cafeteria approach
- Students to learn courses of their choice
- Learning at their own pace
- Inter-disciplinary learning

Learning goals/ objectives and outcomes are specified leading to what a student should be able to do at the end of the program.

## 4. STRUCTURE OF THE PROGRAMME

### 4.1 The Program Consists of

i) Foundation Courses (compulsory) which give general exposure to a Student in communication and subject related area.

ii) Core Courses (compulsory).

iii) Discipline centric electives which

- |                                       |   |                           |
|---------------------------------------|---|---------------------------|
| a) are supportive to discipline       | } | Intra                     |
| b) give expanded scope of the subject |   | Departmental<br>Electives |
| c) give inter disciplinary exposure   | } | Inter                     |
| d) nurture the student skills         |   | Departmental<br>Electives |

iv) Open electives are of general nature either related or unrelated to the discipline.

4.2 Each course is assigned a certain number of credits depending upon the number of contact hours (lectures/tutorials/practical) per week.

4.3 In general, credits are assigned to the courses based on the following contact hours per week per semester.

- One credit for each Lecture / Tutorial hour per week.
- One credit for two hours of Practicals per week.
- Two credits for three (or more) hours of Practicals per week.

## **5. MEDIUM OF INSTRUCTION**

The medium of instruction (including examinations, project work, seminar, assignments and dissertation report) shall be English.

## **6. REGISTRATION**

Every student has to register himself/herself for each semester individually at the time specified by the Institute /University.

## **7. ATTENDANCE REQUIREMENTS**

7.1 A student whose attendance is less than 75% in all the courses put together in any semester will not be permitted to attend the end - semester examination and he/she will not be allowed to register for subsequent semester of study. He /She has to repeat the semester along with his / her juniors.

7.2 However, the Vice Chancellor on the recommendation of the Principal / Director of the University College / Institute may condone the shortage of attendance to the students whose attendance is between 66% and 74% on genuine medical grounds and on payment of prescribed fee.

## **8. EVALUATION**

8.1 The assessment of the student's performance in a Theory/Practical course shall be based on two components: Continuous Evaluation (40 marks) and Semester-end examination (60 marks).

8.2 A student has to secure an aggregate of 40% in the course in the two components put together to be declared to have passed the course, subject to the condition that the candidate must have secured a minimum of 24 marks (i.e. 40%) in the theory/practical component at the semester-end examination.

8.3 Project Work/ Industrial Training/ Viva voce/ Seminar etc. course are completely assessed under Continuous Evaluation for a maximum of 100 marks, and a student has to obtain a minimum of 40% to secure Pass Grade. Details of Assessment Procedure are furnished below in Table 1.

**Table 1: Assessment Procedure**

| S. No. | Component of assessment | Marks allotted | Type of Assessment       | Scheme of Examination  |
|--------|-------------------------|----------------|--------------------------|--|
| 1      | Theory                  | 40             | Continuous evaluation    | 1. Best two mid examinations of the three mid examinations conducted for 15 marks each for a total of 30 marks<br>2. Remaining 10 marks are given by the teacher by conducting quiz / assignments / surprises tests etc. |
|        |                         | 60             | Semester-end examination | The semester-end examination question paper in theory courses will be for a maximum of 60 marks.   |
|        | Total                   | 100            |                          |  |

|   |   |     |  |  |
|---|---|-----|--|--|
| 2 | Practical   | 40  | Continuous evaluation                    | (I) 20 marks are allotted for record work and regular performance of the student in the lab (Day to day performance & Viva voce).<br>(ii) One examination for a maximum of 20 marks shall be conducted by the teacher handling the lab course at the middle of the semester. |
|   |   | 60  | Semester-end examination                 | (iii) One examination for a maximum of 60 marks shall be conducted at the end of the semester (as scheduled by the Head of the Institution).   |
|   | Total   | 100 |  |  |
| 3 | Self-study  | 100 | Assignment evaluation                    | 100 marks are allotted for assignment on the related subject.  |
| 4 | Project work (VII & VIII Semester )   | 100 | Project evaluation                       | (i) 50 marks are allotted for continuous evaluation of the project work.<br>(ii) 25 marks are allotted for the presentation of the project work.<br>(iii) 25 marks are allotted for viva voce  |
| 5 | Industrial Training / visits (at the end of 6 <sup>th</sup> or 7 <sup>th</sup> or 8 <sup>th</sup> semesters). | 100 | Evaluation of Industrial training report | 100 marks are allotted for report submission on the training.  |

## **9. RETOTALLING, REVALUATION & REAPPEARANCE**

- 9.1 Retotalling of the theory answer scripts (Theory) of the end-semester examination is permitted on a request made by the student by paying the prescribed fee within ten days of the announcement of the result.
- 9.2 Revaluation of the theory answer scripts (Theory) of the end-semester examination is also permitted on a request made by the student by paying the prescribed fee within fifteen days of the announcement of the result.
- 9.3 A Student who has secured 'F' Grade in any theory course shall have to reappear at the subsequent Semester end examination held for that course.
- 9.4 A Student who has secured 'F' Grade in a Practical course shall have to reappear at the subsequent Semester end examination held for that course.
- 9.5 A student who has secured 'F' Grade in Project work / Industrial Training shall have to improve his/her report and reappear for Viva – voce at the time of Special Examination to be conducted in the summer vacation.

## **10. SPECIAL EXAMINATION**

A student who has completed his/her period of study and still has "F" grade in a 'Maximum of Five' of Theory/ Practical courses is eligible to appear for Special Examination normally held during summer vacation.

## 11. BETTERMENT OF GRADES

A student who has secured only a Pass or Second class and desires to improve his/her Class can appear for Betterment Examinations only in Theory courses of any Semester of his/her choice, conducted in Summer Vacation along with the Special Examinations. Betterment of Grades is permitted 'only once' immediately after completion of the program of study.

## 12. GRADING SYSTEM

12.1 Based on the student performance during a given semester, a final letter grade will be awarded at the end of the semester in each course. The letter grades and the corresponding grade points are as given in Table 2.

**Table 2: Grades & Grade Points**

| Sl.No. | Grade             | Grade Points | Absolute Marks |
|--------|-------------------|--------------|----------------|
| 1      | O (outstanding)   | 10           | 90 and above   |
| 2      | A+ (Excellent)    | 9            | 80 to 89       |
| 3      | A (Very Good)     | 8            | 70 to 79       |
| 4      | B+ (Good)         | 7            | 60 to 69       |
| 5      | B (Above Average) | 6            | 50 to 59       |
| 6      | C (Average)       | 5            | 45 to 49       |
| 7      | P (Pass)          | 4            | 40 to 44       |
| 8      | F (Fail)          | 0            | Less than 40   |
| 9      | Ab. (Absent)      | 0            | -              |

12.2 A student who earns a minimum of 4 grade points (P grade) in a course is declared to have successfully completed the course, and is deemed to have earned the credits assigned to that course, subject to securing a GPA of 5 for a Pass in the semester/trimester.



### 13. GRADE POINT AVERAGE

13.1 A Grade Point Average (GPA) for the semester will be calculated according to the formula:

$$\text{GPA} = \frac{\Sigma [ C G ]}{\Sigma C}$$

Where

C = number of credits for the course,

G = grade points obtained by the student in the course.

13.2 To arrive at Cumulative Grade Point Average (CGPA), a similar formula is used considering the student's performance in all the courses taken, in all the semesters up to the particular point of time.

13.3 CGPA required for classification of class after the successful completion of the program is shown in Table 3.

**Table 3: CGPA required for award of Degree**

|                              |              |
|------------------------------|--------------|
| First Class with Distinction | $\geq 8.0^*$ |
| First Class                  | $\geq 6.5$   |
| Second Class                 | $\geq 5.5$   |
| Pass                         | $\geq 5.0$   |

\* In addition to the required CGPA of 8.0, the student must have necessarily passed all the courses of every semester in first attempt.

## **14. ELIGIBILITY FOR AWARD OF THE B.PHARM DEGREE**

14.1 Duration of the programme: A student is ordinarily expected to complete the B. Pharm programme in eight semesters of four years. However a student may complete the programme in not more than six years including study period.

14.2 However the above regulation may be relaxed by the Vice Chancellor in individual cases for cogent and sufficient reasons.

14.3 A student shall be eligible for award of the B. Pharm degree if he / she fulfils all the following conditions.

- a) Registered and successfully completed all the courses and projects.
- b) Successfully acquired the minimum required credits as specified in the curriculum corresponding to the branch of his/her study within the stipulated time.
- c) Has no dues to the Institute, hostels, Libraries, NCC / NSS etc, and
- d) No disciplinary action is pending against him / her.

14.4 The degree shall be awarded after approval by the Academic Council.

## **15. DISCRETIONARY POWER**

Not withstanding anything contained in the above sections, the Vice Chancellor may review all exceptional cases, and give his decision, which will be final and binding.

## B. PHARM – SCHEME OF INSTRUCTION

### Choice Based Credit System I SEMESTER

| Code No.           | Name of the Subject                       | Category | Prescribed Hours |          |          | No. of Credits |
|--------------------|---|----------|------------------|----------|----------|----------------|
|                    |   |          | L                | T        | P        |                |
| PPH 101            | Anatomy Physiology & Health Education - I | C.C.     | 3                | 2        | --       | 4              |
| PPH 103            | Pharmaceutical Inorganic Chemistry        | C.F.     | 3                | --       | --       | 3              |
| PPH 105            | Computer Applications & Programming       | C.F.     | 3                | --       | --       | 3              |
| PPH 107            | Pharmaceutical Organic Chemistry - I      | C.F.     | 3                | 2        | --       | 4              |
| PPH 109            | Ethics and Moral values                   | C.F.     | 2                | --       | --       | NC             |
| PBI / PMA<br>111   | Remedial Biology/ Mathematics             | C.F.     | 3                | --       | --       | NC             |
| <b>PRACTICALS:</b> |   |          |                  |          |          |                |
| PPH 121            | Anatomy Physiology & Health Education - I | C.C.     | --               | --       | 3        | 2              |
| PPH 123            | Pharmaceutical Inorganic Chemistry        | C.F.     | --               | --       | 3        | 2              |
| PPH 125            | Computer Applications & Programming       | C.F.     | --               | --       | 3        | 2              |
| <b>Total</b>       |   |          | <b>17</b>        | <b>4</b> | <b>9</b> | <b>20</b>      |

### II SEMESTER

| Code No.           | Name of the Subject                        | Category | Prescribed Hours |          |          | No. of Credits |
|--------------------|--|----------|------------------|----------|----------|----------------|
|                    |  |          | L                | T        | P        |                |
| PPH 102            | Pharmaceutical Organic Chemistry – II      | C.F.     | 3                | 2        | --       | 4              |
| PPH 104            | Physical Pharmacy-I                        | C.C.     | 3                | 2        | --       | 4              |
| PPH 106            | Pharmacy Practice                          | C.C.     | 3                | --       | --       | 3              |
| PPH 108            | Anatomy Physiology & Health Education - II | C.C.     | 3                | 2        | --       | 4              |
| PPH 110            | Environmental Sciences                     | C.F.     | 2                | --       | --       | 2              |
| <b>PRACTICALS:</b> |  |          |                  |          |          |                |
| PPH 122            | Pharmaceutical Organic Chemistry – II      | C.F.     | --               | --       | 3        | 2              |
| PPH 124            | Physical Pharmacy-I                        | C.C.     | --               | --       | 3        | 2              |
| PPH 126            | Pharmacy Practice                          | C.C.     | --               | --       | 3        | 2              |
| <b>Total</b>       |  |          | <b>14</b>        | <b>6</b> | <b>9</b> | <b>23</b>      |

### III SEMESTER

| Code No.           | Name of the Subject                   | Category | Prescribed Hours |          |          | No. of Credits |
|--------------------|---------------------------------------|----------|------------------|----------|----------|----------------|
|                    |                                       |          | L                | T        | P        |                |
| PPH 201            | Pharmaceutical Analysis - I           | C.C.     | 3                | --       | --       | 3              |
| PPH 203            | Pharmacognosy and Phytochemistry - I  | C.C.     | 3                | --       | --       | 3              |
| PPH 205            | Physical Pharmacy - II                | C.C.     | 3                | --       | --       | 3              |
| PPH 207            | Pharmaceutical Engineering-I          | C.F.     | 3                | 2        | --       | 4              |
| PPH 241 & 243      | Elective – I                          |          | 3                | --       | --       | 3              |
| <b>PRACTICALS:</b> |                                       |          |                  |          |          |                |
| PPH 221            | Pharmaceutical Analysis - I           | C.C.     | --               | --       | 3        | 2              |
| PPH 223            | Pharmacognosy and Phytochemistry - I  | C.C.     | --               | --       | 3        | 2              |
| PPH 225            | Physical Pharmacy - II                | C.C.     | --               | --       | 3        | 2              |
| <b>SELF STUDY:</b> |                                       |          |                  |          |          |                |
| PPH 271            | Tropical Diseases and their Treatment |          | --               | --       | --       | 2              |
| <b>Total</b>       |                                       |          | <b>15</b>        | <b>2</b> | <b>9</b> | <b>24</b>      |

| <b>Elective – I</b> |                                  |
|---------------------|----------------------------------|
| PPH 241             | Traditional Systems of Medicines |
| PPH 243             | Community Pharmacy               |

### IV SEMESTER

| Code No.           | Name of the Subject                        | Category | Prescribed Hours |          |          | No. of Credits |
|--------------------|--|----------|------------------|----------|----------|----------------|
|                    |  |          | L                | T        | P        |                |
| PPH 202            | Pharmaceutical Engineering - II            | C.F.     | 3                | 2        | --       | 4              |
| PPH 204            | Pharmaceutical Microbiology                | C.F.     | 3                | 2        | --       | 4              |
| PPH 206            | Pharmacology - I                           | C.C.     | 3                | 2        | --       | 4              |
| PPH 208            | Disaster Management                        | C.F.     | 2                | --       | --       | NC             |
| PPH 242 & 244      | Elective - II                              |          | 3                | --       | --       | 3              |
| <b>PRACTICALS:</b> |  |          |                  |          |          |                |
| PPH 222            | Pharmaceutical Engineering - II            | C.F.     | --               | --       | 3        | 2              |
| PPH 224            | Pharmaceutical Microbiology                | C.F.     | --               | --       | 3        | 2              |
| PPH 226            | Pharmacology - I                           | C.C.     | --               | --       | 3        | 2              |
| <b>SELF STUDY:</b> |  |          |                  |          |          |                |
| PPH 272            | Unit Operations in Pharmaceutical Industry |          | --               | --       | --       | 2              |
| <b>Total</b>       |  |          | <b>14</b>        | <b>6</b> | <b>9</b> | <b>23</b>      |

| <b>Elective – II</b> |                             |
|----------------------|-----------------------------|
| PPH 242              | Public Health and Nutrition |
| PPH 244              | Cosmetics                   |

## V SEMESTER

| Code No.           | Name of the Subject                       | Category | Prescribed Hours |           |          | No. of Credits |
|--------------------|---|----------|------------------|-----------|----------|----------------|
|                    |   |          | L                | T         | P        |                |
| PPH 301            | Pharmaceutical Technology                 | C.C.     | 3                | --        | --       | 3              |
| PPH 303            | Medicinal Chemistry - I                   | C.C.     | 3                | --        | --       | 3              |
| PPH 305            | Applied Biochemistry                      | C.F.     | 3                | --        | --       | 3              |
| PPH 307            | Biostatistics                             | C.F.     | 3                | --        | --       | 3              |
| EOE 208 & SOE 750  | Open Elective - I                         |          | 3                | --        | --       | 3              |
| <b>PRACTICALS:</b> |   |          |                  |           |          |                |
| PPH 321            | Pharmaceutical Technology                 | C.C.     | --               | --        | 3        | 2              |
| PPH 323            | Medicinal Chemistry - I                   | C.C.     | --               | --        | 3        | 2              |
| PPH 325            | Applied Biochemistry                      | C.F.     | --               | --        | 3        | 2              |
| <b>SELF STUDY:</b> |   |          |                  |           |          |                |
| PPH 371            | Diagnostic Tools in Disease Investigation |          | --               | --        | --       | 2              |
| <b>Total</b>       |   |          | <b>15</b>        | <b>--</b> | <b>9</b> | <b>23</b>      |

| <b>OPEN ELECTIVE – I</b> |                                       |
|--------------------------|---------------------------------------|
| EOE 208                  | Gandhian Philosophy                   |
| SOE 750                  | Object Oriented Programming Using C++ |

## VI SEMESTER

| Code No.           | Name of the Subject                   | Category | Prescribed Hours |          |          | No. of Credits |
|--------------------|---------------------------------------|----------|------------------|----------|----------|----------------|
|                    |                                       |          | L                | T        | P        |                |
| PPH 302            | Pharmacognosy and Phytochemistry - II | C.C.     | 3                | --       | --       | 3              |
| PPH 304            | Pharmaceutical Biotechnology          | C.C.     | 3                | --       | --       | 3              |
| PPH 306            | Soft Skills                           | C.F.     | 2                | --       | --       | 2              |
| PPH 308            | Medicinal Chemistry – II              | C.C.     | 3                | 2        | --       | 4              |
| MMH 844 & EOE 317  | Open Elective – II                    |          | 3                | --       | --       | 3              |
| <b>PRACTICALS:</b> |                                       |          |                  |          |          |                |
| PPH 322            | Pharmacognosy and Phytochemistry - II | C.C.     | --               | --       | 3        | 2              |
| PPH 324            | Pharmaceutical Biotechnology          | C.C.     | --               | --       | 3        | 2              |
| PPH 326            | Soft Skills                           | C.F.     | --               | --       | 3        | 2              |
| <b>SELF STUDY:</b> |                                       |          |                  |          |          |                |
| PPH 372            | Herbal Drugs                          |          | --               | --       | --       | 2              |
| <b>Total</b>       |                                       |          | <b>14</b>        | <b>2</b> | <b>9</b> | <b>23</b>      |

| <b>OPEN ELECTIVE – II</b> |                         |
|---------------------------|-------------------------|
| MMH 844                   | Technology Management   |
| EOE 317                   | Personality Development |

## VII SEMESTER

| Code No.           | Name of the Subject   | Category | Prescribed Hours |           |          | No. of Credits |
|--------------------|---|----------|------------------|-----------|----------|----------------|
|                    |   |          | L                | T         | P        |                |
| PPH 401            | Pharmacognosy and Phytochemistry - III<br>(Chemistry of Natural Products) | C.C.     | 3                | --        | --       | 3              |
| PPH 403            | Pharmacology – II   | C.C.     | 3                | --        | --       | 3              |
| PPH 405            | Biopharmaceutics and Pharmacokinetics                                     | C.C.     | 3                | --        | --       | 3              |
| PPH 407            | Pharmaceutical Jurisprudence  | C.C.     | 2                | --        | --       | 2              |
| PPH 441 &<br>443   | Elective – III  |          | 3                | --        | --       | 3              |
| <b>PRACTICALS:</b> |   |          |                  |           |          |                |
| PPH 421            | Pharmacognosy and Phytochemistry - III<br>(Chemistry of Natural Products) | C.C.     | --               | --        | 3        | 2              |
| PPH 423            | Pharmacology – II   | C.C.     | --               | --        | 3        | 2              |
| PPH 425            | Project Work (Selection of Topic,<br>Literature Review, Methodology)      |          | --               | --        | --       | NC             |
| <b>SELF STUDY:</b> |   |          |                  |           |          |                |
| PPH 471            | Pharmacy Profession - Health Care System                                  |          | --               | --        | --       | 2              |
| <b>Total</b>       |   |          | <b>14</b>        | <b>--</b> | <b>6</b> | <b>20</b>      |

| <b>ELECTIVE – III</b> |                              |
|-----------------------|------------------------------|
| PPH 441               | Quality Assurance and GMP    |
| PPH 443               | Biological Screening Methods |

## VIII SEMESTER

| Code No.           | Name of the Subject          | Category | Prescribed Hours |           |          | No. of Credits |
|--------------------|------------------------------|----------|------------------|-----------|----------|----------------|
|                    |                              |          | L                | T         | P        |                |
| PPH 402            | Pharmaceutical Analysis – II | C.C.     | 3                | --        | --       | 3              |
| PPH 404            | Novel Drug Delivery Systems  | C.C.     | 3                | --        | --       | 3              |
| PPH 406            | Pharmaceutical Management    | C.F.     | 3                | --        | --       | 3              |
| PPH 442,<br>444    | Elective - IV                |          | 3                | --        | --       | 3              |
| <b>PRACTICALS:</b> |                              |          |                  |           |          |                |
| PPH 422            | Pharmaceutical Analysis – II | C.C.     | --               | --        | 3        | 2              |
| PPH 424            | Novel Drug Delivery Systems  | C.C.     | --               | --        | 3        | 2              |
| PPH 492            | Project Work                 | C.C.     | --               | --        | --       | 6              |
| PPH 494            | Industrial Training / Visits | C.C.     | --               | --        | --       | 2              |
| <b>Total</b>       |                              |          | <b>12</b>        | <b>--</b> | <b>6</b> | <b>24</b>      |

| <b>ELECTIVE – IV</b> |                            |
|----------------------|----------------------------|
| PPH 442              | Computer Aided Drug Design |
| PPH 444              | Pharmacotherapeutics       |

| Credit Distribution System |            |           |                      |                         |            |
|----------------------------|------------|-----------|----------------------|-------------------------|------------|
| Semester                   | Theory     | Practical | Elective/ Self Study | Project / Ind. Training | Total      |
| I Semester                 | 14         | 6         | --                   | --                      | 20         |
| II Semester                | 17         | 6         | --                   | --                      | 23         |
| III Semester               | 13         | 6         | 5                    | --                      | 24         |
| IV Semester                | 12         | 6         | 5                    | --                      | 23         |
| V Semester                 | 12         | 6         | 5                    | --                      | 23         |
| VI Semester                | 12         | 6         | 5                    | --                      | 23         |
| VII Semester               | 11         | 4         | 5                    | --                      | 20         |
| VIII Semester              | 9          | 4         | 3                    | 8                       | 24         |
| <b>Total</b>               | <b>100</b> | <b>44</b> | <b>28</b>            | <b>8</b>                | <b>180</b> |

**C.C.:** Core Course

**C.F.:** Compulsory Foundation

**Self Study:** Assignment only, No Examination

**NC (Non credit):** College level examination only.

| Credit Distribution System |           |           |                             |            |                         |               |            |
|----------------------------|-----------|-----------|-----------------------------|------------|-------------------------|---------------|------------|
| Semester                   | CF        | CC        | Discipline Centric Elective | Self Study | Project / Ind. Training | Open Elective | Total      |
| I Semester                 | 14        | 6         | --                          | --         | --                      | --            | 20         |
| II Semester                | 8         | 15        | --                          | --         | --                      | --            | 23         |
| III Semester               | 4         | 15        | 3                           | 2          | --                      | --            | 24         |
| IV Semester                | 12        | 6         | 3                           | 2          | --                      | --            | 23         |
| V Semester                 | 8         | 10        | --                          | 2          | --                      | 3             | 23         |
| VI Semester                | 4         | 14        | --                          | 2          | --                      | 3             | 23         |
| VII Semester               | --        | 15        | 3                           | 2          | --                      | --            | 20         |
| VIII Semester              | 3         | 10        | 3                           | --         | 8                       | --            | 24         |
| <b>Total</b>               | <b>53</b> | <b>91</b> | <b>12</b>                   | <b>10</b>  | <b>8</b>                | <b>6</b>      | <b>180</b> |

## B. PHARM – SCHEME OF EXAMINATION

### I SEMESTER

| Code No.           | Name of the Subject                       | Continuous Assessment |  |            | End Semester Examination |            | Grand Total |
|--------------------|---|-----------------------|--|------------|--------------------------|------------|-------------|
|                    |   | Midsem                | Assignments /MCQ/ *Day to Day Assessment | Total      | Duration in Hrs.         | Max. Marks |             |
| PPH 101            | Anatomy Physiology & Health Education - I | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 103            | Pharmaceutical Inorganic Chemistry        | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 105            | Computer Applications & Programming       | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 107            | Pharmaceutical Organic Chemistry - I      | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 109            | Ethics and Moral values                   | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PBI / PMA 111      | Remedial Biology/ Mathematics             | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| <b>PRACTICALS:</b> |   |                       |  |            |                          |            |             |
| PPH 121            | Anatomy Physiology & Health Education - I | 20                    | 20                                       | 40         | 3                        | 60         | 100         |
| PPH 123            | Pharmaceutical Inorganic Chemistry        | 20                    | 20                                       | 40         | 3                        | 60         | 100         |
| PPH 125            | Computer Applications & Programming       | 20                    | 20                                       | 40         | 3                        | 60         | 100         |
| <b>Total</b>       |   |                       |  | <b>360</b> |                          | <b>540</b> | <b>900</b>  |

### II SEMESTER

| Code No.           | Name of the Subject                        | Continuous Assessment |  |            | End Semester Examination |            | Grand Total |
|--------------------|--|-----------------------|--|------------|--------------------------|------------|-------------|
|                    |  | Midsem                | Assignments /MCQ/ *Day to Day Assessment | Total      | Duration in Hrs.         | Max. Marks |             |
| PPH 102            | Pharmaceutical Organic Chemistry - II      | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 104            | Physical Pharmacy - I                      | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 106            | Pharmacy Practice                          | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 108            | Anatomy Physiology & Health Education - II | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 110            | Environmental Sciences                     | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| <b>PRACTICALS:</b> |  |                       |  |            |                          |            |             |
| PPH 122            | Pharmaceutical Organic Chemistry - II      | 20                    | 20                                       | 40         | 3                        | 60         | 100         |
| PPH 124            | Physical Pharmacy - I                      | 20                    | 20                                       | 40         | 3                        | 60         | 100         |
| PPH 126            | Pharmacy Practice                          | 20                    | 20                                       | 40         | 3                        | 60         | 100         |
| <b>Total</b>       |  |                       |  | <b>320</b> |                          | <b>480</b> | <b>800</b>  |



### III SEMESTER

| Code No.           | Name of the Subject                   | Continuous Assessment |  |            | End Semester Examination |            | Grand Total |
|--------------------|---------------------------------------|-----------------------|--|------------|--------------------------|------------|-------------|
|                    |                                       | Midsem                | Assignments /MCQ/ *Day to Day Assessment | Total      | Duration in Hrs.         | Max. Marks |             |
| PPH 201            | Pharmaceutical Analysis - I           | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 203            | Pharmacognosy and Phytochemistry - I  | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 205            | Physical Pharmacy - II                | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 207            | Pharmaceutical Engineering - I        | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 241 & 243      | Elective - I                          | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| <b>PRACTICALS:</b> |                                       |                       |  |            |                          |            |             |
| PPH 221            | Pharmaceutical Analysis - I           | 20                    | 20                                       | 40         | 3                        | 60         | 100         |
| PPH 223            | Pharmacognosy and Phytochemistry - I  | 20                    | 20                                       | 40         | 3                        | 60         | 100         |
| PPH 225            | Physical Pharmacy - II                | 20                    | 20                                       | 40         | 3                        | 60         | 100         |
| <b>SELF STUDY:</b> |                                       |                       |  |            |                          |            |             |
| PPH 271            | Tropical Diseases and their Treatment | --                    | --                                       | 100        | --                       | --         | 100         |
| <b>Total</b>       |                                       |                       |  | <b>420</b> |                          | <b>480</b> | <b>900</b>  |

### IV SEMESTER

| Code No.           | Name of the Subject                        | Continuous Assessment |  |            | End Semester Examination |            | Grand Total |
|--------------------|--|-----------------------|--|------------|--------------------------|------------|-------------|
|                    |  | Midsem                | Assignments /MCQ/ *Day to Day Assessment | Total      | Duration in Hrs.         | Max. Marks |             |
| PPH 202            | Pharmaceutical Engineering - II            | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 204            | Pharmaceutical Microbiology                | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 206            | Pharmacology - I                           | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 208            | Disaster Management                        | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 242 & 244      | Elective - II                              | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| <b>PRACTICALS:</b> |  |                       |  |            |                          |            |             |
| PPH 222            | Pharmaceutical Engineering - II            | 20                    | 20                                       | 40         | 3                        | 60         | 100         |
| PPH 224            | Pharmaceutical Microbiology                | 20                    | 20                                       | 40         | 3                        | 60         | 100         |
| PPH 226            | Pharmacology - I                           | 20                    | 20                                       | 40         | 3                        | 60         | 100         |
| <b>SELF STUDY:</b> |  |                       |  |            |                          |            |             |
| PPH 272            | Unit Operations in Pharmaceutical Industry | --                    | --                                       | 100        | --                       | --         | 100         |
| <b>Total</b>       |  |                       |  | <b>420</b> |                          | <b>480</b> | <b>900</b>  |

### V SEMESTER

| Code No.           | Name of the Subject                       | Continuous Assessment |  |            | End Semester Examination |            | Grand Total |
|--------------------|---|-----------------------|--|------------|--------------------------|------------|-------------|
|                    |   | Midsem                | Assignments /MCQ/ *Day to Day Assessment | Total      | Duration in Hrs.         | Max. Marks |             |
| PPH 301            | Pharmaceutical Technology                 | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 303            | Medicinal Chemistry - I                   | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 305            | Applied Biochemistry                      | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 307            | Biostatistics                             | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| EOE 208 & SOE 750  | Open Elective - I                         | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| <b>PRACTICALS:</b> |   |                       |  |            |                          |            |             |
| PPH 321            | Pharmaceutical Technology                 | 20                    | 20                                       | 40         | 3                        | 60         | 100         |
| PPH 323            | Medicinal Chemistry - I                   | 20                    | 20                                       | 40         | 3                        | 60         | 100         |
| PPH 325            | Applied Biochemistry                      | 20                    | 20                                       | 40         | 3                        | 60         | 100         |
| <b>SELF STUDY:</b> |   |                       |  |            |                          |            |             |
| PPH 371            | Diagnostic Tools in Disease Investigation | --                    | --                                       | 100        | --                       | --         | 100         |
| <b>Total</b>       |   |                       |  | <b>420</b> |                          | <b>480</b> | <b>900</b>  |

### VI SEMESTER

| Code No.           | Name of the Subject                   | Continuous Assessment |  |            | End Semester Examination |            | Grand Total |
|--------------------|---------------------------------------|-----------------------|--|------------|--------------------------|------------|-------------|
|                    |                                       | Midsem                | Assignments /MCQ/ *Day to Day Assessment | Total      | Duration in Hrs.         | Max. Marks |             |
| PPH 302            | Pharmacognosy and Phytochemistry - II | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 304            | Pharmaceutical Biotechnology          | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 306            | Soft Skills                           | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 308            | Medicinal Chemistry - II              | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| MMH 844 & EOE 317  | Open Elective - II                    | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| <b>PRACTICALS:</b> |                                       |                       |  |            |                          |            |             |
| PPH 322            | Pharmacognosy and Phytochemistry - II | 20                    | 20                                       | 40         | 3                        | 60         | 100         |
| PPH 324            | Pharmaceutical Biotechnology          | 20                    | 20                                       | 40         | 3                        | 60         | 100         |
| PPH 326            | Soft Skills                           | 20                    | 20                                       | 40         | 3                        | 60         | 100         |
| <b>SELF STUDY:</b> |                                       |                       |  |            |                          |            |             |
| PPH 372            | Herbal Drugs                          | --                    | --                                       | 100        | --                       | --         | 100         |
| <b>Total</b>       |                                       |                       |  | <b>420</b> |                          | <b>480</b> | <b>900</b>  |

### VII SEMESTER

| Code No.           | Name of the Subject  | Continuous Assessment |  |            | End Semester Examination |            | Grand Total |
|--------------------|--|-----------------------|--|------------|--------------------------|------------|-------------|
|                    |  | Midsem                | Assignments /MCQ/ *Day to Day Assessment | Total      | Duration in Hrs.         | Max. Marks |             |
| PPH 401            | Pharmacognosy and Phytochemistry - III (Chemistry of Natural Products) | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 403            | Pharmacology - II  | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 405            | Biopharmaceutics and Pharmacokinetics                                  | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 407            | Pharmaceutical Jurisprudence   | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 441 & 443      | Elective - III   | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| <b>PRACTICALS:</b> |  |                       |  |            |                          |            |             |
| PPH 421            | Pharmacognosy and Phytochemistry - III (Chemistry of Natural Products) | 20                    | 20                                       | 40         | 3                        | 60         | 100         |
| PPH 423            | Pharmacology - II  | 20                    | 20                                       | 40         | 3                        | 60         | 100         |
| PPH 425            | Project Work (Selection of Topic, Literature Review, Methodology)      |                       |  | 100        |                          |            | 100         |
| <b>SELF STUDY:</b> |  |                       |  |            |                          |            |             |
| PPH 471            | Pharmacy Profession - Health Care System                               | --                    | --                                       | 100        | --                       | --         | 100         |
| <b>Total</b>       |  |                       |  | <b>480</b> |                          | <b>420</b> | <b>900</b>  |

### VIII SEMESTER

| Code No.           | Name of the Subject          | Continuous Assessment |  |            | End Semester Examination |            | Grand Total |
|--------------------|------------------------------|-----------------------|--|------------|--------------------------|------------|-------------|
|                    |                              | Midsem                | Assignments /MCQ/ *Day to Day Assessment | Total      | Duration in Hrs.         | Max. Marks |             |
| PPH 402            | Pharmaceutical Analysis - II | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 404            | Novel Drug Delivery Systems  | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 406            | Pharmaceutical Management    | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| PPH 442 & 444      | Elective - IV                | 30                    | 10                                       | 40         | 3                        | 60         | 100         |
| <b>PRACTICALS:</b> |                              |                       |  |            |                          |            |             |
| PPH 422            | Pharmaceutical Analysis - II | 20                    | 20                                       | 40         | 3                        | 60         | 100         |
| PPH 424            | Novel Drug Delivery Systems  | 20                    | 20                                       | 40         | 3                        | 60         | 100         |
| PPH 492            | Project Work                 | --                    | --                                       | 50         | --                       | 50         | 100         |
| PPH 494            | Industrial Training / Visits | --                    | --                                       | 100        | --                       | --         | 100         |
| <b>Total</b>       |                              |                       |  | <b>390</b> |                          | <b>410</b> | <b>800</b>  |

| <b>Mark Distribution System</b> |                              |                                 |              |
|---------------------------------|------------------------------|---------------------------------|--------------|
| <b>Semester</b>                 | <b>Marks</b>                 |                                 |              |
|                                 | <b>Continuous Assessment</b> | <b>End Semester Examination</b> | <b>Total</b> |
| I Semester                      | 360                          | 540                             | 900          |
| II Semester                     | 320                          | 480                             | 800          |
| III Semester                    | 420                          | 480                             | 900          |
| IV Semester                     | 420                          | 480                             | 900          |
| V Semester                      | 420                          | 480                             | 900          |
| VI Semester                     | 420                          | 480                             | 900          |
| VII Semester                    | 480                          | 420                             | 900          |
| VIII Semester                   | 390                          | 410                             | 800          |
| <b>Grand Total</b>              | <b>3230</b>                  | <b>3770</b>                     | <b>7000</b>  |

\*Day to Day Assessment – Practical Component only

## **B. Pharm – I SEMESTER**

### **PPH 101: ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION - I**

Hours per week: 3L+2T  
Credit: 4

End Examination: 60 Marks  
Midsem: 40 Marks

#### **UNIT – I**

Scope of anatomy and physiology, basic terminologies used in this subject (Description of the body as such planes and terminologies). Structure of cell – its components and their functions. Elementary tissues of the human body: epithelial, connective, Muscular and nervous tissues-their sub-types and characteristics

- a) Osseous system:-** Structure, composition and functions of the Skeleton.
- b)** Classification of joints, Types of movements of joints and disorders of joints
- c) Skeletal muscles:-** Histology, Physiology of Muscle contraction, Physiological properties of skeletal muscle and their disorders.
- d) Sports physiology:-** Muscles in exercise, Effect of athletic training on muscles and muscle performance Respiration in exercise, CVS in exercise, Body heat in exercise, Body fluids and salts in exercise, Drugs and athletics
- e)** Myasthenia gravis, Spasticity, Tetanus, Osteoporosis, Rickets, Osteomalacia, Arthritis, Gout.

#### **UNIT – II**

##### **a) Haemopoetic System**

Composition and functions of blood. Haemopoiesis and disorders of blood components (definition of disorder) Blood groups, clotting factors and mechanism, platelets and disorders of coagulation

##### **b) Lymphatic System**

Lymph and lymphatic system, composition, formation and circulation.

Spleen: structure and functions,

Disorders of lymphatic system, Anemia, Leukemia, leucopenia, purpura, aggranulocytosis, thrombocytopenia, polycythemia, haemophilia.

#### **UNIT – III**

##### **Cardiovascular system**

Anatomy and functions of heart, blood vessels and circulation (Pulmonary, coronary and systemic circulation), Electrocardiogram (ECG), Cardiac cycle and heart sounds, Blood pressure – its maintenance and regulation

Definition of the following disorders Hypertension, Hypotension, Arteriosclerosis, Atherosclerosis, Angina, Myocardial infarction, Congestive heart failure, Cardiac arrhythmias.

#### **UNIT – IV**

##### **Respiratory system**

Anatomy and physiology of respiratory organs, functions and mechanism of respiration, regulation of respiration, transport and exchange of respiratory gases.

Respiratory cycle, Respiratory volumes and capacities. Definition of: hypoxia, asphyxia, dybarism, oxygen therapy and resuscitation.

### **Digestive system**

Anatomy and physiology of GIT and its accessory glands.

Definition of the following disorders

Emesis, pyloric stenosis, hyperacidity, peptic and duodenal ulcer, dyspepsia, colic, constipation diarrhea, piles, jaundice, cirrhosis, asthma, bronchitis, tuberculosis.

## **UNIT – V**

### **Health Education**

Concepts of health and disease, causative agent and prevention of disease

Demography and family planning: Medical termination of pregnancy

Brief outline of communicable diseases, their causative agents, modes of transmission and prevention (Chicken pox, measles, influenza, diphtheria, whooping cough, tuberculosis, poliomyelitis, helminthiasis, malaria, filariasis, rabies, trachoma, tetanus, leprosy, syphilis, gonorrhoea and AIDS)

First aid: Emergency treatment of shock, snake bites, burns, poisoning, fractures and resuscitation methods.

### **Books Recommended:**

1. Gerard J. Tortora and Bryan H. Derrickson: "Principles of Anatomy and Physiology", Vol. 1 & 2, 12<sup>th</sup> edition, John Willey & Sons, Inc., 2009.
2. Waugh and A. Grant Ed.: "Ross and Wilson's Anatomy and Physiology – in Health and Illness", 10<sup>th</sup> edition (2<sup>nd</sup> reprint), Churchill Livingstone, Elsevier, Edinburg, 2008.
3. Arthur C. Guyton and John E. Hall: "Text Book of Medical Physiology", 12<sup>th</sup> edition: Saunders, Elsevier, 2011.
4. W. F. Ganong: "Review of Medical Physiology, 24<sup>th</sup> edition, Mc Graw Hill, 2012.
5. "Gray's Anatomy" 39<sup>th</sup> edition, Churchill Livingstone, London.

## **PPH 103: PHARMACEUTICAL INORGANIC CHEMISTRY**

Hours per week: 3

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

### **UNIT – I**

a. Brief introduction to Pharmacopoeia: Indian Pharmacopoeia, United States Pharmacopoeia and British Pharmacopoeia.

b. Sources of impurities in pharmaceutical substances, their control and tests for purity.

c. Importance of Limit tests, general principles and procedures of limit tests for chloride, sulphate, lead, iron, heavy metals and arsenic with their Pharmacopoeial standards.

### **UNIT – II**

a. **Major intra and extra cellular electrolytes:** requirements and functions of the following major physiological ions- -sodium, potassium, calcium, chloride, magnesium, iodine. Electrolytes used in replacement therapy, physiological acid-

base balance, electrolyte combination therapy, buffers and antioxidants and their pharmaceutical applications.

b. **Essential and trace elements:** Transition elements and their compounds.

c. **Iron and Haematinics.** Mineral supplements.

### UNIT – III

Definition, general method of preparation, tests for purity and medicinal uses for the following classes of compounds:

a. **Gastro-intestinal agents:**

1) Acidifying agents- hydrochloric acid, sodium acid phosphate.

2) Antacids- aluminium hydroxide, sodium bicarbonate, magnesium carbonate, milk of magnesia, magnesium trisilicate, magnesium oxide.

3) Protectives and adsorbents- charcoal, kaolin, bismuth subgallate, bismuth subcarbonate.

4) Saline cathartics- sodium potassium tartrate, magnesium sulphate, sodium phosphate.

b. **Dental products:** Anti- caries agents, dentifrices and desensitizing agents.

c. **Gases and respiratory stimulants:** Oxygen, carbon dioxide, helium, nitrogen and nitrous oxide.

### UNIT – IV

Definition, general method of preparation, tests for purity and medicinal uses for the following classes of compounds:

a. **Topical agents:** 1) Protectives- talc, calamine, zinc oxide. 2) Antimicrobial agents- hydrogen peroxide, potassium permanganate, sodium perborate, iodine, boric acid, borax, silver nitrate, silver protein, sulphur, ammoniated mercury, yellow mercuric oxide. 3) Astringents- alum, zinc sulphate.

b. **Expectorants and emetics:** Antidotes. Complexing and chelating agents.

### UNIT – V

**Radiopharmaceuticals:** General theory regarding radioactivity, units, radioactivity decay, biological effects of radiation, measurement of radioactivity, radiopharmaceuticals and their pharmaceutical applications, storage and handling of radio pharmaceuticals.

Radio-opaque contrast media- barium sulfate.

### Books Recommended:

1. L. M. Atherden: "Bentley & Driver's Textbook of Pharmaceutical Chemistry", 8th edition, Oxford University Press, Delhi, 2007.
2. G. R. Chatwal: "Pharmaceutical Chemistry – Inorganic", 4th edition, Himalaya Publishing House Pvt. Ltd., Mumbai, 2008.
3. "Indian Pharmacopoeia" Government of India, Ministry of Health & Family Welfare, Controller of Publication, Delhi, 1996.
4. A. H. Beckett & J. B. Stenlake: "Practical Pharmaceutical Chemistry", 4th edition, Part-1, CBS Publishers, New Delhi, 2005.

## PPH 105: COMPUTER APPLICATIONS & PROGRAMMING

Hours per week: 3

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

### UNIT – I

**Introduction:** Characteristics and Evolution of Computers, the Computer Generations. Computer memories, semiconductor memory, optical disks, cache memory, input/output devices, number systems, assembly language, machine language.

### UNIT – II

**MS-DOS-Disk Operating system:** Introduction, need of operating system, function of operating system, introduction to MS-DOS, various DOS commands.

### UNIT – III

#### **MS Office Applications:**

Introduction of MS Word – Word control functions – Editing Document – Find and Replace – Tab Stops – Formatting the document – Spell Check – Tables & Graphs preparation – Graphics – Advanced Tools.

Introduction of MS Excel – Excel Basics – Editing cell contents – worksheet – Command for worksheet.

Introduction of MS PowerPoint – Steps to a Presentation – Adding new slides – Editing & Formatting new slides – Creating slide show.

### UNIT – IV

**Variables and Expressions:** Introduction – Character Set – Identifiers and Keywords – Variables – Displaying Variables – data types – Qualifiers – Types of Statement – Constants – Operators and Expressions, Input-Output statements-

### UNIT – V

**Control structures-** if Statement – if-else Statement – Nested-if, Else-if ladder, Switch Statement- goto Statement- Programming Examples.

**Loops** – need for looping constructs- for Loop – while Loop – do-while Loop – break Statement -Programming examples.

#### **Books Recommended:**

1. Computer Fundamentals; Pradeep K. Sinha: 4<sup>th</sup> Edition, BPB Publications.
2. Programming with C; K R Venugopal, Sudeep R. Prasad: 6<sup>th</sup> reprint, 2004.
3. Computer Fundamentals; Rajaraman V.
4. Programming in C; E. Balaguruswamy



## PPH 107: PHARMACEUTICAL ORGANIC CHEMISTRY - I

Hours per week: 3L+2T  
Credit: 4

End Examination: 60 Marks  
Midsem: 40 Marks

### UNIT – I

#### **Structure & Properties of organic molecules:**

- Structure of atom, Periodic table & Periodic properties
- Structure of Molecules-Atomic and molecular orbitals, molecular orbital theory, Covalent bond formation in organic compounds, hybridization, Calculations for determining empirical & molecular formula
- Properties of Organic Molecules- polarity of bonds, polarity of molecules, Intermolecular forces, influence of structure on physical properties like m.p., b.p., solubility (structure property relationship).

### UNIT – II

#### **Systematic Nomenclature & Classification of Organic compounds - Aliphatic, Alicyclic, Aromatic and Polycyclic compounds**

Reactivity of Organic molecules- Acid base concept, electron displacement effects like inductive, mesomeric, conjugation and hyperconjugation. Bond dissociation, Addition, Substitution, Elimination, Condensation.

### UNIT – III

Methods of preparations and reactivity with emphasis on reaction mechanisms for the below classes of organic compounds

- Alkanes**-general methods of preparation, Combustion of alkanes, free radical substitution reactions: Mechanism, relative reactivity and stability. Alicyclic compounds: Preparations of cycloalkanes
- Alkenes** general methods of preparation, Relative stability of alkene isomers, Carbocations, Hammond's postulate. Additions to Alkenes- Halohydrin formation, Alcohol formation (hydration and hydroboration), Ozonolysis, Glycol formation, Free radical additions, Bond dissociation energies.
- Alkyne** - Structure of alkynes, Acidity of alkynes, Additions to alkynes, Reduction of alkynes

### UNIT – IV

**Alkyl Halides**-Elimination and substitution - An overview- Nucleophilic substitution- Reaction rates and activation energy, SN2 Reactions, E2 Reactions, SN1 Reactions and E1 Reactions, Summary. Eliminations- Alcohol dehydration, Alkyl halides from alcohols

### UNIT – V

**Alcohols, Glycols, Thiols, Ethers, Epoxides, and Sulfides** - Oxidation and reduction, Oxidation to aldehydes, ketones, and carboxylic acids, Group equivalence, Thiol oxidation, Williamson synthesis, Ethers from alkene addition, Synthesis of epoxides, Cleavage of ethers, Nucleophilic substitution of epoxides, Glycol cleavage, Neighbouring-group participation

**Books Recommended:**

1. Thornton Morrison, Robert and Neilson Boyd, Robert Organic Chemistry. 6th, 1983, New Delhi: Allyn and Bacon Inc
2. IL Finar, "Organic Chemistry-I", 6<sup>th</sup> edition, 2002, Pearson Education (Singapore) Pte. Ltd
3. IL Finar, "Organic Chemistry-II" 5<sup>th</sup> edition, 2002, Pearson Education (Singapore) Pte. Ltd
4. Solomon's Organic Chemistry, 8<sup>th</sup> edition, 2007, John Wiley and Sons, New York
5. T.A. Geissman, "Principles of Organic Chemistry", 1<sup>st</sup> edition, 1977, CBS Publishers & Distributors, New Delhi.
6. C.K. Ingold, "Structure and Mechanism Organic Chemistry" 2<sup>nd</sup> edition, 1994, CBS Publishers & Distributors, New Delhi.
7. Clayden, Jonathan, "Organic Chemistry", 1<sup>st</sup> edition, 2009, Oxford University Press, New York.
8. Francis Carey, "Organic Chemistry", 7<sup>th</sup> edition, 2009, Tata McGraw-Hill: New Delhi.
9. L.G. Wade, "Organic Chemistry", 5<sup>th</sup> edition, 2003, Dorling Kindersley (India) Pvt. Ltd., New Delhi.
10. Marc M Loudon, "Organic Chemistry", 3<sup>rd</sup> edition, 1995, The Benjamin/Cummings Publishing Company Inc., California.

**PPH 109: ETHICS AND MORAL VALUES**

Hours per week: 2

End Examination: 60 Marks

Credit: Nil

Midsem: 40 Marks

**UNIT – I**

**Human Values:** Morals, Values and Ethics—Integrity—Work, Ethic—Service Learning—Civic Virtue, Respect for others—Living Peacefully—Caring—Sharing—Honesty—Courage—Valuing Time—Co-operation—Commitment—Empathy—Self-confidence—Character— Spirituality.

**UNIT – II**

**Code of Pharmaceutical Ethics:** General introduction to code of pharmaceutical ethics, pharmacist in relation to his job, pharmacist in relation to his trade, pharmacist in relation to medical profession, pharmacist in relation to his profession.

**UNIT – III**

Ethical infrastructure for good governance in the pharmaceutical sector, problem of corruption, types of unethical behavior, ethics in infrastructure, ethical principles of justice and fairness, ethical principles of trust issue.

**UNIT – IV**

**Safety, Responsibilities and Rights:** Safety and risk—Assessment of safety and risk—Risk Benefit Analysis—Reducing risk —The Three Mile Island and Chernobyl Case Studies. Collegiality and loyalty—Respect for Authority—

Collective Bargaining—Confidentiality —Conflicts of Interest—Occupational Crime—Professional Rights—Employee Rights— Discrimination.

#### **UNIT – V**

**Ethics in Pharmaceutical Issues:** Introduction, Ethical issues in clinical pharmacy practice, Ethical Issues in manufacturing of pharmaceutical products.

#### **Books Recommended:**

1. Contemporary Issues in Bioethics, by Dr. Peter A. Clark, 2012.
2. Professional Ethics and Human Values, by S. Dinesh Babu, first edition, 2007.
3. Ethical infrastructure for good governance in the public pharmaceutical sector, WHO, November 2006, by Dr. Eloy Anello.

### **PBI 111: REMEDIAL BIOLOGY**

Hours per week: 3

End Examination: 60 Marks

Credit: Nil

Midsem: 40 Marks

#### **UNIT – I**

Introduction, General organization of plant cell and its inclusions, mitosis, meiosis, Plant tissues, Plant kingdom and its classification.

#### **UNIT – II**

Morphology of plants, Root, Stem, Leaf and Its modifications, Inflorescence and Pollination of flowers, Morphology of fruits and seeds, Plant physiology

#### **UNIT – III**

Plant Taxonomy of Fabaceae, Apocynaceae, Rutaceae, Umbelliferae, Solanaceae, Liliaceae, Zinziberaceae, Rubiaceae.

Study of Fungi, Yeast, Penicillin and Bacteria

#### **UNIT – IV**

Study of Animal cell, Study animal tissues, detailed study of frog

#### **UNIT – V**

Study of Pisces, Reptiles, Aves, General organization of mammals, Study of poisonous animals

#### **Books Recommended:**

1. Text book of Biology by S.B. Gokhale
2. A Text book of Biology by Dr. Thulajappa and Dr. Seetaram.
3. A Text book of Biology by B.V. Sreenivasa Naidu
4. A Text book of Biology by Naidu and Murthy
5. Botany for Degree students By A.C. Dutta.
6. Outlines of Zoology by M. Ekambaranatha Ayyer and T.N. Ananthakrishnan.
7. A manual for pharmaceutical biology practical by S.B. Gokhale and C.K. Kokate

## PMA 111: REMEDIAL MATHEMATICS

Hours per week: 3

End Examination: 60 Marks

Credit: Nil

Midsem: 40 Marks

### UNIT – I

**Algebra:** Determinants, Matrices

**Trigonometry:** Sides and angles of a triangle, solution of triangles

**Analytical Geometry: Points,** Straight line, circle, parabola

### UNIT – II

**Differential calculus:** Limit of a function, Differential calculus, Differentiation of a sum, Product, Quotient Composite, Parametric, exponential, trigonometric and Logarithmic function. Successive differentiation, Leibnitz's theorem, Partial differentiation, Euler's theorem on homogeneous functions of two variables.

### UNIT – III

**Integral Calculus:** Definite integrals, integration by substitution and by parts, Properties of definite integrals.

### UNIT – IV

**Laplace transform:** Definition, Laplace transform of elementary functions, Properties of linearity and shifting.

### UNIT – V

**Differential equations:** Definition, order, degree, variable separable, homogeneous, linear, heterogeneous, linear, differential equation with constant coefficient, simultaneous linear equation of second order.

### Books Recommended:

1. Differential calculus By Shantinakaran
2. Text book of Mathematics for second year pre-university by Prof. B.M. Sreenivas
3. Integral calculus By Shanthinarayan
4. Engineering mathematics By B.S. Grewal
5. Trigonometry Part-I By S.L. Loney

## PPH 121: ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION - I

Hours per week: 3

End Examination: 60 Marks

Credit: 2

Midsem: 40 Marks

1. Study of tissues of human body: (a) Epithelial tissue. (b) Muscular tissue.
2. Study of tissues of human body: (a) Connective tissue. (b) Nervous tissue.
3. Study of appliances used in hematological experiments.
4. Determination of: (a) Bleeding time & Clotting time (b) Hemoglobin content of Blood.
5. Determination of: (a) Blood group (b) Erythrocyte Sedimentation Rate.
6. Determination of W.B.C. count of blood.
7. Determination of R.B.C. count of blood.
8. Determination of Differential Leucocytes Count of blood.
9. Determination of Blood Pressure.
10. a. Recording of body temperature, pulse rate  
b. Basic understanding of Electrocardiogram-PQRST waves and their significance.
11. Study of various systems with the help of charts, models & specimens
  - (a) Skeleton system part I-axial skeleton
  - (b) Skeleton system part II- appendicular skeleton
  - (c) Cardiovascular system
  - (d) Respiratory system
  - (e) Digestive system.
12. Study of different family planning appliances
13. Study of appliances used in experimental physiology
14. Physiological experiments on nerve-muscle preparations
15. Determination of vital capacity, experiments on spirometry
16. Detailed study of frog (For students of remedial Biology)

**General Requirements:** Dissection box, Laboratory Napkin, muslin cloth, record, Stationary items and Blood lancet.

## PPH 123: PHARMACEUTICAL INORGANIC CHEMISTRY

Hours per week: 3

End Examination: 60 Marks

Credit: 2

Midsem: 40 Marks

- a. **Limit tests (any three):**
  - Limit test for chloride in sodium citrate.
  - Limit test for sulphates in boric acid
  - Limit test for sulphates in sodium phosphate.
  - Limit test for iron in ammonium chloride.
  - Limit test for iron in calcium carbonate.

- b. Systematic simple salt analysis of the following inorganic compounds. (any five):**  
Sodium chloride  
Calcium chloride  
Sodium acetate  
Zinc sulphate  
Barium sulphate  
Barium chloride  
Lead nitrate  
Aluminium nitrate  
Aluminium sulphate
- c. Preparation of the following inorganic pharmaceutical compounds (any five):**  
Ferrous sulphate,  
Alum,  
Magnesium carbonate  
Magnesium sulphate  
Zinc stearate  
Sodium salicylate  
Ferric ammonium citrate  
Precipitated calcium carbonate
- d. Tests for purity for the following (any two):**  
Swelling power in bentonite  
Ammonium salts in potash alum.  
Presence of iodates in KI

### **PPH 125: COMPUTER APPLICATIONS & PROGRAMMING**

Hours per week: 3  
Credit: 2

End Examination: 60 Marks  
Midsem: 40 Marks

Study of simple C programmes as follows:

- Addition, Subtraction, Multiplication of 2 Nos.
- Calculate area and circumference of a circle.
- Calculate simple interest
- Find the given Number is even or odd.
- Find the biggest of three numbers.
- Read a student name and Print it.
- Get a character and display the same using getchar ( ) and putchar ( )
- Printing the reverse of an integer
- Printing the odd and even series of N numbers
- Find whether a given number is Armstrong or not

- Find whether a given number is Prime or not.
- Finding the first N terms of Fibonacci sequence.

#### MS OFFICE APPLICATIONS

- MS Word: Word control functions, editing document, find & replace, Formatting the document, spell check, tables & graph preparations, graphics
- MS Excel: Excel basics, editing cell contents, work sheet, command for work Sheet
- MS PowerPoint: Steps to a presentation, adding new slides, editing & formatting new slides, creating slide show.

## B. Pharm – II SEMESTER

### PPH 102: PHARMACEUTICAL ORGANIC CHEMISTRY - II

Hours per week: 3L+2T  
Credit: 4

End Examination: 60 Marks  
Midsem: 40 Marks

#### UNIT – I

**Stereochemistry: Isomerism:** Different types of isomerism, their nomenclature and associated physicochemical properties. Structural isomerism: chain isomerism, positional isomerism, functional isomerism and metamerism, keto-enol tautomerism. Conformational isomerism: Conformations of ethane and butane. Geometrical isomerism: cis-trans isomers and E-Z isomers, physical and chemical properties, stability of cis and trans-isomers. Optical isomerism: Optical activity, diastereoisomers, and meso-compounds. Specification of configuration: Absolute and relative configuration (D, L system and R, S system). Racemic mixture, racemization.

#### UNIT – II

##### **Aromaticity and Electrophilic Aromatic Substitution:**

- Benzene, aromaticity, and other aromatic systems, Nomenclature of benzene derivatives, Other aromatic systems Electron donating and withdrawing groups, Inductive vs. resonance effects; effects of substituents, General mechanism of electrophilic aromatic substitution, Halogenation, Nitration, Sulfonation, Friedel-Crafts Alkylation and Acylation, Directing and activating effects in electrophilic aromatic substitution, Use of electrophilic aromatic substitution in synthesis, Nucleophilic substitution of aryl halides (benzyne and addition-elimination mechanisms).
- Polynuclear aromatic hydrocarbons: Haworth's synthesis, structure, properties and reactions of naphthalene and anthracene. Phenolic compounds

#### UNIT – III

**Aldehydes and Ketones - Carbonyl Addition:** Structure and reactivity of the C=O group, Irreversible additions to aldehydes and ketones: Grignard reagents, NaBH<sub>4</sub>, and LiAlH<sub>4</sub> Reversible addition reactions of aldehydes and ketones: hydration, hemiacetals, acetals, Reduction of aldehydes and ketones to alkanes.

#### UNIT – IV

**Carboxylic Acids and their Derivatives:** Acidity of carboxylic acids, Preparations of carboxylic acids, General mechanism for interconversion of carboxylic acid derivatives, Converting between carboxylic acids, acid chlorides, esters, and amides, Relative reactivity of carboxylic acid derivatives, Reaction of carboxylic acids and derivatives with hydride reagents, Grignard reagents, and organolithium reagents, Preparation of ketones from carboxylic acids and derivatives, Reduction of esters to aldehydes (DIBAL) Oxidizing ketones: The Baeyer-Villiger Oxidation.

**Amines:** Nomenclature, structure, and acid/base reactions of amines, Preparation of primary amines: reduction of azides and nitriles, Preparation of secondary and



tertiary amines: reductive amination, Synthesis and reactivity of aromatic amines  
Preparation and reactivity of aryl diazonium salts, Using aryl diazonium salts in synthesis.

## UNIT – V

### Heterocyclic Chemistry

Introduction to heterocyclic systems, nomenclature and numbering of heterocyclic compounds including bridged heterocycle systems.

General methods of preparation and important reactions of five membered and six membered heterocyclic systems—furan, pyrrole, thiophene, pyridine, quinoline, isoquinoline and indole.

#### Books Recommended:

1. Organic Chemistry Thornton Morrison, Robert and Neilson Boyd, Robert 6th,1983, New Delhi: Alyn and Bacon Inc
2. Warren Stuart: “Organic Synthesis: Disconnection approach”, 2<sup>nd</sup> edition, Wiley India Pvt. Ltd, 2008.
3. I.L. Finar: “Organic Chemistry-II”, 5<sup>th</sup> edition, Pearson Education (Singapore) Pte. Ltd, 2002.
4. Jerry March: “Advanced Organic Chemistry: Reactions, Mechanisms, and Structure”, 4<sup>th</sup> edition, New York: John Wiley & Sons, 2001.
5. C.K. Ingold, “Structure and Mechanism Organic Chemistry”, 2<sup>nd</sup> edition, 1994, CBS Publishers & Distributors: New Delhi.
6. Jonathan Clayden: “Organic Chemistry”, 1<sup>st</sup> edition, New York: Oxford University Press, 2009
7. Francis Carey: “Organic Chemistry” 7<sup>th</sup> edition, New Delhi: Tata McGraw-hill, 2009.
8. The art of Writing Reasonable Organic Reactions mechanism Grossman, B 2nd, 2007, Taylor and Francis
9. Organic Chemistry L.G. Wade, L.G and J.R, 5th,2003, New Delhi: Dorling Kindersley (India) Pvt. Ltd
10. Organic Chemistry, Loudon, Marc M, 3rd,1995, California: The Benjamin/Cummings Publishing Company, Inc

## PPH 104: PHYSICAL PHARMACY - I

Hours per week: 3L+2T

End Examination: 60 Marks

Credit: 4

Midsem: 40 Marks

### UNIT – I

**Matter, Properties of Matter :** State of matter, change in the state of matter, latent heats and vapour pressure, sublimation, critical point, eutectic mixtures, gases, aerosols, inhalers, relative humidity, liquid complexes, liquid crystals, glassy state, solids- crystalline, amorphous and polymorphism, 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.

## **UNIT – III**

**Solutions :** Ideal and real solutions, Henry's law, solution of gases in liquids, colligative properties, Colligative properties and determination of molecular weight, partition coefficient, Arrhenius theory of electrolytic dissociation, conductance and its measurement. Van't Hoff Theory of Solution, Degree of dissociation, Ionic strength and Debye Huckel theory.

**pH, Buffers and Isotonic solution:** Sorensen's pH scale, Determination of pH, Application, Common ion effect, pH indicators, Buffer equations and buffer capacity, Buffer action – Mechanism, Buffers in pharmaceutical systems, preparation, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.

## **UNIT – IV**

**Surface and Interfacial Phenomenon :** Liquid interface, surface and interfacial tensions, surface free energy, measurement of surface and interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, Critical Micelle Concentration, Influence of CMC on the physical properties of surfactant solution, Factors effecting CMC, HLB classification, solubilization, detergency, adsorption at solid interfaces, solid-gas and solid-liquid interfaces, complex films, electrical properties.

**Adsorption:** Freundlich and Gibbs adsorption isotherms, Langmuir theory of adsorption, BET equation.

## **UNIT – V**

**Solubility & Distribution Phenomena:** Solubility expression, Solvent- solute interactions, Factors effecting the solubility of gases in liquid, Solubility of liquid in liquid, Ternary systems, Solubility of solids in liquids, Factors effecting, Nernst's distribution law, its application, Effect of molecular association and ionic association on partition Co-efficient, Application of distribution co-efficient.

### **Books Recommended:**

1. Patrick J. Sinko Ed.: "Martin's Physical Pharmacy and Pharmaceutical Sciences", 5<sup>th</sup> edition, Lippincott Williams & Wilkins, 2009.
2. E. Shotton: "Physical Pharmaceutics", 1<sup>st</sup> Indian edition, Oxford University press, London, 2008.
3. Carter, Ed.: "Cooper & Gunn's Tutorial Pharmacy," 6<sup>th</sup> edition., CBS Publishers, 1972.

## **PPH 106: PHARMACY PRACTICE**

Hours per week: 3

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

### **UNIT – I**

Introduction to profession of pharmacy, definition of pharmacy, registered pharmacist, career opportunities for Pharmacy graduates.

History of Pharmacy – Historical background and development of profession of Pharmacy and Pharmaceutical industry in brief. Pharmaceutical education in India. Development of Indian Pharmacopoeia and introduction to other Pharmacopoeias such as BP, USP, International Pharmacopoeia and national formulary.

### **UNIT – II**

General Dispensing Procedures, Prescription: definition, various parts of prescription and their functions, handling of prescription, preliminary knowledge of important Latin terms used in the prescriptions and their translation in to English. Labeling of dispensed products.

Sources of errors- Dispensing errors & Medication errors (Examples, Causes & safety systems to prevent occurrences of errors).

### **UNIT – III**

Introduction, principles formulation, general methods of preparation, dispensing and uses of the following classes of extemporaneous pharmaceutical preparations including a study of official (IP/BP) and other popular products under each category:

Liquid Dosage Forms- Mixtures, Waters, Solutions, Spirits, Elixirs, Syrups, Lotions, Liniments, Glycerins, Collodions, Paints, Gargles, Mouth washes, Ear drops.

Suspensions and emulsions: Introduction, types, agents used, preparation.

Solid Dosage Forms– Powders, Granules: Classifications, compounding and dispensing procedure

### **UNIT – IV**

Semisolid Dosage Forms- Ointments, Creams, Pastes, Suppositories & Pessaries.

Galenicals: Definition, like infusion, Decoction, Maceration and Percolation, methods of preparation of spirits, tinctures and extracts.

Method of Preparation and Uses of the Following Galenicals: Compound Tincture of Benzoin, Liquid Extract of Belladonna, Dry Extract of Nux Vomica.

### **UNIT – V**

Incompatibilities– definition, types, Physical, Chemical & Therapeutic, steps to overcome the incompatibility

Pharmaceutical Calculations in Dispensing Pharmacy (Weights & Measures in Metric System only), Percentage calculation, Proportion calculation & Methods of Allegation, Proof Strength, Adjustment of Tonicity, Displacement value.

Posology: Definition, Factors affecting dose selection. Calculation of pediatrics, infant and geriatric doses

**Books Recommended:**

1. S.J. Cartar Ed.: “Cooper & Gunn’s Dispensing for Pharmaceutical Students”, 12<sup>th</sup> edition, CBS Publisher, New Delhi, 1987.
2. S.J. Cartar Ed.: “Cooper & Gunn’s Tutorial Pharmacy”, 6<sup>th</sup> edition, CBS Publisher, New Delhi, 1972.
3. “Indian Pharmacopoeia” Government of India, Ministry of Health & Family Welfare, the Indian Pharmacopoeial Commission, Ghaziabad, 2007
4. British Pharmacopoeia, Vol. III, 2009.
5. “United States Pharmacopoeia”, USP 32 – NF 27, Vol1 & 2, Asian Edition, 2008.
6. Walter Lund Ed.: “The Pharmaceutical Codex – Principle and Practice of Pharmaceutics”, 12<sup>th</sup> edition, CBS Publishers (India) & The Pharmaceutical Press (London), 2009.
7. M. E. Aulton: “Pharmaceutics – The Science of Dosage Form Design”, 2<sup>nd</sup> edition, Churchill Livingstone, 2002.

**PPH 108: ANATOMY PHYSIOLOGY & HEALTH EDUCATION - II**

Hours per week: 3L+2T

End Examination: 60 Marks

Credit: 4

Midsem: 40 Marks

**UNIT – I****Nervous system**

- a. Definition and classification of nervous system
- b. Anatomy, physiology and functional areas of cerebrum
- c. Anatomy and physiology of cerebellum
- d. Anatomy and physiology of mid brain
- e. Thalamus, hypothalamus and Basal Ganglia
- f. Spinal cord: Structure & reflexes – mono-poly-planter
- g. Cranial nerves – names and functions
- h. Reticular activating system, Limbic system and their functions
- i. Blood brain barrier, cerebrospinal fluid (CSF) and its circulation
- j. Thermoregulation-Pyrexia, EEG. Sleep, Insomnia, Epilepsy, Anxiety, Schizophrenia, Depression, Parkinsonism

**UNIT – II****Autonomous nervous system**

- a. ANS – Anatomy & functions of sympathetic & parasympathetic nervous system
- b. Neurotransmitters-chemical transmission
- c. Organs of special senses- Eye, Ear, Skin, Tongue & Nose
- d. Glaucoma, Mydriasis, Meosis, Conjunctivitis, Deafness

**UNIT – III****Endocrine system**

- a. Pituitary gland
- b. Adrenal gland
- c. Thyroid and Parathyroid glands
- d. Pancreas and gonads
- e. Addison’s diseases, Cretinism, Goiter, Myxoedema, Acromegaly

## **UNIT – IV**

### **Reproductive system**

- a. Male and female reproductive system
- b. Their hormones – Physiology of menstruation
- c. Spermatogenesis & Oogenesis
- d. Sex determination (genetic basis)
- e. Pregnancy and maintenance and parturition

## **UNIT – V**

### **Urinary system**

- a. Anatomy and physiology of urinary system
- b. Structure of Nephron and Formation of urine
- c. Renin Angiotensin system – Juxtaglomerular apparatus - acid base Balance
- d. Clearance tests and micturition

### **2) Immune Systems.**

- a. Immune component cells and their development
- b. Autoimmune disorders
- c. Hypersensitivity

### **3) Types of shock, mechanisms, stages and management**

### **Books Recommended:**

1. Gerard J. Tortora and Bryan H. Derrickson: “Principles of Anatomy and Physiology”, Vol. 1 & 2, 12th edition, John Willey & Sons, Inc., 2009.
2. A. Waugh and A. Grant Ed.: “Ross and Wilson’s Anatomy and Physiology – in Health and Illness”, 10th edition (2nd reprint), Churchill Livingstone, Elsevier, Edinburgh, 2008.
3. Arthur C. Guyton and John E. Hall: “Text Book of Medical Physiology”, 11th edition, Saunders, Elsevier, 2006.
4. W. F. Ganong: “Review of Medical Physiology”, 22nd edition, Mc Graw Hill, 2005.
5. “Gray’s anatomy” 39th edition, Churchill Livingstone - Elsevier, London, 2005.
6. Roger and Walker “Clinical Pharmacy and Therapeutics“, 4th edition, Churchill Livingstone Publication, 2007.
7. Cotran, Kumar, Robbins: “Pathologic Basis of Disease”, 7th edition, Elsevier India Pvt. Ltd, 2007.

## **PPH 110: ENVIRONMENTAL SCIENCES**

Hours per week: 2

End Examination: 60 Marks

Credit: 2

Midsem: 40 Marks

## **UNIT – I**

**Multidisciplinary Nature of Environmental Studies:** Definition, scope and importance, need for public awareness, Renewable and non-renewable resources: Natural resources and associated problems.

- a) Forest Resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

- b) **Water Resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- c) **Mineral Resources:** Use and exploitation, environmental effects of extracting and use mineral resources, case studies.
- d) **Food Resources:** World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- e) **Energy Resources:** Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.
- f) **Land Resources:** Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
  - Role of an individual in conservation of natural resources
  - Equitable use of resources for sustainable lifestyles

## **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 ecosystems:

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

**Biodiversity and its conservation:** Introduction-Definition: genetic, species and ecosystem diversity, Biogeographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot spots of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

## **UNIT – III**

**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

## UNIT – IV

**Social Issues and the Environment:** From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, resettlement and rehabilitation of people; its problems and concerns – Case studies, Environmental ethics: Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust – Case studies, Wasteland reclamation, Consumerism and waste products, Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness.

## UNIT – V

**Human Population and the Environment:** Population growth, variation among nations, Population explosion – Family Welfare Programme, Environment and human health, Human Rights, Value Education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environment and human health, Case studies

### Books Recommended:

1. K.C. Agarwal, "Environmental Biology", Nidi Publ. Ltd., Bikaner, 2001.
2. Bharucha Erach, "The Biodiversity of India", Mapin Publishing Pvt. Ltd., Ahmedabad,
3. R.C., Brunner "Hazardous Waste Incineration", McGraw Hill Inc., 1989,
4. Clark R.S., "Marine Pollution", Clarendon Press Oxford.
5. W.P. Cunningham, T.H. Cooper, E. Gorhani, & M.T. Hepworth, "Environmental Encyclopedia", Jaico Publ. House Mumbai, 2001.
6. A.K. De, "Environmental Chemistry", Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment
8. H.P. Gleick, Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press, 1993.
9. R.E. Hawkins, "Encyclopedia of Indian Natural History", Bombay Natural History Society, Bombay.
10. V.H. Heywood, & R.T. Waston, "Global Biodiversity Assessment", Cambridge Univ. Press, 1995.
11. H. Jadhav, & V.M. Bhosale, "Environmental Protection and Laws", Himalaya Pub. House, Delhi, 1995.
12. M.L. McKinney, & R.M. Schyool, "Environmental Science Systems & Solutions", Web enhanced edition, 1996.
13. T.G. Miller Jr., "Environmental Sciences", Wadsworth Publishing Co.
14. E.P. Odum, "Fundamentals of Ecology", W.B. Saunders Co. USA, 1971.
15. M.N. Rao & A.K. Datta, "Waste Water treatment", Oxyford & IBH Publ. Co. Pvt. Ltd., 1987.
16. B.K. Sharma, "Environmental Chemistry", Geol Publ. House, Meerut, 2001.
17. Survey of the Environment, The Hindu (M)
18. C. Townsend, J. Harper, and Michael Begon, "Essentials of Ecology", Blackwell Science.

19. R.K. Trivedi, "Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards", Vol. I and II, Enviro Media.
20. R.K. Trivedi and P.K. Goel, "Introduction to Air Pollution", Techno-Science Publication.
21. K.D. Wanger, "Environmental Management" W.B. Saunders Co. Philadelphia, USA, 1998.

### **PPH 122: PHARMACEUTICAL ORGANIC CHEMISTRY - II**

Hours per week: 3

End Examination: 60 Marks

Credit: 2

Midsem: 40 Marks

1. Safety in laboratories. Precautions in handling chemicals, fire hazards with solvents, hair, etc. First aid in all such unfortunate accidents.
2. Determination of physical constants - melting points, boiling points.
3. Identification of organic compounds:  
Systematic Qualitative Analysis of organic compounds containing functional groups - phenols, carboxylic acids, aldehyde and ketones, alcohols, esters, nitro compounds, amines, amides.
  - Separation of binary mixtures (any three).
4. Preparation of organic compounds involving a specific organic reaction: (any five)
  - a. Acetanilide / aspirin (Acetylation)
  - b. Benzanilide / Phenyl benzoate (Benzoylation)
  - c. P-bromo acetanilide / 2,4,6 – tribromo aniline (Bromination)
  - d. Dibenzylidene acetone (Condensation)
  - e. 1-Phenylazo-2-naphthol (Diazotization and coupling)
  - f. Benzoic acid / salicylic acid (Hydrolysis of ester)
  - g. M-dinitro benzene (Nitration)
  - h. 9, 10 – Anthraquinone (Oxidation of anthracene) / preparation of benzoic acid from toluene or benzaldehyde
  - i. M-phenylene diamine (Reduction of M-dinitrobenzene) / Aniline from nitrobenzene, Benzophenone oxime, Nitration of salicylic acid.

### **PPH 124: PHYSICAL PHARMACY - I**

Hours per week: 3

End Examination: 60 Marks

Credit: 2

Midsem: 40 Marks

- 1) Determination of Dissociation Constant ( $pK_a$ )
- 2) Preparation and testing of Buffer Capacity
- 3) Determination of Specific gravity
- 4) Determination of Density
- 5) Determination of Bulk density of powder



- 6) To study the effect of salt (NaCl) in different concentration on the density of water at room temperature
- 7) Determination of Partition Co-efficient of Iodine between Carbon Tetrachloride and Distilled Water, effect of additives
- 8) Determination of Distribution Co-efficient involving Association
- 9) Determination of Spreading coefficient
- 10) Construction of Phase diagram of Phenol-Water system, effect of impurities
- 11) Construction of Ternary phase diagram
- 12) Determination of Surface and Interfacial Tension using Stalagmometer
- 13) Measurement of CMC of a surfactant
- 14) Determination of Hydrophilic- Lipophilic number
- 15) Determination of Kraft point and Cloud point
- 16) Effect of co-solvent on Solubility
- 17) Effect of temperature on solubility of solid in liquid
- 18) Determination of Freundlich Adsorption Isotherm constant
- 19) Determination of Molecular Weight of a substance by Rast- Camphor method
- 20) Determination of Molecular Weight of a volatile substance by Victor- Mayer method

### **PPH 126: PHARMACY PRACTICE**

Hours per week: 3

End Examination: 60 Marks

Credit: 2

Midsem: 40 Marks

#### **1. Syrups**

- a. Simple Syrup I.P.
- b. Syrup of Ephedrine HCl NF
- c. Syrup Vasaka IP
- d. Syrup of ferrous Phosphate IP
- e. Orange Syrup

#### **2. Elixir**

- a. Piperizine citrate elixir BP
- b. Cascara elixir BPC
- c. Paracetamol elixir BPC

#### **3. Linctus**

- a. Simple Linctus BPC
- b. Pediatric simple Linctus BPC

#### **4. Solutions**

- a. Solution of cresol with soap IP
- b. Strong solution of Ferric Chloride BPC
- c. Aqueous Iodine Solution IP
- d. Strong Solution of Iodine IP
- e. Strong Solution of ammonium acetate IP

#### **5. Liniments**

- a. Liniment of turpentine IP\*
- b. Liniment of camphor IP

**6. Suspensions\***

- a. Calamine lotion
- b. Magnesium Hydroxide mixture BP

**7. Emulsions\***

- a. Castor oil emulsion
- b. Liquid paraffin emulsion

**8. Powders\***

- a. Eutectic powder
- b. Effervescent powder
- c. Dusting powder
- d. Insufflations

**9. Semisolids**

- a. Ointment - Simple, Paraffin Salicylic acid, Zinc oxide ointments etc.
- b. Creams - Cold cream, Vanishing cream etc.
- c. Paste - Lasar's paste, Unna's paste etc.
- d. Suppositories\*-Boric acid suppository, Glycero-Gelatin suppository

**10. Incompatibilities**

- a. Mixtures with Physical
- b. Chemical & Therapeutic incompatibilities

\* colourless bottles required for dispensing \* Paper envelope (white), butter paper and white paper required for dispensing.

## B. Pharm – III SEMESTER

### PPH 201: PHARMACEUTICAL ANALYSIS - I

Hours per week: 3L  
Credit: 3

End Examination: 60 Marks  
Midsem: 40 Marks

#### UNIT – I

Standard solutions, preparation of standard solutions of acids and bases (IP), primary and secondary standards, definitions of normality, molarity, molality, equivalent weight and calculations. Accuracy and precision. Errors-determinate errors, indeterminate errors, sources of errors and their minimization. Significant figures and computation of analytical results, rejection of doubtful values.

**Acid base titrations:** Definitions of acids & bases according to Arrhenius & Lewis theory, different types of acid base titrations with examples, Law of mass action, pH meter, hydrolysis of salts, strengths of acids & bases, dissociation constant, buffer solutions, Henderson-Hasselbalch equation. Theory of neutralization indicators, mixed indicators, universal indicator, neutralization curves. Principles and procedures involved in the estimation of benzoic acid in soft drinks, assay of borax, assay of formaldehyde.

#### UNIT – II

**Oxidation reduction titrations:** Theoretical considerations including oxidation and reduction, oxidizing agent and reducing agents, strength and equivalent weight of oxidizing and reducing agents, standard potentials, calculation of redox potential, systematic balancing of half reactions (oxalic acid-KMnO<sub>4</sub>, I<sub>2</sub>-sodium thiosulphate solution titrations), calculation of equivalent weight of oxalic acid, KMnO<sub>4</sub>, FeSO<sub>4</sub>, permanganate & I<sub>2</sub> from half reactions. Principles, procedures and preparations involved in different types of redox titrations using potassium permanganate, iodine (iodimetry, iodometry), bromine, ceric sulphate, potassium iodate, titanous chloride, applications. Redox indicators. Principles and procedures involved in the assay of ascorbic acid with 2, 6 DCPIP, assay of potassium bromide, assay of sodium nitrite, assay of chloramine.

#### UNIT – III

**Precipitation titrations:** Solubility product, common ion effect, principles and procedures involved in argentimetry, factors affecting a precipitation titration (pH, solvent, temperature), preparation & standardization of silver nitrate & ammonium thiocyanate solutions, titrants & indicators used in argentimetry including Mohr's method, Volhard's method and Fajan's method, use of nitrobenzene in the assay of halides, titration curve method, applications of precipitation titrations.

Principles and procedures involved in the assay of mercuric oxide, determination of iodine content in iodized salt

**Non-aqueous titrations:** Theory, acid-base equilibria in nonaqueous media, solvents (protophilic, protogenic, amphiprotic & aprotic), titrants & indicators used for assay of weakly acidic & basic substances, preparation of perchloric acid, formation of onium ion, standardization of reagents, assay of 1<sup>o</sup>, 2<sup>o</sup>, 3<sup>o</sup> amines & amine hydrochlorides using perchloric acid & the reactions involved in

it, types of non aqueous titrations with examples, advantages & pharmaceutical applications. Principles and procedures involved in the assay of bisacodyl, assay of ethosuximide

#### **UNIT – IV**

**Complexometry:** Basic principles of complexometric analysis, complex, Werner's coordination number of metal ions, ligands- uni-, bi- & multidentate, complexing, chelating, & sequestering agents with respective examples, difference between double salts & co-ordinate compounds, theories of complex ions, properties of metal complexes with particular reference to EDTA, , structure of complex ion, standardization of reagents , types of complexometric titrations (direct, back, replacement, alkalimetric) and curves with examples, metal ion or pM indicators used ,selective analysis of ions based on pH adjustment and end point detection, masking and demasking agents pharmaceutical applications. Principles and procedures involved in the determination of hardness of water , assay of magnesium sulphate , assay of dried aluminium hydroxide gel, assay of sodium fluoride by indirect titration.

#### **UNIT – V**

**Gravimetric analysis:** Principles involved (precipitation method, colloidal method, supersaturation), critical factors affecting precipitation , formation and properties of precipitate, typical methods involving precipitation ( co precipitation & post precipitation ), coagulation, digestion, filtration, washing, incineration procedures with suitable examples, advantages & disadvantages , sources of errors and their elimination in gravimetric analysis, applications of gravimetry in pharmacy.

Principles and procedures involved in the determination of fat in milk, estimation of thiamine as silicotungstate, estimation of magnesium as pyrophosphate.

**Miscellaneous methods of analysis:** Sodium nitrite titrations, determination of moisture content (drying, distillation, Karl Fisher titration), estimation of nitrogen by Kjeldahl method, oxygen flask combustion, gasometry.

#### **Books Recommended:**

1. Mendham et al.: "Vogel's Text book of Quantitative Analysis", 6<sup>th</sup> edition, Pearsons Education Ltd., 2008.
2. A. H. Beckett & J. B. Stenlake: "Practical Pharmaceutical Chemistry", 4<sup>th</sup> edition, Part-1, CBS Publishers, New Delhi, 2005.
3. Skoog, West et al.: "Fundamentals of Analytical Chemistry", 8<sup>th</sup> edition, Thomson Business Information India Pvt. Ltd., 2006.
4. Gary. D. Christian: "Analytical Chemistry", 6<sup>th</sup> edition, John Wiley & Sons, 2007.
- 8 K.A. Connors, "A text book of pharmaceutical analysis" 3<sup>rd</sup> edition, John Wiley & Sons, 2007.
- 9 L.G. Chatten, "Pharmaceutical Chemistry-Theory and application" Volume 1, 1<sup>st</sup> edition, CBS publishers and distributors
- 10 "Indian Pharmacopoeia" Government of India, Ministry of Health & Family Welfare, The Indian Pharmacopoeia Commission, Ghaziabad, 2010

## PPH 203: PHARMACOGNOSY AND PHYTOCHEMISTRY - I

Hours per week: 3L

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

### UNIT – I

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

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

### UNIT – II

Microscopical and macroscopical characters, varieties, cultivation, collection, principal, constituents, chemical nature, tests for identification, adulterants, substituents and uses of the following drugs.

**Leaves:** Eucalyptus, senna, adhatoda, digitalis, squill and datura.

**Flowers:** Cloves, pyrethrum, saffron

### UNIT – III

Microscopical and macroscopical characters, varieties, cultivation, collection, principal, constituents, chemical nature, tests for identification, adulterants, substituents and uses of the following drugs

**Fruit:** Fennel, cumin, coriander, ajowan, dill, caraway, orange, lemon and capsicum.

**Powders of natural occurrence:** Lycopodium, pollen, kamala, lupulin; Entire organisms:

### UNIT – IV

Microscopic characters, cultivation, collection, commercial varieties, adulterants, chemical constituents and uses of the following drugs.

**Barks:** Cinchona, cinnamon, cascara segrada, kurchi, wild cherry, quillaia.

### UNIT – V

Microscopic characters, cultivation, collection, commercial varieties, adulterants, chemical constituents and uses of the following drugs.

**Seeds:** Nux vomica, strophanthus, linseed, ispaghula, castor, areca nut, colchicum.

**Woods:** Quassia, Sandal.

### Books Recommended:

1. Atal C.K. and Kappor B.M.: Cultivation and Utilisation of Medicinal Plants.
2. Trease, C.E. and Evans W.C.: Textbook of Pharmacognosy. 11<sup>th</sup> to 14<sup>th</sup> Editions. Tindal L. U.K.
3. Tyler V.C., Brady L.R., and Robers J.E.: Pharmacognosy. 8<sup>th</sup> Edition, Lea & Febeger, Philadelphia.

4. Wallis T.E.: Textbook of Pharmacognosy, 5<sup>th</sup> Edition, J & A, Churchill Limited, U.K.
5. Kokate C.K., Purohit A.P. and Gokhale S.B.: Pharmacognosy.

## PPH 205: PHYSICAL PHARMACY - II

Hours per week: 3L

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

### UNIT – I

**Kinetics:** Rate and order of a reaction, mathematical concept of zero order, first order, and pseudo-first order reactions; determination of order; half-life, shelf-life and their usefulness; factors effecting rate of reactions; decomposition & stabilization of medicinal agents; accelerated stability analysis; application of chemical kinetics; simple numerical problems.

### UNIT – II

**Rheology:** Newtonian & non-Newtonian systems; thixotropy & measurement of thixotropy; rheopexy, viscoelasticity, psychorheology; determination of rheological properties; application to pharmacy.

#### **Micromeritics & Powder Rheology**

Particle size & size distribution; methods of determining particle size; particle shape & surface area, method of determining surface area; derived properties of powders: porosity, density, compressibility, bulkiness; flow properties of powders; simple numerical problems; importance of particle size & size distribution in pharmacy.

### UNIT – III

**Diffusion and Dissolution:** Introduction; types of diffusion, laws of diffusion, concept of steady state, diffusion study, pH partition hypothesis in drug diffusion; dissolution studies, dissolution testing, official apparatus used for dissolution testing, drug release from polymer matrix & granular polymer matrix, Hixson-Crowell cube root law, factors effecting dissolution.

### UNIT – IV

**Colloids:** Definitions, classification of dispersion systems, types of colloidal system, method of preparation of colloids, purification of colloids, properties of colloids (optical, kinetic, electrical), interaction of colloids, stability of colloidal system, Schultz-Hardy rule, Gold Number, DLVO theory, lyotropic series, Donnan membrane effect, pharmaceutical application of colloids

#### **Coarse Dispersions:**

**Suspension:** Introduction, interfacial properties of suspended particles, flocculation & deflocculation in suspension, settling in suspension, sedimentation parameters, formulation of suspensions (wetting, controlled flocculation & controlled flocculation in structured vehicles), rheological considerations, preparation of suspension, physical stability of suspension, evaluation of suspension.

**Emulsion:** Definition, types of emulsion, identification of emulsion system, theories of emulsification, emulsifying agents & their mechanism of action, physical stability of emulsion, preservation of emulsions, micro emulsions, multiple emulsions, rheology of emulsion, pharmaceutical applications.

#### **UNIT – V**

**Complexation and protein binding:** Introduction, classification of complexes, metal ion complexes, organic molecular complexes, inclusion complexes, method of analysis of complexes, job's method of constant variation, pH titration method, distribution method, solubility method, spectroscopic method; protein binding & binding equilibrium, experimental methods for determining protein binding, factors effecting Complexation & protein binding, thermodynamic treatment of stability constant.

#### **Books Recommended:**

1. Patrick J. Sinko Ed.: "Martin's Physical Pharmacy and Pharmaceutical Sciences", 5<sup>th</sup> edition, Lippincott Williams & Wilkins, 2009.
2. E. Shotton: "Physical Pharmaceutics", 1<sup>st</sup> Indian edition, Oxford University press, London, 2008.
3. Carter, Ed.: "Cooper & Gunn's Tutorial Pharmacy," 6<sup>th</sup> edition., CBS Publishers, 1972.

### **PPH 207: PHARMACEUTICAL ENGINEERING - I**

Hours per week: 3L+2T

End Examination: 60 Marks

Credit: 4

Midsem: 40 Marks

#### **UNIT – I**

**Stoichiometry:** Introduction, Basic Laws, Unit operation processes, Material & Energy balance, Molecular Unit, Mole Fraction, Gas law, Mole Volume, Primary & secondary Quantities, Equilibrium State, Rate Process, Steady & unsteady State, Dimensionless equation, Dimensionless Formula, Units & their Conversion, Different type of Graphic Representation, Mathematical Problems

**Fluid Flow:** Fluid Statics - Hydrostatic Pressure, Definition of head, Manometers  
Fluid Dynamics - Types of Flow, Mechanism of Fluid Flow, Reynolds's experiment, Viscosity, Concept of boundary layer, Basic equation of fluid flow, Bernoulli's Theorem & its Application, Flow meters- Orifice meter, Venturi Meter, Pitot Tube, Rotameter, Energy losses in flowing fluids in pipes.

#### **UNIT – II**

Material Handling System

Liquid Handling – Valves & Pumping Equipments, Reciprocating Pump, Diaphragm Pump, Centrifugal Pump, Rotary Pump

Gas Handling - Various types of fans, blowers & compressors, Air lift pump, Mono pump

Solid Handling - Construction & working of Belt conveyer, Screw conveyer, Pneumatic conveyer, Chain conveyer, Bins, Bunkers

Heat Transfer: Introduction, Sources of Heat, Steam & Electricity as heating media, Mechanism of heat transfer, Conduction, Fourier's law & its application,

Conduction through flat wall, cylindrical surfaces & compound resistances, Forced & Natural convection, Overall surface co-efficient, Drop-wise & film type condensation, Boiling liquids, Heat exchangers- parallel & counter current flow, Heat interchangers, Heat conservation & Insulation, Radiation, Stefan-Boltzmann's equation, Physical nature of surfaces.

### **UNIT – III**

Evaporation: General principle, Basic concept of phase equilibrium, Factors effecting evaporation, Methods of supply of heat, Evaporators: Jacketed evaporator, Film evaporator, forced circulation evaporator, Multiple effect evaporator- Principle, Capacity, Economy, Evaporator accessories - wet & dry condenser, vacuum pump gauge, steam trap, entrainment.

Distillation: Theory applied to binary mixture, Raoult's law, Boiling point & boiling point-composition diagram, Volatility, Constant boiling mixture, Simple steam & flash distillation, Azeotropic & extractive Distillation, Molecular distillation & its application, Equilibrium distillation, Differential distillation.

### **UNIT – IV**

Filtration: Theory of filtration, Filter aid & filter media, Classification of industrial filters, Construction & working of Filter press, Rotary filter, Edge filter, Meta filter, Filter leaf, Candle filter, Sterile filtration of liquids, Air filters, Effect of pressure & temp on rate of filtration, Compressibility of filter cake,

Centrifugation: Theory & principle of Centrifugation, Classification of Industrial centrifuges, Basket, Tubular bowl, conical disc, Semi continuous & continuous horizontal centrifuge, Centrifugal sediments.

### **UNIT – V**

Material of Plant Construction: General study of composition, Consideration of mechanical property, Iron, Stainless Steel, aluminium, glass, Rubber & Plastics as construction material, Properties & application of materials of construction with special reference to Stainless Steel & Glass, Factors effecting selection,

Corrosion: Classification & mechanism of corrosion, Factors, prevention & control.

Industrial Establishment & Hazard: Layout, Location, services, Mechanical, Chemical, Electrical, Fire & Dusty hazards, Safety requirements, Industrial Dermatitis, Accidental records

#### **Books Recommended:**

1. Badger & Banchero: "Introduction to Chemical Engineering," 5<sup>th</sup> Reprint, McGraw, 1997
2. Carter, Ed.: "Cooper & Gunn's Tutorial Pharmacy," 6<sup>th</sup> edition, CBS Publishers, 1972.
3. Lachman Leon & H. A. Liberman, The Theory and Practice of Industrial Pharmacy, CBS Publishers & Distributors, Special Indian edition.
4. Sambamurthy: "Pharmaceutical Engineering," New Age Int. Pvt. Ltd., 1998.
5. CVS Subrahmanyam: "Pharmaceutical Engineering- Principles & Applications, 1<sup>st</sup> edition, Vallabh Prakashan, 2007.
6. Aulton, Ed.: "Pharmaceutics- The Science of Dosage Form Design," ELBS, 1990.



## PPH 241: TRADITIONAL SYSTEMS OF MEDICINES

Hours per week: 3

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

### UNIT – I

**Herbs and healing:** Ethnobotany and Ethnomedicine; Development of European, South and Central American, African, Indian, Chinese, and South East Asian Herbal Cultures.

### UNIT – II

**Classical health traditions:** Systems of medicine: origin and development of biomedicine; Indian Systems of Medicine (*Ayurveda, Siddha, Unani, Tibetan*) *Ayurveda*: Historical perspective, *Swasthavritta* (measures to be adopted for maintaining the health of healthy person in a positive way through prevention, promotion and correction), *Athurvavritta* (disease management and treatment which involves eight specialties including Internal medicine and Surgery); Fundamental principles of *Ayurveda*: *Panchabhootha* theory, *Thridosha* theory, *Saptadhatu* theory and *Mala* theory; Ayurvedic Pharmacology, Ayurvedic Pharmacopoeia; *Mrigayurveda* and *Vrikshayurveda*.

### UNIT – III

**Single plant drugs** and formulations in Ayurveda, Siddha and Unani; classical and modern means of drug administration.

### UNIT – IV

**Cross cultural influences:** Mutual influences of Ayurveda, Tibetan Medicine; Chinese Medicine, South American herbal medicine, Homoeopathy and Biomedicine; benefits of integration of ideas and material

### UNIT – V

**Dietetics and supportive therapies:** Role of diet in health and disease; *pathya, apathya, anupana*; therapeutic and nutritive value of Indian foods; Fermentation techniques and development of self generated alcoholic drinks; role of Raw Juice Therapy, Aromatherapy, Bach's flower remedies, Naturopathy, Hydrotherapy and Yoga in health care Cultural, Social and economic issues in health and disease: Causes for the decline and the current revival of interest in indigenous systems of medicine; a comparative evaluation of accessibility, benefits and costs of different systems of medicine.

#### Books Recommended:

1. Bannerman, R.H., Burton, J. and Wen Chen, C. (eds). 1983. Traditional medicine and health care coverage. WHO, Geneva.
2. Cotton, C.M. 1996. Ethnobotany: principles and applications. John Wiley & Sons, New York.
3. Foster, G.M. and Anderson, B.G. 1983. Medical anthropology. John Wiley, New York.
4. Gopalan, C., Ramasastri, B.V. and Balasubramanian, S.C. 1985. Nutritive Value of Indian Foods. National Institute of Nutrition, Hyderabad.
5. Jamil, T. 1997. Complementary Medicine. Butterworth Heinemann, Oxford.

6. Jayasurya, A. 1997. The Future of Complementary Medicines. Medicina Alternativa, Colombo.
7. Kameswara Rao, C. 2000. Database of Medicinal Plants. KSCST, Bangalore.
8. Keys, J.D. 1976. Chinese herbs. CE Tuttle Co., Tokyo.
9. Lawless, L 1997. The Complete Illustrated Guide to Aromatherapy. Element Books Ltd., Dorset.
10. Leavitt, D. 1974. Chine herbal medicine. DHEW Publishers, New York
11. Martin, G.S. 1995. Ethnobotany. Chapman and Hall, London.
12. Mukherjee, B. (ed). 1993. Traditional Medicine. Oxford & IBH Pub. Co. Pvt. Ltd. New Delhi.
13. Oliver-Bever, B.E.P. 1986. Medicinal Plants of Tropical West Africa. Cambridge University Press, Cambridge.
14. Pushpangadan, P., Nyman, U. and George, V. 1995. Glimpses of Indian Ethnopharmacology. Tropical Botanic Garden and Research Institute, Thiruvananthapuram, Kerala.
15. Ray, P. and Gupta, M.N. 1980. Caraka Samhita: a Scientific Synopsis. 2<sup>nd</sup> ed. INSA, New Delhi.
16. Ray, P., M.N. Gupta, and M. Roy. 1980. Susruta Samhita: a Scientific Synopsis. INSA, New Delhi
17. Schultes, R.E. and Reis, S. von (eds). 1995. Ethnobotany: evolution of a discipline. Chapman and Hall, London
18. Savanur, H.V. 1993. A Handbook of Ayurvedic Materia Medica. Vol. I. Dr. Jarthar and Sons, Mathuri Street, Belgaum, Karnataka, India.
19. Savanur, H.V. 1993. A Handbook of Ayurvedic Materia Medica. Vol. VI (4). Dr. Jarthar and Sons, Mathuri Street, Belgaum, Karnataka, India. Pp: 258-261.

### **PPH 243: COMMUNITY PHARMACY**

Hours per week: 3

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

#### **UNIT – I**

Definition, scope, of community pharmacy. Roles and responsibilities of Community pharmacist

#### **Community Pharmacy Management**

- a) Selection of site, Space layout, and design
- b) Staff, Materials- coding, stocking
- c) Legal requirements
- d) Maintenance of various registers
- e) Use of Computers: Business and health care soft wares

#### **UNIT – II**

**Inventory control in community pharmacy:** Definition, various methods of Inventory Control - ABC, VED, EOQ, Lead time, safety stock

**Pharmaceutical care:** Definition and Principles of Pharmaceutical care.

### UNIT – III

**Patient counseling:** Definition, outcomes, various stages, barriers, Strategies to overcome barriers, Patient information leaflets- content, design, & layouts, advisory labels

**Patient medication adherence:** Definition, Factors affecting medication adherence, role of pharmacist in improving the adherence.

### UNIT – IV

**Health screening services:** Definition, importance, methods for screening blood pressure/ blood sugar/ lung function and cholesterol testing

**OTC Medication-** Definition, OTC medication list & Counseling

### UNIT – V

**Health Education:** WHO Definition of health, and health promotion, care for children, pregnant & breast feeding women, and geriatric patients.

Commonly occurring Communicable Diseases, causative agents, Clinical presentations and prevention of communicable diseases – Tuberculosis, Hepatitis, Typhoid, Amoebiasis, Malaria, Leprosy, Syphilis, Gonorrhoea and AIDS

Balance diet, and treatment & prevention of deficiency disorders

Family planning – role of pharmacist

**Responding to symptoms of minor ailments:** Relevant pathophysiology, common drug therapy to, Pain, GI disturbances (Nausea, Vomiting, Dyspepsia, diarrhea, constipation), Pyrexia, Ophthalmic symptoms, worms infestations.

Essential Drugs concept and Rational Drug Therapy. Role of community pharmacist

#### Books Recommended:

1. N.S.Parmar: “Health Education and Community Pharmacy”, 1<sup>st</sup> edition, CBS Publishers & Distributors, 2008.
2. K. Wiedenmayer et al.: “Developing Pharmacy Practice – A Focus on Patient Care”, Handbook – 2006 edition, World Health Organization and International Pharmaceutical Federation, 2006.  
([www.who.int/hq/2006/WHO\\_PSM\\_PAR\\_2006.5\\_eng.pdf](http://www.who.int/hq/2006/WHO_PSM_PAR_2006.5_eng.pdf))
3. M. Ali & J. Gupta: “Drug Store & Business Management”, 1<sup>st</sup> edition (Reprint), CBS Publishers & Distributors, 2008.
4. Parthasarathi et al. Ed.: “A Textbook of Clinical Practice – Essential Concepts and Skills”, 1<sup>st</sup> edition (Reprint), Orient Longman Pvt. Ltd., 2007.
5. Leon Shargel et al. Ed.: “Comprehensive Pharmacy Review”, 6<sup>th</sup> edition, Lippincott Williams & Wilkins, 2008.
6. Handbook of pharmacy – health care. Ed. Robin J Harman. The Pharmaceutical press.

## PPH 221: PHARMACEUTICAL ANALYSIS - I

Hours per week: 3  
Credit: 2

End Examination: 60 Marks  
Midsem: 40 Marks

1. Calibration of pipettes, burettes and volumetric flasks
2. Preparation of acidic and basic buffers
3. Preparation and Standardization of 0.1N HCl, 0.1N H<sub>2</sub>SO<sub>4</sub>, 0.1N NaOH, Assay of Boric acid or Borax, Sodium bicarbonate, Assay of Ammonium chloride, Zinc oxide, Aspirin, Ibuprofen.
4. Preparation and Standardization of 0.1N KMnO<sub>4</sub>, 0.1N Iodine, 0.1N Sodium thiosulphate, Assay of Ferrous sulphate (permanganometry), Assay of Sodium nitrite (permanganometry), Assay of Hydrogen peroxide (permanganometry), Assay of Ferrous fumarate (cerimetry), Assay of Sodium meta bisulphate (iodimetry), Assay of Copper sulphate (iodometry), and Ascorbic acid by iodimetry
5. Preparation and Standardization of 0.1N AgNO<sub>3</sub>, Assay of Sodium chloride, Assay of Ammonium chloride
6. Preparation and Standardization of perchloric acid, Assay of Metronidazole, Sodium benzoate, Ephedrine hydrochloride, Lidocaine HCl by non-aqueous titrimetry
7. Preparation and Standardization of 0.05M EDTA solution, Assay of Calcium gluconate injection, Assay of Zinc sulphate, Determination of Hardness of tap water.

## PPH 223: PHARMACOGNOSY AND PHYTOCHEMISTRY - I

Hours per week: 3  
Credit: 2

End Examination: 60 Marks  
Midsem: 40 Marks

Organoleptic examination, description and microscopical examination of the drugs mentioned below.

**Powders:** Lycopodium, Kamala

**Starches:** Wheat, potato, rice and maize

**Leaves:** Eucalyptus, senna, datura, adhatoda and digitalis

**Barks:** Cinnamon, cinchona, cascara and kurchi

**Wood:** Quassi

**Seeds:** Nux-vomica, linseed

**Fruit:** Fennel, coriander, cumin, cloves.

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

### Books Recommended:

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

## **PPH 225: PHYSICAL PHARMACY - II**

Hours per week: 3  
Credit: 2

End Examination: 60 Marks  
Midsem: 40 Marks

1. To determine the particle size and size distribution of powder by sieving method
2. To determine the particle size and size distribution in disperse medium by microscopic method
3. To determine the globule size of emulsion by microscopic method
4. To determine the true density of given powder by:
  - i. Solvent displacement method
  - ii. Compression powder method
5. Determination of bulk density of given powder
6. Determination of granule density of given sample
7. Determinations of porosity, intra-particle porosity, interspaces and void porosity and total porosity of powder
8. Determination of specific surface area
9. Determination of flow properties of powder by angle of repose
10. Determination of flow properties of powder by Carr's Index
11. Effect of glidant on flow properties of powder
12. Determination of compressibility index of powder
13. Determination of viscosity of liquid using Ostwald viscometer
14. To study the effect of temperature on viscosity
15. To study the effect of concentration on viscosity
16. To study the effect of impurities on viscosity
17. To study the effect of mono-valent, di-valent, tri-valent ions on ferric hydroxide sol
18. To study the protective action of hydrophilic colloid on the precipitation of a hydrophobic colloid
19. Determination of optimum ratio for precipitation
20. Physical stability of suspension
21. Physical stability of emulsion
22. Determination of wet-point & flow point of an indiffusible solid (medicaments)
23. Determination of rate constant
24. Accelerated stability testing

## **PPH 271: TROPICAL DISEASES AND THEIR TREATMENT (Self Study)**

Credit: 2

End Semester Assessment: 100 Marks

## B. Pharm – IV SEMESTER

### PPH 202: PHARMACEUTICAL ENGINEERING - II

Hours per week: 3L+2T  
Credit: 4

End Examination: 60 Marks  
Midsem: 40 Marks

#### UNIT – I

**Drying:** Moisture content and mechanism of drying, Factors effecting drying, Drying rate curves, EMC, CMC, LOD, Classification and types of dryers, dryers used in pharmaceutical industries and special drying methods, Construction & Working of Tray dryer, Drum dryer, Fluidized bed dryer, Spray dryer, Vacuum dryer, Freeze dryer.

**Crystallization:** Characteristics of crystals like-purity, size, shape, geometry, habit, form size and factors affecting them, Solubility curves, Swenson-Walker crystallizer, Super-saturation theory, nucleation mechanism, crystal growth, Study of various types of crystallizers - tank, agitated batch, Vacuum crystallizer, Krystal crystallizer, Caking of crystal and its prevention.

#### UNIT – II

**Size Reduction:** Definition, objectives of size reduction, factors affecting size reduction, Mechanism of size reduction, theories of comminution, Laws governing energy & power requirement of size reduction, Classification of size reduction equipments, operation and energy aspects of various types of crushing and grinding machinery used in pharmaceutical industry such as ball mill, hammer mill, Fluid energy mill, Cutter mill, Roller mill, Colloidal mill, Selection of equipment.

**Size Separation:** Screen, standard screen, different techniques of size separation-screening, sedimentation, elutriation, Screen analysis, overall screen effectiveness, Types of screening equipments, selection of screening equipments, Classifiers - Laws of settling, sedimentation, principles of centrifugal sedimentation, centrifugal settling process, and Equipments used in solid-gas, solid-liquid and liquid-liquid systems.

#### UNIT – III

**Mixing:** Theory of mixing, Mechanism of Solid-solid, solid-liquid and liquid-liquid mixing, mixing devices-Propeller, Turbine, Paddles, Baffles, Vortex formation & prevention, mixing equipments from each class

**Bioreactors:** Fundamentals of bioreactor design for pharmaceutical operation.

#### UNIT – IV

**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, Mechanism of dehumidification, Equipments for dehumidification operation.

**Refrigeration and Air Conditioning:** Principles, Mechanism and applications of –Refrigeration and Air conditioning.

## **UNIT – V**

**Mass Transfer:** Absorption: Gases in liquid, Henry's law, gas absorption equipments, Numerical problems.

**Liquid-Liquid Extraction:** Distribution law, principles of extraction, selection of solvents for extraction, extraction equipments – Podbielniak and tower extractor.

**Solid-liquid extraction:** Principle, methods of extraction, equipments – Diffusion battery, Dorr extractor, Rotocell, Soxhlet extractor.

### **Books Recommended:**

1. Badger & Banchero: "Introduction to Chemical Engineering," 5<sup>th</sup> Reprint, McGraw Hill, 1997
2. Carter, Ed.: "Cooper & Gunn's Tutorial Pharmacy," 6<sup>th</sup> ed., CBS Publishers, 1972
3. Lachman Leon & H. A. Liberman, The Theory and Practice of Industrial Pharmacy, CBS Publishers & Distributors, Special Indian edition.
4. CVS Subrahmanyam: "Pharmaceutical Engineering- Principles & Applications, 1<sup>st</sup> edition, Vallabh Prakashan, , 2007
5. Aulton, Ed.: "Pharmaceutics- The Science of Dosage Form Design," ELBS, 1990.
6. Sambamurthy: "Pharmaceutical Engineering," New Age Int. Pvt. Ltd., 1998.

## **PPH 204: PHARMACEUTICAL MICROBIOLOGY**

Hours per week: 3L+2T

End Examination: 60 Marks

Credit: 4

Midsem: 40 Marks

### **UNIT – I**

Introduction to the science of microbiology including the history and scope of microbiology. Differences between Prokaryotic cell and Eukaryotic cell.

Major divisions of microbial world and Relationship among them.

Morphology, functions and detailed study of bacteria, virus, fungi, spirochetes and rickettsiae.

### **UNIT – II**

Nutritional requirements, growth and cultivation of bacteria and virus. Identification of bacteria with emphasis to different staining techniques and biochemical reactions. Different methods in counting of bacteria

Study of different important media required for the growth of bacteria & fungi.

Different techniques used in isolation and maintenance of bacterial cultures

Microbial limit tests (Official in I.P)

### **UNIT – III**

**Sterilization & Disinfection:** Detailed study of different methods of sterilization including merits and demerits. Maintenance of aseptic conditions. Study of disinfectants, antiseptics. Evaluation of disinfectants

### **UNIT – IV**

**Immunology:** Immunity, definition, classification, general Principles of Natural Immunity & acquired immunity

- 1) Active and passive immunity
- 2) Antigens and its chemical nature
- 3) Structure and formation of antibodies
- 4) Antigen-Antibody reactions
- 5) Immunization programme & Hybridoma technology

### **UNIT – V**

Microbiology of foods including food spoilage and food preservation.

Microbiology of Water and Milk.

Industrially significant microbes and microbial enzymes.s

#### **Books Recommended:**

1. Prescott, Harley & Klein: “Microbiology”, 6<sup>th</sup> edition, Mc Graw Hill, 2005.
2. Doyle et al.: “Food Microbiology” 2<sup>nd</sup> edition, ASM Press, 2001.
3. B. S. Nagoba: “Clinical Microbiology” 1<sup>st</sup> edition (Reprint), B I Publication Pvt. Ltd., 2005.
4. I. E. Alcammo: “Fundamentals of Microbiology”, 6<sup>th</sup> edition, Jones & Bartlett, 2000.
5. “Indian Pharmacopoeia” Government of India, Ministry of Health & Family Welfare, The Indian Pharmacopoeia Commission, Ghaziabad, 2007.
6. David green wood: “Medical Microbiology”, 16<sup>th</sup> edition, Churchill Livingstone, 2006.
7. Jacquelyn G. Black: “Microbiology – Principles and explorations”, 5<sup>th</sup> edition, John Willey & Sons, 2000.
8. Pelczar et al.: “Microbiology”, 5<sup>th</sup> edition, Tata Mc Graw Hill Publishing Company Ltd., 2007.
9. Ananthanaryanan and J. Paniker: “Text Book of Microbiology” 8<sup>th</sup> edition, Orient Longman, 2009.
10. Disinfection, Sterilisation and Preservation, Seymour S Block
11. Clinical Aspects of Immunology , Lacman
12. Immunology and Immunotechnology, Ashim K.Chakravarty

## **PPH 206: PHARMACOLOGY - I**

Hours per week: 3L+2T

End Examination: 60 Marks

Credit: 4

Midsem: 40 Marks

### **UNIT - I**

#### **General Pharmacology**

- a) Introduction, definition and scope of Pharmacology
- b) Routes of administration of drugs
- c) Pharmacokinetics (Absorption, Distribution, Metabolism and Elimination)
- d) Pharmacodynamics-receptor and non-receptor mediated mechanism of drug, receptor drug interactions and adverse drug reactions
- e) Factors modifying drug effects

### **UNIT – II**

#### **Pharmacology of Drugs acting on CNS**

- a) Alcohol
- b) General anaesthetics



- c) Sedatives and hypnotics
- d) Anticonvulsants
- e) Local anaesthetics
- f) Analgesics and anti-inflammatory agents
- g) Opioid analgesic and antagonists
- h) Neurotransmitters in CNS
- i) CNS stimulants and Analeptics

### **Local anaesthetics**

## **UNIT – III**

### **Psychopharmacological Agents**

- a) Neuroleptics
- b) Antidepressants
- c) Anxiolytics
- d) Hallucinogens
- e) Habit forming drugs and drugs of addiction

### **Pharmacology of Drugs acting on ANS**

- a) Adrenergic and anti adrenergic drugs
- b) Cholinergic and anti cholinergic drugs
- c) Ganglionic blockers

## **UNIT – IV**

### **Pharmacology of Drugs acting on Blood and Blood forming organs**

- a) Coagulants and Anticoagulants
- b) Thrombolytics and Anti platelet drugs
- c) Plasma substitutes
- d) Haemopoietics

## **UNIT – V**

### **Pharmacology of Drugs acting on Renal system**

- a) Diuretics
- b) Antidiuretics
- c) Drugs used in urinary tract infections

### **Books Recommended:**

1. K. D. Tripathi: “Essentials of Medical Pharmacology”, 4<sup>th</sup> edition, Jaypee Publication, Delhi, 1999.
2. R. S. Satoskar & S. D. Bhadarkar: “Pharmacology and Pharmacotherapeutics”, 20<sup>th</sup> edition (single volume), Popular Publication, Dubai, 2009.
3. H. P. Rang & M. M. Dale, “Pharmacology” 4<sup>th</sup> edition, Churchill Livingstone, 1999.
4. T. W. A. Rall, A. I. S. Nies & P. Taylor “Goodman and Gilman’s- The Pharmacological Basis of Therapeutics” 9<sup>th</sup> Ed<sup>n</sup>, Mc Graw Hill, Pergamon Press, 1996.
5. B. G. Katzung: “Basic and Clinical Pharmacology” 9<sup>th</sup> edition. Prentice Hall, Int., 2004.
6. Shargel and Leon: “Applied Biopharmaceutics and Pharmacokinetics”, 6<sup>th</sup> edition, Prentice Hall, London 2008.

7. Richard A. Harvey “pharmacology” 4<sup>th</sup> edition ,Wolters Kluwer (India) Pvt. Ltd., New Delhi,2006
8. David E. Golan “principals of pharmacology” Lippincott Williams & Wilkins, USA, 2005.

## **PPH 208: DISASTER MANAGEMENT**

Hours per week: 2

End Examination: 60 Marks

Credit: Nil

Midsem: 40 Marks

### **UNIT – I**

Disaster Management: Meaning, Approaches and Scope, Elements of disaster, management.

Types of Disasters: Natural and manmade

1) Natural hazards and Disasters: Volcanic, Earthquake, Cyclones, Lightning, Floods, Droughts, Cold waves, Heat waves, Tsunami- Causes, Environmental impacts, control measures.

2) Man induced Hazards /Disasters:

1 Physical hazards/ Disasters-Soil Erosion, Mechanics & forms of Soil Erosion, Factors & causes of Soil Erosion, Conservation measures of Soil Erosion Sedimentation processes- Global, Regional Sedimentation problems, Corrective measures of Erosion & Sedimentation

2 Chemical hazards/ disasters - Release of toxic chemicals, nuclear explosion

3) Biological hazards/ disasters- Population Explosion

### **UNIT – II**

Emerging approaches in Disaster Management- Three Stages

1. Pre- disaster stage : Preparedness, mitigation

2. Emergency Stage: Rescue training for search & operation at national & regional level, Immediate relief, Assessment surveys

3. Post Disaster stage-Rehabilitation, Political Administrative Aspect, Social Aspect, Economic Aspect, Environmental Aspect

### **UNIT – III**

Natural Disaster Reduction & Management

a) Provision of Immediate relief measures to disaster affected people

b) Prediction of Hazards & Disasters

c) Measures of adjustment to natural hazards

### **UNIT – IV**

Disaster Management- An integrated approach for disaster preparedness, mitigation & awareness.

Different Mitigation- Institutions like Meteorological observatory, Seismological observatory, Volcanology Institution, Hydrology Laboratory, Industrial Safety inspectorate, Institution of urban & regional planners, Chambers of Architects, Engineering Council, National Standards Committee

Integrated Planning- Contingency management Preparedness -Role of Media Various U.N agencies like UNCRD, IDNDR, WHO, UNESCO, UNICEF, UNEP.

## UNIT – V

- a. A regional survey of Land Subsidence, Coastal Disaster, Cyclonic Disaster & Disaster in Hills with particular reference to India
- b. Ecological planning for sustainability & sustainable development in India- Sustainable rural development: A Remedy to Disasters -Role of Panchayats in Disaster mitigations
- c. Environmental policies & programmes in India- Institutions & National Centres for Natural Disaster reduction, Environmental Legislations in India, Awareness, Conservation Movement, Education & training.

### Books Recommended:

1. R.B.Singh (Ed) Environmental Geography, Heritage Publishers New Delhi, 1990.
2. Savinder Singh Environmental Geography, Prayag Pustak Bhawan, 1997.
3. Kates, B.I & White, G.F The Environment as Hazards, Oxford, New York, 1978.
4. R.B. Singh (Ed) Disaster Management, Rawat Publication, New Delhi, 2000.
5. H.K. Gupta (Ed) Disaster Management, Universities Press, India, 2003.
6. R.B. Singh, Space Technology for Disaster Mitigation in India (INCED), University of Tokyo, 1994.
7. Dr. Satender , Disaster Management in Hills, Concept Publishing Co., New Delhi, 2003.
8. A.S. Arya Action Plan For Earthquake, Disaster, Mitigation in V.K. Sharma (Ed).
9. Disaster Management IIPA Publication New Delhi, 1994.
10. R.K. Bhandani An overview on Natural & Man made Disaster & their Reduction, CSIR, New Delhi.
11. M.C. Gupta Manuals on Natural Disaster management in India, National Centre for Disaster Management, IIPA, New Delhi, 2001.

## PPH 242: PUBLIC HEALTH AND NUTRITION

Hours per week: 3

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

### UNIT – I

#### FOOD SCIENCE AND FOOD PROCESSING

**Processing of foods:** Primary, secondary and tertiary processing, historical perspective, traditional technologies used in food processing. Effects of processing on components, properties and nutritional value of foods.

**Processing of wheat:** Structure, composition, primary processing, functionality in food system, study of preparation/ manufacture of common unleavened and leavened products like chapathi, bread, cake etc.

**Rice:** Structure, composition, primary and secondary processing, rice processed products. **Millet:** Types, composition, malting, other food uses.

### UNIT – II

#### HUMAN NUTRITION

**Carbohydrates:** Occurrence and physiological functions, factors influencing metabolism. Lactose intolerance. Dental caries. Artificial sweeteners. Role of

dietary fiber in health and disease. Disorders related to carbohydrate metabolism. Glycemic index of foods and its uses.

**Lipids:** Concepts of visible and invisible fats. EFA, SFA, MUFA, PUFA- sources and physiological functions. Role of lipoproteins and cholesterol, triglycerides in health and disease.

**Proteins:** Concepts of essential and non-essential amino acids- their role in growth and development. Physiological functions of proteins. Requirements, nitrogen balance concept. Methods for evaluating protein quality. Protein energy malnutrition-clinical features and biochemical changes.

### **UNIT – III**

#### **FOOD HYGIENE AND SANITATION**

General principle of food hygiene, Hygiene in rural and urban areas in relation to food preparation, personal hygiene and food handling habits. Place of sanitation in food plants. Sanitary aspects of building and equipment: Plant layout and design. Sanitary aspects of water supply: Source of water, quality of water, water supply and its uses in food industries. Purification and disinfection of water preventing contamination of potable water supply.

### **UNIT – IV**

#### **VITAMINS AND MINARALS IN NUTRITION**

**Fat soluble Vitamins:** Vitamin A, Vitamin D, E & K.

**Water soluble vitamins:** Vitamin C, Thiamine, Riboflavin, Niacin, Pantothenic acid, Biotin, Folic acid, Vitamin B12, Vitamin B.

**Macro minerals:** Calcium, Phosphorus Magnesium, Sodium, Potassium chloride.

**Micro minerals:** Iron, Zinc, copper, selenium, chromium, iodine, manganese, Molybdenum and fluoride.

**Ultra trace minerals:** Arsenic, Boron, Nickel, Silicon, Vanadium & cobalt: Digestion & absorption, Functions, Toxicity, interaction with other nutrients. RDA and food sources.

### **UNIT – V**

#### **NUTRACEUTICALS AND HEALTH FOODS**

**Use of nutraceuticals in traditional health sciences:** Their role in preventing /controlling diseases. Definition, Classification, food and non food sources, mechanism of action. Role of omega-3, fatty acids, carotenoids, dietary fiber, phytoestrogens; glucosinates; organosulphur compounds as nutraceuticals.

**Prebiotics and probiotics:** Usefulness of probiotics and prebiotics in gastro intestinal health and other benefits. Beneficiary microbes; prebiotic ingredients in foods; types of prebiotics and their effects on gut microbes.

#### **Books Recommended:**

1. Physical chemistry of food process, fundamental aspects; CVS Publications, Biaanuion C.
2. Food lipids, Chemistry, Nutrition, and Biotechnology: Marcel Dekkar: Akoh, Casimir C.
3. Food science: New age International PVT. Ltd. Publisher. Author: Srilakshmi B.
4. Food Nutrition and environmental security, the road ahead. NISCAIR Publishers.

5. The chemical analysis of foods and food products. CVS Publishers and Distributors. Jacobs Morris B.
6. Public Health Nutrition by Michael J. Gibney (Editor), Barrie M. Margetts (Editor), John M. Kearney (Editor), Lenore Arab (Editor). 2004
7. Introduction to Human Nutrition by Michael J. Gibney (Editor), Susan A. Lanham-New (Editor), Aedin Cassidy (Editor), Hester H. Vorster (Editor), 2009
8. Public Health Nutrition: Principles and Practice in Community and Global Health by Natalie Stein, 2014
9. Handbook of Nutraceuticals and Functional Foods, Third Edition by Robert E.C. Wildman, Robert Wildman, Taylor C. Wallace, CRC Press, 01-Jan-2002.
10. Prescription for Nutritional Healing, Fifth Edition: A Practical A-to-Z Reference to Drug-Free Remedies Using Vitamins, Minerals, Herbs & Food Supplements Paperback – October 5, 2010 by Phyllis A. Balch CNC.
11. Essentials of Food Safety and Sanitation by David Zachary McSwane, Nancy Roberts Rue, Richard Linton., 2003.

### **PPH 244: COSMETICS**

Hours per week: 3

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

#### **UNIT – I**

Fundamentals of cosmetic technology, classification of cosmetics, a brief study of raw materials used for Cosmetic preparations: surfactants, humectants, cream bases, aerosol propellants, perfumes, colours.

#### **UNIT – II**

Skin Care Products: Anatomy and physiology of skin, formulation of skin cleaners, moisturizers, sunscreen products, acne products, anti ageing creams.

#### **UNIT – III**

Colour Cosmetics: Introduction, lip colour, nail polish, face make-up, eye make-up.

#### **UNIT – IV**

Hair Care Products: Hair structure, Shampoos, Conditioners, Setting lotion, Hair creams, Hair dyes.

Dental products: Dentifrices, Oral rinses, Tooth powder, Tooth paste.

#### **UNIT – V**

Personal Hygiene Products: Shaving creams, after shave products.

Quality control tests of different cosmetic products, Packaging of Cosmetics

#### **Books recommended**

1. H. Butler Ed.: "Paucher's Perfumes, Cosmetics & Soaps", 10<sup>th</sup> edition (1<sup>st</sup> Indian edition), Springer (India) Pvt. Ltd.
2. M.S. Balsan & E. Sagari: "Cosmetics-Science & Technology", 2<sup>nd</sup> ed., Vol. I to III, Willey Interscience 2008.
3. Cosmetics: Formulation, manufacturing, and Quality control by P.P.Sharma

4. B.M. Mithal, R.N. Saha: "A Handbook of Cosmetics", 1<sup>st</sup> edition (Reprint), Vallabh Prakashan, Delhi, 2010.
5. K. Sampath: "A Concise Book of Cosmetic", 2<sup>nd</sup> edition, Birla Publications Pvt. Ltd., 2008.
6. The Theory and Practice of Industrial Pharmacy by Lachman L., Liberman, H.A.
7. Modern Cosmetics by Thomson, E.G.
8. Hary's cosmeticology by J.B.Wilkimsson.

### **PPH 222: PHARMACEUTICAL ENGINEERING - II**

Hours per week: 3

End Examination: 60 Marks

Credit: 2

Midsem: 40 Marks

1. Determination of radiation constant of Iron cylinder, Brass, Copper, Painted & non-Painted Glass
2. Evaluation of filter media, Determination of rate of filtration and Study of factors affecting filtration.
3. Determination of porosity of different pharmaceuticals.
4. Studies on grinding equipments, and testing the validity of Laws governing energy and power requirements of size reduction.
5. Experiment designed on screen analysis to determine particle-size distribution.
6. Experiment on determination of various parameters related to sedimentation.
7. Study of relative viscosity determination of liquid mixtures of various compositions & plotting of graph (Ostwald viscometer).
8. Determination of flow behavior and Reynolds number.
9. Measurement of rate of flow of fluids.
10. Determination of friction loss
11. Determination of rate of drying, free moisture content and bound moisture of solids of Pharmaceutical interest.
12. Experiments to illustrate the effects various parameters on rate of drying.
13. Distillation study and Boiling point diagram.
14. Determination of calorific value of Solids.
15. Determination of calorific value of Laboratory Gases.
16. Determination of flash point of Oils and Solvents.
17. Determination of overall heat-transfer coefficient.

### **PPH 224: PHARMACEUTICAL MICROBIOLOGY**

Hours per week: 3

End Examination: 60 Marks

Credit: 2

Midsem: 40 Marks

1. Biosafety Methods and Good Laboratory Practices.
2. Introduction to Microscopy
3. Preparation of different types of Media
4. Different inoculation techniques
5. Effect of physical and chemical agents on bacterial growth.

6. Study of Motility Characters by using hanging drop method
7. Methods of isolation of pure culture.
8. Enumeration of micro-organisms (Total and Viable).  
Biochemical tests for identification of micro-organisms Indole test b) Methyl red test c) Voges-Proskauer test d) Citrate Utilization test Starch Hydrolysis test and f) Gelatin Liquefaction test.
9. Oligo-Dynamic action of Heavy metals.
10. Different Staining techniques – Simple staining, Grams staining, Negative staining and endospore staining.
11. Identification of Unknown bacteria from infected samples.
12. Microbiology of Milk and water.
13. Phenol coefficient test
14. Immobilization Techniques of enzymes /cell
15. Sterilization by autoclaving and test for sterility
16. Sterilization by dry heat and test for its sterility
17. Sterilization by filtration and test for its sterility
18. Test for sterility I.P. for Pharmaceutical products.

**Books recommended:**

1. Laboratory Manual in Microbiology – Cappuccino Sherman.
2. Laboratory Manual in General Microbiology: N. Kannan.
3. Laboratory Manual in Microbiology : P.gunasekaran
4. Dr T. Sundar Raj: “Microbiology Laboratory Manual”, University of Madras
5. N. Kannan: “Laboratory Manual in Microbiology”

**PPH 226: PHARMACOLOGY - I**

Hours per week: 3

End Examination: 60 Marks

Credit: 2

Midsem: 40 Marks

- 1) Study of laboratory animals and their handling
- 2) Study of physiological salt solutions used in experimental pharmacology
- 3) Study of laboratory appliances used in experimental pharmacology
- 4) Drug action on the eye of rabbit-miotics and mydriatics
- 5) Dose response curve (DRC) of acetylcholine on frog rectus abdominis muscle/ isolated ileum preparations
- 6) To study the effects of the drugs on intestinal motility using frog's esophagus model
- 7) Potentiation of acetylcholine response by Eserine on frog rectus abdominis muscle/ isolated ileum preparations
- 8) Inhibition of acetylcholine response by Curare/Procaine/Quinidine/ Pethidine on frog rectus abdominis muscle/ isolated ileum preparations
- 9) Study of use of Anaesthetics in Laboratory Animals
- 10) Study of different routes of administration of drugs in laboratory animals.

Study of principle, procedure involved and interpretation of results for the following experiments.

- 11) Analgesic property of the drug using Analgesiometer
- 12) Anti-inflammatory effect of drugs using Rat –paw oedema method
- 13) Anticonvulsant property of the drugs using maximal electric shock and Pentylene tetrazole methods
- 14) Antidepressant activity of the drugs using pole climbing apparatus and Phenobarbitone induced sleeping time method
- 15) Locomotor activity evaluation of the drugs using Actophotometer and Rotorod

**PPH 272: UNIT OPERATIONS IN PHARMACEUTICAL INDUSTRY  
(Self Study)**

Credit: 2

End Semester Assessment: 100 Marks



**B. Pharm – V SEMESTER**  
**PPH 301: PHARMACEUTICAL TECHNOLOGY**

Hours per week: 3  
Credit: 3

End Examination: 60 Marks  
Midsem: 40 Marks

**UNIT – I**

**Pre-formulation:** Objectives – Protocols – Physical, chemical, Micromeritic studies and stability considerations in pre – formulation.

**Liquid Dosage forms:** Solutions: Vehicles, Additives Used in Formulation of Solutions, Oral Solution Products, Equipment, Manufacture, Filling of Liquids.

Suspension: Formulation of suspension, different types of suspending agents, Manufacture of suspension, Preservation of suspension, Physical stability of suspension.

Emulsion: Formulation of emulsion, Types of emulsifying agents, Preservation of emulsions, Physical stability of emulsion, Manufacture of emulsion. Quality control test for liquid dosage forms.

**UNIT – II**

**Tablets:** Introduction, Formulation of tablet, Tablet type, Excipients used in Tablet manufacturing, selection of excipients. Tablet manufacturing: tablet production via direct compression & granulation, equipment used in tablet manufacturing. Tablet presses, Stages in tablet formulation, Technical problems during tableting,

**Tablet Coating:** Introduction, Reasons for coating tablets, Types of tablet coating, Sugar , Film & Press coating: Ideal characteristics, Formulation, excipients used for film, sugar, enteric, prolonged release coating, Process details & Equipments used in film coating, , Defects in coating, Standards for coated tablets. Quality control tests for tablets.

**UNIT – III**

**Capsules:** Introduction, sizes of capsules, raw materials required for empty capsules shell manufacturing, properties of Gelatin, process of preparation, equipment

**Hard Gelatin Capsule:** Capsule filling & Machines used in filling, filling of Powder, Pellet, Semisolid & Liquid into empty shell, Formulation of capsule, Formulation optimization of capsules.

**Soft Gelatin Capsules:** Introduction to soft gelatin capsule dosage form, Rationale for the selection of softgels as a dosage form, Manufacture of soft gels, Formulation of Softgels, Properties of soft gelatin shell, Types of softgel fill materials. Quality control tests for capsules. Microencapsulation: Methods and Applications of Microencapsulation

**UNIT – IV**

**Parenterals & Ophthalmics:** Types of parenteral dosage forms, Route of parenteral administration, formulation principles, Water for injection, Containers: types & physical characterization, closures: materials & composition, sterilization procedures, General manufacturing process of injections and ophthalmic

preparations. Quality assurance of parenterals: Production facilities, clean rooms, personnel, environmental control evaluation, Quality control tests for parenterals & Ophthalmics.

#### **UNIT – V**

**Semisolid Dosage forms:** Raw materials, Types of vehicles, Different types of semisolid preparation like Pastes, Gels, Ointments and creams. Quality control tests.

**Suppositories:** Suppository base-Ideal characteristics, Types, Manufacturing, Specific problems and formulation of suppository. Quality control tests.

**Pharmaceutical Aerosols:** Components of aerosol package, Formulation of pharmaceutical aerosols, Manufacture of pharmaceutical aerosols, Quality control tests.

#### **Books Recommended:**

1. Leon Lachman, H. A. Lieberman & J. L. Kanig: “The Theory and Practice of Industrial Pharmacy”, 3<sup>rd</sup> edition, Varghese Publishing House, Bombay, 1991.
2. M. E. Aulton: “Pharmaceutics – The Science of Dosage Form Design”, 2<sup>nd</sup> edition, Churchill Livingstone, 2002.
3. L. V. Allen, N. G. & Popovich H. C. Ansel: “Ansel’s Pharmaceutical Dosage Forms and Drug Delivery Systems”, 8<sup>th</sup> edition, Lipincott William & Wilkins, USA, 2005
4. Rawlins, Ed.: “Remington’s The Science and Practice of Pharmacy”, 20<sup>th</sup> edition, Lippincott William & Wilkins, USA, 2000.
5. H. A. Lieberman, Leon Lachman, J. B. Schwartz Ed.: “Pharmaceutical Dosage Forms: Tablets”, 2<sup>nd</sup> edition ( Revised and Expanded), Vol. 1, 2 & 3, Marcel Dekker Inc., Vol – 1, 2 & 3, New York, 2008.
6. Walter Lund Ed.: “The Pharmaceutical Codex – Principle and Practice of Pharmaceutics”, 12<sup>th</sup> edition, CBS Publishers (India) & The Pharmaceutical Press (London), 2009.

### **PPH 303: MEDICINAL CHEMISTRY - I**

Hours per week: 3L

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

**Classification, mode of action, structure activity relationship and uses of the following classes of drugs.**

#### **UNIT – I**

**Basic Principles of Medical Chemistry:** Physico-chemical aspects (Optical, geometric and bioisosterism) of drug molecules and biological action; Drug receptor interaction including transduction mechanisms.

**Drug metabolism:** General pathways of drug metabolism, sites of drug biotransformation, oxidative biotransformation, oxidative, reductive, hydrolytic and conjugative reactions. Factors affecting drug metabolism. Polymorphisms and pharmacogenomics

#### **UNIT – II**

**General anesthetics:** Synthesis of halothane, enflurane, ketamine HCl. Thiopental sodium.

**Local anaesthetics:** Benzoic acid derivatives, amino benzoic acid derivatives, anilide derivatives, miscellaneous agents. Synthesis of benzocaine, procaine, lidocaine.

**Sedative and hypnotic agents:** SAR of barbiturates. Synthesis of Phenobarbital, amobarbital, methohexital, glutethimide, meprobamate.

**Anticonvulsants:** Synthesis of phenytoin, Ethosuximide, Valproic acid, Carbamazepine, Trimethadione.

**Antipsychotics:** Synthesis of fluphenazine, thioridazine, chlorprothixene, trifluoperidol.

**Anti-anxiety drugs** – Classification - SAR of benzodiazepines, Synthesis of diazepam, chlordiazepoxide and meprobamate.

**Antidepressants and Anti-parkinsonian drugs:** Synthesis of amitriptyline, desipramine, phenelzine.

**C.N.S. stimulants** – Classification, Synthesis of amphetamine.

### UNIT – III

**Analgesic agents:** Structure and uses of morphine and related compounds. Synthetic derivatives of morphine, narcotic antagonists, antitussive agents. Synthesis of codeine phosphate, heroin, levorphanol tartarate, mepiridine, fentanyl citrate, methadone, naloxone hydrochloride.

**Anti-inflammatory agents:** Salicylic acid derivatives, N-aryl anthranilic acid derivatives, aryl acetic acid derivatives, aniline and p-amino phenol derivatives, propionic acid derivatives, pyrazolone and pyrazolidine derivatives. SAR of indole acetic acid derivatives, anthranilic acid derivatives. Synthesis of aspirin, indomethacin, diclofenac, ibuprofen, naproxen, mefenamic acid, phenyl butazone.

### UNIT – IV

**Cholinergic agonists:** cholinesterase inhibitors, irreversible inhibitors. SAR of acetylcholine derivatives. Synthesis of carbachol, bethanechol chloride, methacholine and edrophonium.

**Cholinergic blocking agents:** parasympathetic post ganglionic blocking agents, synthetic cholinergic blocking agents, neuromuscular blocking agents. SAR of anticholinergic agents, neuromuscular blocking agents. Synthesis of Atropine, Propantheline, tropicamide, succinyl choline, Dantrolene and Baclofen

### UNIT – V

**Histamine and anti-histaminic agents:** amino alkyl ethers, ethylene diamines, propyl amine derivatives, phenothiazine derivatives, piperazine derivatives, miscellaneous agents. SAR of ethylene diamine derivatives, amino alkyl ether analogues. Synthesis of mepyramine, diphenhydramine, chlorpheniramine maleate, promethazine, cyclazine HCl.

**Gastro-intestinal agents:** antacids, antiulcer agents, appetizers, digestants, emetics, antidiarrhoeals and laxatives. Synthesis of ranitidine, famotidine, omeprazole.

**Books Recommended:**

1. J. H. Block and J. M. Beale: "Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry", 11th edition, Lippincott-Williams & Wilkins, Philadelphia, 2004.
2. William et al. "Foye's Principles of Medicinal Chemistry", 6th edition, Lippincott-Williams & Wilkins, Philadelphia, 2008.
3. D. J. Abraham Ed.: "Burger's Medicinal Chemistry & drug Discovery", 6th edition, Vol 1 to 6, John Willey & Sons, Inc., 2007.
4. Indian Pharmacopoeia 1985 and 1996. The Controller of Publications, Civil Lines, Delhi - 54.
5. Current Index of Medical Specialities (CIMS) and MIMS India, MIMS, A.E. Morgan Publications (I) Pvt. Ltd, New Delhi-19.
6. H. J. Roth and A. Kleemann: "Pharmaceutical Chemistry Drug Synthesis", Vol. I and II
7. Surendra N. Pandeya: "A Text Book of Medicinal Chemistry" Vol. I and II, S.G. Publisher, Varanasi.

**PPH 305: APPLIED BIOCHEMISTRY**

Hours per week: 3

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

**UNIT – I**

**Introduction to biochemistry:** Cell and its biochemical organization, transport process across the cell membranes. Energy rich compounds: ATP, GTP, Cyclic AMP, Cyclic GMP and their biological significance.

**Enzymes:** Definition; Nomenclature; IUB classification; Factor affecting enzyme activity; Enzyme action; enzyme inhibition. Isoenzymes and their therapeutic and diagnostic applications; Coenzymes and their biochemical role and deficiency diseases

**UNIT – II**

**Carbohydrate metabolism:** Glycolysis, Citric acid cycle (TCA cycle), HMP shunt, Glycogenolysis, gluconeogenesis, glycogenesis. Metabolic disorders of carbohydrate metabolism (diabetes mellitus and glycogen storage diseases); Glucose, Galactose tolerance test and their significance; hormonal regulation of carbohydrate metabolism.

**Lipid metabolism:** Oxidation of saturated ( $\beta$ -oxidation); Ketogenesis and ketolysis; biosynthesis of fatty acids, lipids; metabolism of cholesterol; Hormonal regulation of lipid metabolism. Defective metabolism of lipids (Atherosclerosis, fatty liver, hypercholesterolemia); Lipid profile tests: Lipoproteins, composition, functions. Determination of serum lipids, total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides.

**UNIT – III**

**Protein and amino acid metabolism:** protein turn over; nitrogen balance; Catabolism of Amino acids (Transamination, deamination & decarboxylation).

Urea cycle and its metabolic disorders; production of bile pigments; hyperbilirubinemia, porphoria, jaundice. Metabolic disorder of Amino acids.

**Nucleic acid metabolism:** Metabolism of purine and pyrimidine nucleotides; Protein synthesis; Genetic code; inhibition of protein synthesis; mutation and repair mechanism; DNA replication (semiconservative /onion peel models) and DNA repair mechanism.

#### **UNIT – IV**

##### **Introduction to clinical chemistry:**

**The kidney function tests:** Role of kidney; Laboratory tests for normal function includes-

- a) Urine analysis (macroscopic and physical examination, quantitative and semiquantitative tests.)
- b) Test for NPN constituents. (Creatinine /urea clearance, determination of blood and urine creatinine, urea and uric acid)
- c) Urine concentration test
- d) Urinary tract calculi. (Stones)

**Liver function tests:** Physiological role of liver, metabolic, storage, excretory, protective, circulatory functions and function in blood coagulation.

- a) Test for hepatic dysfunction-Bile pigments metabolism.
- b) Test for hepatic function test- Serum bilirubin, urine bilirubin, and urine urobilinogen.
- c) Dye tests of excretory function.
- d) Tests based upon abnormalities of serum proteins.
- e) Selected enzyme tests.

#### **UNIT – V**

**Vitamins:** Definition, Classification, Structure (Except Vitamin B<sub>12</sub>) biochemical role, sources, daily requirement, and deficiency symptoms. Vitamins as co-factor in biochemical reactions.

**Biological oxidation:** Coenzyme system involved in Biological oxidation. Electron transport chain (its mechanism in energy capture; regulation and inhibition); Uncouplers of ETC; Oxidative phosphorylation.

##### **Books Recommended:**

1. Harpers review of biochemistry - Martin
2. U. Satyanarayana and U Chakrapani: "Biochemistry", 3<sup>rd</sup> edition, Books and Allied (P) Ltd., 2008.
3. Text book of clinical chemistry- Alex kaplan &Laverve L. Szabo
4. Principles of biochemistry -- Lehninger
5. Text book of biochemistry -- Ramarao
6. Practical Biochemistry-David T. Plummer.
7. Practical Biochemistry-Pattabhiraman.

## PPH 307: BIOSTATISTICS

Hours per week: 3L

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

### UNIT – I

Introduction to Biostatistics, Frequency distribution, graphical representation of data, measures of central tendency: mean, median, mode. Measures of dispersion: range, mean deviation, quartile deviation, standard deviation, coefficient of variation.

### UNIT – II

**Scenes, moments and kurtosis:** Scenes, definition of scenes, difference between dispersion and scenes, measures of scenes, relative measures, Karl Pearson's coefficient of scenes, Bowel's coefficient of scenes, Kelly's measures of scenes, coefficient of scenes based on moments.

### UNIT – III

#### **Correlation and regression analysis, curve fitting**

Correlation, covariance, calculation of covariance, correlation analysis, correlation coefficient calculated from ungrouped data, Shearson's rank correlation coefficient, Scatter diagram, regression analysis, regression coefficients, properties of regression coefficients, standard error of estimate or prediction, linear regression line or equation, curve fitting-straight-line, 2<sup>nd</sup> degree parabola.

### UNIT – IV

Probability and Bayer's theorem, Probability distribution: binominal, poisson and normal distributions, Pharmaceutical applications of binominal, poisson, normal distributions.

### UNIT – V

**Sampling and test of significance:** Pharmaceutical applications of students t-test, F-test, chi-square test and analysis of variance (one way classification).

#### **Recommended Books:**

1. P.N. Arora, P.K. Malhan: "Biostatistics", Himalaya Publishers
2. N.P. Bali, P.N. Gupta, C.P. Gandhi: "A Text Book of Pharmaceutical Mathematics (Advanced Mathematics)" Vol – II, Lakshmi Publications.
3. Dr. Qazi Shorf Ahmad, Dr. Mohd. Vaseem Ismail, Shadaf Ahmad Khan: "Biostatostics" Lakshmi Publications Pvt. Ltd.

## EOE 208: GANDHIAN PHILOSOPHY

Hours per week: 3

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

## SOE 750: OBJECTIVE ORIENTED PROGRAMMING USING C<sup>++</sup>

Hours per week: 3

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

## PPH 321: PHARMACEUTICAL TECHNOLOGY

Hours per week: 3  
Credit: 2

End Examination: 60 Marks  
Midsem: 40 Marks

1. Preparation and Evaluation of Acetaminophen Syrup
2. Preparation and Evaluation of Acetaminophen Syrup for Children
3. Preparation and Evaluation of Benzyl Benzoate Solution
4. Preparation and Evaluation of Sodium Chloride Nasal Drops
5. Preparation and Evaluation of Acetaminophen Oral Suspension
6. Preparation and Evaluation of Barium Sulfate Oral Suspension
7. Preparation and Evaluation of Benzyl Benzoate Emulsion
8. Preparation & Evaluation of Medicated Powders
9. Preparation & Evaluation granules loaded with Active Pharmaceutical Ingredients
10. Preparation & Evaluation of Tablet by:
  - i. Wet granulation method
  - ii. Dry granulation method
  - iii. Direct compression
11. Preparation & Evaluation of Film Coated Tablets
12. Preparation & Evaluation of Capsules
  - i. Powder filled
  - ii. Granule filled
13. Preparation & Evaluation of Ascorbic acid injection I.P.
14. Preparation & Evaluation Calcium gluconate injection
15. Preparation of Sodium chloride infusion
16. Preparation of Dextrose I.V. Infusion I.P.
17. Manufacture of Dextrose & Sodium chloride infusion
18. Performance of test for sterility of marketed parenteral preparations and eye preparations

## PPH 323: MEDICINAL CHEMISTRY - I

Hours per week: 3  
Credit: 2

End Examination: 60 Marks  
Midsem: 40 Marks

- A) Preparation of medicinally useful compounds
1. Benzimidazole from O-phenylene diamine
  2. Benzotriazole from O-phenylene diamine
  3. PAS from p-nitro salicylic acid
  4. Chlorbutol
  5. Benzil from benzoin
  6. Phenytoin from benzil
  7. Benzocaine from p-amino benzoic acid
- B. Synthesis selective drugs/intermediates in relevance to theory (Two steps).

- C. Separation and identification of plant pigments by Column chromatography
- D. Separation and identification of amino acids by Paper chromatography
- E. Preparation of Silica gel TLC plates and Separation and identification of amino acids by Thin layer chromatography.

### **PPH 325: APPLIED BIOCHEMISTRY**

Hours per week: 3

End Examination: 60 Marks

Credit: 2

Midsem: 40 Marks

#### **Minor Experiments**

1. Qualitative tests for carbohydrates, amino acids & proteins
2. Qualitative tests for amino acids & proteins
3. Qualitative analysis of normal constituents of urine
4. Qualitative analysis of abnormal constituents of urine.
5. Preparation of standard buffer solutions and its pH measurements (any two)

#### **Major Experiments**

6. Quantitative estimation of urine sugar by Benedict's reagent method.
7. Quantitative estimation of urine chlorides by Volhard's method
8. Quantitative estimation of serum cholesterol by Libermann Burchard's method.
9. Quantitative estimation of urine calcium by precipitation method.
10. Quantitative estimation of blood creatinine.
11. Estimation of SGOT & SGPT in serum.
12. Estimation of Urea in Serum.
13. Estimation of Proteins in Serum.
14. Determination of serum bilirubin
15. Study of factors affecting Enzyme activity. (pH & Temp.)

### **PPH 371: DIAGNOSTIC TOOLS IN DISEASE INVESTIGATION (Self Study)**

Credit: 2

End Semester Assessment: 100 Marks



## **B. Pharm – VI SEMESTER**

### **PPH 302: PHARMACOGNOSY AND PHYTOCHEMISTRY - II**

Hours per week: 3L  
Credit: 3

End Examination: 60 Marks  
Midsem: 40 Marks

#### **UNIT – I**

General Pharmacognosy: Advantages and disadvantages of obtaining drugs from cultivated and wild plants. Variability of drug constituents due to exogenous and endogenous factors like altitude, temperature, rain fall, light, propagation by seed vegetative means, mutation, hybridization

Deterioration of crude drugs during storage by insects, pests and enzymes. Factors influencing the storage of crude drugs. Methods of storage.

#### **UNIT – II**

Evaluation of crude drugs: Identity, purity and quality of crude drugs by organoleptic microscopic, physical, chemical and biological evaluation

Methods of adulteration, detection and identification of adulterants types and significance of standards for crude drugs included in I.P. and B.P. Quantitative pharmacognosy

#### **UNIT – III**

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

#### **UNIT- IV**

A detailed study of the following drugs, their classification methods of preparation, commercial varieties, active principles, their chemical nature, identification, tests and uses Resins, gum resins, oleoresins-colophony, benzoin, shellac, myrrh, asafetida, balsam of Tolu, balsam of Peru and storax;

Glands and glandular secretions-thyroid, pituitary, adrenal, pancreas and musk; Gums and saccharin substances: acacia, tragacanth and honey.

#### **UNIT – V**

Chromatography and some related terms. Classification and a study of various chromatographic methods. Column, paper, thin layer and gas chromatography, HPLC and their applications to natural products.

Biogenesis; Pathways leading to formation of plant products; Historical development of plant tissue culture, types of cultures

#### **Books Recommended:**

1. Atal CK and Kapoor BM. Cultivation and utilization of Aromatic Plants. CSIR Publications
2. Tyler, VC, Brady, LR and Robers, JE. Pharmacognosy, 11<sup>th</sup> to 14<sup>th</sup> Editions

3. Wallis, TE. Textbook of Pharmacognosy, 5<sup>th</sup> Edition, J & A, Churchill Limited, U.K.
4. Kokate, CK Purohit, AP. and Gokhale, SB. Pharmacognosy
5. Ross, MF. And Brain, KR. An introduction to Phytopharmacy, Pitman Medical –Kent
6. Deinvert, J. and Bajaj YPS. Applied and Fundamental Aspects of Plant Cell, Tissue and Organ Culture, Berlin.

## **PPH 304: PHARMACEUTICAL BIOTECHNOLOGY**

Hours per week: 3L

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

### **UNIT – I**

**Hormonal Preparations:** Manufacture, storage and Standardization of the following glandular and Animal Products 1. Insulin 2. Chronic Gonadotrophin (CGT) and Gonadotrophin Hormones 3. Anterior and Posterior Pituitary Products 4. Thyroid Preparations 5. Liquid Extract of Liver preparations

### **UNIT – II**

**Vaccines and Sera:** Introduction, General Method of Preparation, Standardization, Labelling and Packing of following vaccines : Diphtheria, Pertussis and Tetanus (DPT), Small Pox, Polio Myelitis, B.C.G Vaccine and anti toxins like Gas gangrene antitoxin, Anti Rabies serum, Anti venom serum

### **UNIT – III**

#### **Microbial Assay:**

- I. Antibiotics: Assay Design, Cylindrical and cup plate method, types of assay media as Per Indian Pharmacopoeia (I.P)
- II. Vitamins: Assay of riboflavin, Nicotinic acid, Vitamin B1 And Vitamin B12
- III. Amino Acids: Assay of Tryptophan and Glutamic acid

### **UNIT – IV**

**Blood Products:** General requirements for blood collection, preparation, standards, labeling and storage of the following products: Whole human blood, Human plasma and dried human plasma, dried human serum, human Gamma globulins, concentrated human R.B.C, Plasma protein Fraction,

### **UNIT – V**

**Fermentation Technology:** Basic Principles in Fermentation and Application: Introduction to Fermentation. Screening of Industrially important microbes- primary and secondary screening, Maintenance of stock culture, Strain improvement for increased yield Study of design and working of bioreactor, fermentation media, anaerobic and aerobic fermentation, Downstream processing techniques

#### **Books Recommended:**

1. L.E Cassida: "Industrial Microbiology", John Willey and sons, India
2. S. C. Prescott and C. G. Dunn: "Industrial Microbiology", 3<sup>rd</sup> & 4<sup>th</sup> edition, McGraw Hill Book Company,
3. Under Koflar and Hickey: "Industrial Fermentation", Vol 1 & 2
4. Biochemistry of Industrial microorganism by Rainbow and Rose

5. Kesav Trehan: "Biotechnology", 1<sup>st</sup> edition, New Age International (P) Ltd., 2006.
6. Primrose SB and Old Rw, Blackwell: "Principles of Gene Manipulation" Scientific Publications
7. H.D Kumar: "Nucleic Acids and Biotechnology", Vikas Publishing and Company
8. David Freifelder: "Microbial Genetics"
9. Lewin Benjamin: "Genes"
10. P. Stanbury: "Industrial Microbiology"

### **PPH 306: SOFT SKILLS**

Hours per week: 2L  
Credit: 2

End Examination: 60 Marks  
Midsem: 40 Marks

#### **UNIT – I**

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

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

#### **UNIT – II**

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

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

#### **UNIT – III**

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

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

#### **UNIT – IV**

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

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

#### **UNIT – V**

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

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

**Books Recommended:**

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

**PPH 308: MEDICINAL CHEMISTRY - II**

Hours per week: 3L+2T

End Examination: 60 Marks

Credit: 4

Midsem: 40 Marks

**UNIT – I**

**Anti-anginal agents and vasodilators.** Synthesis of nitroglycerine, isosorbide trinitrate.

**Anti-arrhythmic drugs:** membrane depressant drugs, beta adrenergic blocking agents, repolarization prolongators, calcium channel blockers. SAR of calcium channel blockers. Synthesis of procainamide, disopyramide, amiodarone, nifedipine and diltiazem.

**Anti-hypertensive agents:** beta blockers, ACE inhibitors, calcium channel blockers, alpha1 antagonists, alpha2 agonists, miscellaneous agents. Synthesis of methyldopa, clonidine hydrochloride, prazosin, propranolol, atenolol, hydralazine hydrochloride, minoxidil, verapamil hydrochloride and captopril.

**UNIT – II**

Classification, mode of action, uses and structure activity relationship of the following classes of drugs. Synthesis of those compounds only exemplified against each class.

**Sulfonamides and Quinolones:** synthesis of Sulphadiazine, Sulphamethoxazole, Sulphacetamide sodium, nalidixic acid, norfloxacin, ciprofloxacin.

**Antibiotics :**

- $\beta$ -lactam antibiotics: SAR of Penicillins and Cephalosporins, synthesis of Penicillin, Methicillin, Ampicillin, Amoxycillin, Cephalothin sodium, Clavulanic acid

Tetracyclines, Aminoglycoside antibiotics, Macrolide antibiotics, Lincomycins and Polypeptide antibiotics. Synthesis of Chloramphenicol, Linezolid.

**UNIT – III**

**Anti-hyperlipidemics.** Synthesis of clofibrate, probucol

**Coagulants and anti-coagulants.** Synthesis of warfarin sodium, dicumarol, phenindione, dipyridamole.

**Diuretics:** Carbonic anhydrase inhibitors, thiazide and thiazide like diuretics, high ceiling or loop diuretics, potassium sparing diuretics, miscellaneous agents. SAR of thiazide diuretics. Synthesis of acetazolamide, chlorthiazide, furosemide, ethacrynic acid, amiloride HCl, spironolactone.

**Hypoglycemic agents:** Biguanides, sulphonyl ureas, miscellaneous. SAR of sulphonyl ureas. Synthesis of tolbutamide, glibenclamide, glypizide, metformin and phenformin.

#### UNIT – IV

**Anticancer Drugs:** Classification and synthesis of Chlorambucil, busulphan, procarbazine, carmustine, 5-fluorouracil, 5-mercaptopurine, methotrexate.

**Antifungal agents:** Synthesis of griseofulvin, fluconazole

**Anti Malarial Drugs:** SAR of quinoline anti-malarials, synthesis of Chloroquine,

**Anti-TB and anti-leprosy Drugs:** Synthesis of Isoniazid, Ethambutol, Pyrazinamide, Dapsone, clofazimine.

#### UNIT – V

**Anti-viral including anti-HIV agents:** Synthesis of Acyclovir, Zidovudine.

**Antiamoebic agents:** Synthesis of Metronidazole, Diloxamide furoate.

**Anthelmintics :** Synthesis of Thiabendazole, Mebendazole, Niclosamide.

**Immunosuppressives and immunostimulants:** Synthesis of azathioprine, mycophenolate mofetil

**Diagnostic Agents:** Synthesis of Propylidone, Sodium diatrizoate, Fluorescein sodium.

**Thyroid hormones and antithyroid agents.** Synthesis of levothyroxine, propylthiouracil, methimazole, carbimazole.

**Steroid hormones and adrenocorticoids:** Nomenclature and stereochemistry of steroids, synthesis of diethylstilbesterol, norgestrel, prednisolone, fludrocortisone, betamethasone, triamcinolone.

#### Books Recommended:

1. J. H. Block and J. M. Beale: "Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry", 11<sup>th</sup> edition, Lippincott-Williams & Wilkins, Philadelphia, 2004.
2. William et al. "Foye's Principles of Medicinal Chemistry", 6<sup>th</sup> edition, Lippincott-Williams & Wilkins, Philadelphia, 2008.
3. D.J. Abraham Ed.: "Burger's Medicinal Chemistry & drug Discovery", 6th edition, Vol 1 to 6, John Willey & Sons, Inc., 2007.
4. Indian Pharmacopoeia 1985 and 1996. The Controller of Publications, Civil Lines, Delhi - 54.
5. Current Index of Medical Specialities (CIMS) and MIMS India, MIMS, A.E. Morgan Publications (I) Pvt. Ltd, New Delhi-19.
6. H. J. Roth and A. Kleemann: "Pharmaceutical Chemistry Drug Synthesis", Vol. I and II
7. Remington: "The Science and Practice of Pharmacy", Vol. 1 and 2, MACK Publishing Company, Easton, Pennsylvania.

8. Surendra N. Pandeya: "A Text Book of Medicinal Chemistry" Vol. I and II, S.G. Publisher, Varanasi.

### **MMH 844: TECHNOLOGY MANAGEMENT**

Hours per week: 3L  
Credit: 3

End Examination: 60 Marks  
Midsem: 40 Marks

### **EOE 317: PERSONALITY DEVELOPMENT**

Hours per week: 3L  
Credit: 3

End Examination: 60 Marks  
Midsem: 40 Marks

### **PPH 322: PHARMACOGNOSY AND PHYTOCHEMISTRY - II**

Hours per week: 3  
Credit: 2

End Examination: 60 Marks  
Midsem: 40 Marks

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

#### **Recommended Books:**

1. Pharmacopoeia of India, 2004
2. Practical Pharmacognosy, 3<sup>rd</sup> Edition, By Kokate, C.K.
3. Practical Pharmacognosy by Lala, P.K., Lina, Calcutta

### **PPH 324: PHARMACEUTICAL BIOTECHNOLOGY**

Hours per week: 3  
Credit: 2

End Examination: 60 Marks  
Midsem: 40 Marks

1. Sterilization of surgical dressing and tests for its sterility
2. Sterilization by Gas and tests for its sterility
3. Tests for sterility of Commercial Dextrose injection I.P
4. Tests for sterility of a Preparation Containing Sulphanilamide
5. Preparation and Standardization of bacterial vaccine
6. Microbial counting in Pharmaceutical preparation
7. Primary and Secondary Tests for e.colli
8. Replica plating
9. Bioutography
10. Determination of MIC by gradient plate method
11. Thermal death kinetics
12. Production of wine

13. Estimation of protein by lowrys method
14. Microbial assay of antibiotic
15. Agarose gel electrophoresis

**Books recommended**

1. Microbiology a laboratory manual - 7th edition by Cappuccino, Sherman
2. Published by Dorling Kindersley (India) Pvt. Ltd.
3. Laboratory experiments in microbiology by M. Gopal Reddy, M.N. Reddy. Himalaya publishing house.
4. Laboratory manual in microbiology by P. Gunasekaran, New Age International (Pvt.) Ltd.
5. Laboratory manual in general microbiology by N. Kannan, Panima Publishing Corporation.

**PPH 326: SOFT SKILLS**

Hours per week: 3

End Examination: 60 Marks

Credit: 2

Midsem: 40 Marks

- 1 Verbal Ability
- 2 Reasoning
- 3 Quantitative Aptitude
- 4 Mock Tests, Interview & Group Discussion

**PPH 372: HERBAL DRUGS  
(Self Study)**

Credit: 2

End Semester Assessment: 100 Marks

## B. Pharm – VII SEMESTER

### PPH 401: PHARMACOGNOSY AND PHYTOCHEMISTRY - III (Chemistry of Natural Products)

Hours per week: 3L

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

#### UNIT – I

**Carbohydrates:** Classification and general properties. Knowledge of structure including stereochemistry of glucose, fructose, and sucrose. General treatment of pharmaceutically important carbohydrates-maltose, lactose, starch, cellulose, dextrin, and glycosides.

**Amino acids and proteins:** Classification and general reactions of amino acids and their relationship to proteins and polypeptides. Methods of preparation of amino acids, classification and general reactions of proteins, degradation of proteins-hydrolysis and end group analysis-protein hormones, oxytocin.

#### UNIT – II

**Purines and xanthine derivatives:** Structure and synthesis of uric acid, Theobromine, theophylline, and caffeine. General aspects of nucleoproteins and nucleic acids, Lipids: Fixed oils and fats. Fatty acids: chemistry and analysis of oils and fats.

**Terpenes:** Occurrence, general methods of isolation and classification, chemistry of citral, limonene,  $\alpha$ -terpineol, carvone, camphor and menthol. Preparation, general composition, properties and analysis of essential oils of I.P.

**Alkaloids:** Classification, general methods of isolation, chemical tests for alkaloids, Chemistry and uses of ephedrine, nicotine, papaverine and atropine.

#### UNIT – III

**Vitamins:** Classification, chemistry, physiological role and uses of thiamine, riboflavin and ascorbic acid. Skeletal structures of vitamins official in I.P.

**Steroids:** Nomenclature and skeletal structures of ergosterol, stigmasterol, cholesterol and bile acids. Chemical tests for steroids. Calciferols and Saponins – diosgenin, hecogenin

**Hormones:** Sex hormones, structure and physiological properties of testosterone, progesterone, estrone, estriol and estradiol. Their synthesis from cholesterol or diosgenin. Synthetic estrogens. Introduction to oral contraceptives. Cortisones; prednisolone, aldosterone, synthesis of cortisone. Steroidal anti-inflammatory drugs: structures and their therapeutic uses.

#### UNIT – IV

**Glycosides:** Enzymatic and hydrolysis reactions of glycosides, mechanism of action, SAR, therapeutic uses and toxicity of glycosides. Cardiac glycosides of digitalis, bufa and squill. Structure of salicin, hesperidin and rutin.



## **UNIT – V**

**Antibiotics:** A general study of antibiotics, isolation or synthesis, chemistry and uses of penicillin, chloramphenicol and streptomycin, general introduction to tetracycline and other antibiotics included in I.P.

**Spectroscopy and structure:** An introductory treatment of U.V., I.R. and NMR spectroscopy in structure determination.

### **Books Recommended:**

1. Organic chemistry, Vol. II. By I.L. Finar
2. Wilson and Gisvold, Textbook of Organic, Medicinal and Pharmaceutical Chemistry
3. Bentley and Driver's Textbook of Pharmaceutical chemistry
4. Remington's Practice of Pharmaceutical Sciences
5. Indian Pharmacopoeia.

## **PPH 403: PHARMACOLOGY - II**

Hours per week: 3L

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

## **UNIT – I**

### **Pharmacology of Drugs acting on CVS**

- a) Antihypertensive agents
- b) Vasodilators
- c) Antianginal agents
- d) Antiarrhythmics
- e) Cardiotonics
- f) Antihyperlipidemic agents

## **UNIT – II**

### **Pharmacology of Drugs acting on gastrointestinal tract**

- a) Digestants
- b) Antispasmodics
- c) Anti-diarrhoeal agents
- d) Cathartics
- e) Emetics-anti emetics
- f) Drugs used in inflammatory bowel syndrome
- g) Antacids and drugs used in peptic ulcers
- h) Miscellaneous-Carminatives, demulcents, protectives, adsorbents and astringents

### **Pharmacology of Drugs acting on respiratory system**

- a) Drugs used in asthma
- b) Cough suppressants

## **UNIT – III**

### **Pharmacology of hormones and hormone antagonists**

- a) Thyroid and anti thyroid drugs
- b) Insulin, insulin analogues and oral hypoglycaemic agents
- c) Sex hormones and oral contraceptives

d) Oxytocin, other oxytocics and uterine stimulants

**Drugs acting on immune system**

e) Immuno suppressants

f) Immuno stimulants

**UNIT – IV**

**Chemotherapy**

(a) Introduction (b) Sulphonamides (c) Antibiotics including Penicillin's, Cephalosporin's, Tetracycline, Chloramphenicol, Macrolides, Amino Glycosides, Polyene and Polypeptide antibiotics (d) Quinolones and fluoroquinolones (e) Antifungal agents (f) Antiviral agents

**Pharmacology of Drugs used in** (a) Tuberculosis (b) Leprosy (c) Malaria (d) Amoebiasis (e) Pharmacology of anthelmintic drugs (f) Chemotherapy of cancer

**UNIT – V**

**Biological assays**

a) Principles of biological assays

b) Fundamentals of biometric analysis

c) Detailed study of the official bioassay methods for Adrenaline, Posterior pituitary hormones, Insulin, Gonadotrophic hormones, Cholera vaccine, Diphtheria antitoxin

d) Test for pyrogens-LAL Test, Rabbit method

**Books Recommended:**

1. K. D. Tripathi: "Essentials of Medical Pharmacology", 4<sup>th</sup> edition, Jaypee Publication, Delhi, 1999.
2. R. S. Satoskar & S. D. Bhadarkar: "Pharmacology and Pharmacotherapeutics", 20<sup>st</sup> edition (single volume), Popular Publication, Dubai, 2009.
3. H. P. Rang & M. M. Dale, "Pharmacology" 4<sup>th</sup> edition, Churchill Livingstone, 1999.
4. T.W.A. Rall, A.I. S. Nies & P. Taylor "Goodman and Gilman's The pharmacological Basis of Therapeutics" 9<sup>th</sup> Ed<sup>n</sup>, Mc Graw Hill, Pergamon Press, 1996.
5. B. G. Katzung: "Basic and Clinical Pharmacology" 9<sup>th</sup> edition. Prentice Hall, Int., 2004.
6. Shargel and Leon: "Applied Biopharmaceutics and Pharmacokinetics", 6<sup>th</sup> edition, Prentice Hall, London 2008.
7. Richard A. Harvey "pharmacology" 4<sup>th</sup> edition, Wolters Kluwer (India) Pvt. Ltd., New Delhi, 2006
8. David E. Golan "principals of pharmacology" Lippincott Williams & Wilkins USA, 2005.

## PPH 405: BIOPHARMACEUTICS & PHARMACOKINETICS

Hours per week: 3L

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

### UNIT – I

**Biopharmaceutics:** Introduction, Passage of drug across biological barrier (Passive diffusion, Active transport, Facilitated diffusion and Pinocytosis), Factors influencing absorption- Physicochemical, Physiological and Pharmaceutical.

### UNIT – II

**Drug distribution:** In the body and factors influencing drug distribution, Volume of distribution and distribution coefficient.

Protein binding, Factors affecting protein-drug binding and its Significance.

Pharmacokinetic drug interactions: Mechanism of drug interaction, Drug interactions at absorption, distribution, metabolism and excretion (ADME) pathways. Pharmacodynamic drug interactions in polypharmacy, food-drug interactions.

### UNIT – III

**Metabolism:** Pathway of drug metabolism, First pass effect, Enzyme induction and Inhibition and their influence on drug activity.

Clearance concept, Mechanism of renal clearance, Clearance Ratio, Determination of renal clearance, Extraction ratio, Hepatic clearance, Enterohepatic cycling, Biliary excretion and Extrahepatic circulation.

### UNIT – IV

**Pharmacokinetics:** Plasma drug concentration-time profile, Pharmacokinetic parameters, Rates, Rate constants and order of reaction (Zero order, First order and mixed order), Different pharmacokinetic models, Pharmacokinetic parameters and their significance.

**Compartment kinetics:** One compartment model based pharmacokinetic parameters from plasma and urine data after single dose drug administration by intravascular and extravascular route, involving the concepts like Trapezoidal rule, Method of Residual, Wagner Nelson method.

### UNIT – V

**Bioavailability:** Types of bioavailability, Measurement of bioavailability and their significance, Methods for enhancement of bioavailability.

**Bioequivalence:** Equivalence type, Design of single dose bioequivalence study and related statistics.

### Books Recommended:

1. L. Shargel, & A.B.C. Yu: "Applied Biopharmaceutics & Pharmacokinetics", Appleton and Lange, Connecticut, USA.
2. Milo Gibaldi: "Biopharmaceutics and Clinical Pharmacokinetics", 4<sup>th</sup> edition (Indian Reprint), PharmaMed Press, 2008.
3. Notari : Biopharmaceutics and Clinical Pharmacokinetics

4. M. Brahmankar and Sunil B. Jaiswal: Biopharmaceutics and Pharmacokinetics – A Treatise”, 2<sup>nd</sup> edition, Vallabh Prakashan, Delhi, 2009.
5. Venkateswarulu: “Biopharmaceutics and Pharmacokinetics”, 1<sup>st</sup> edition, PharmaMed Press, 2008.
6. Leon Lachman, H. A. Lieberman & J. L. Kanig: “The Theory and Practice of Industrial Pharmacy”, 3<sup>rd</sup> edition, Varghese Publishing House, Bombay, 1991.

### **PPH 407: PHARMACEUTICAL JURISPRUDENCE**

Hours per week: 2L

End Examination: 60 Marks

Credit: 2

Midsem: 40 Marks

#### **UNIT – I**

Pharmacy Act 1948

#### **UNIT –II**

Drug & Cosmetic Act 1940 & Rules 1945

#### **UNIT –III**

Medicinal & Toilet Preparations (Excise Duties) Act 1955

Narcotic Drugs & Psychotropic Substances Act 1985

Drugs & Magic Remedies (Objectionable Advertisements) Act 1954 & Rules 1955

#### **UNIT – IV**

Prevention & Cruelty to Animal Act 1960

Medical Termination of Pregnancy Act 1971

Poisons Act 1919

#### **UNIT – V**

Drugs (Price Control Order) Act 1995

Code of Ethics

#### **Books Recommended:**

1. B. M. Mithal: “A Text Book of Forensic Pharmacy”, 10<sup>th</sup> edition (11<sup>th</sup> reprint), Vallabh Prakashan, 2009.
2. N. K. Jain: “A Text Book of Forensic Pharmacy”, 7<sup>th</sup> edition, Vallabh Prakashan, 2008.
3. Kokate and Gokhale: “Text Book of Forensic Pharmacy” 1<sup>st</sup> edition, Pharma Book Syndicate, 2006.
4. Drug & Cosmetic Act & Rules Published by Government of India
5. Pharmacy Act Published by Government of India.

## PPH 441: QUALITY ASSURANCE AND GMP

Hours per week: 3L

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

### UNIT – I

**GMP:** A detailed study of GMP as prescribed in Schedule M of Drugs and Cosmetics Act and Rules. Requirements regarding premises, sanitations, personnel, equipment and building, documentation and records and processes. GMP requirements for API manufacture, manufacture of solid, liquid, semisolid and sterile dosage forms.

### UNIT – II

**Quality Control and Quality Assurance:** Principles and General Concepts – Duties and Responsibilities of Quality Control and Quality Assurance. Concept of Statistical Quality Control – Quality Control Charts – Sampling and Sampling Plans.

### UNIT – III

**Validations:** Definition & scope, Types of Validations – A study of Process Validation. Validation Protocols, Validation of Equipments, Cleaning Validation, Analytical Method Validation.

### UNIT – IV

**Documentation:** Importance, Statutory requirements, procedure for documentation, critical examination of documents. Documentation related to Product Development, standard operating procedures, standard test procedures, cleaning methods, quality control documents, batch release document, distribution records, complaints and recalls records, retention of records.

### UNIT – V

Factories Act and rules

Environment Health and Safety (EHS): Hazards- Fire, mechanical, chemical and pharmaceutical, monitoring and prevention systems, industrial effluents testing and treatment, control of environmental pollution

### Books Recommended:

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

## PPH 443: BIOLOGICAL SCREENING METHODS

Hours per week: 3L

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

### UNIT – I

Basic principles of screening of drugs for pharmacological activities. Organization of screening for the pharmacological activities of the new substances with emphasis on the evaluation of

(a) CNS activities (b) Anti-ulcer (c) Hepatoprotective

### UNIT – II

Organization of screening for the pharmacological activities of the new substances with emphasis on the evaluation of (a) Local anesthetics (b) Analgesics (c) Anticonvulsants

### UNIT – III

Organization of screening for the pharmacological activities of the new substances with emphasis on the evaluation of (a) Anti inflammatory agents (b) Anti histaminic (c) Antipyretics

### UNIT – IV

Organization of screening for the pharmacological activities of the new substances with emphasis on the evaluation of

(a) Antifibrilatory agents (b) Cardiotoxic agents (c) Diuretics

### UNIT – V

(a) Cell culture techniques for pharmacological techniques (b) Toxicity tests: Determination of LD<sub>50</sub>, acute, sub acute and chronic toxicities studies. Tests for undue toxicity of drugs. International guidelines (ICH recommendations).

### Books Recommended:

1. R. A Turner: "Screening Methods in Pharmacology", Academic Press, London 1965
2. H. G. Vogel: "Drug Discovery and Evaluation", 2nd edition, Springer, Germany, 2002.
3. A. Goodman Gilman, T. W. Rall, A.I.S. Nies, and P. Taylor: "Goodman and Gilman's- The pharmacological Basis of Therapeutics", 11th Edition, Mc Graw Hill, Pergamon Press 2006.
4. R. Lawrence and A. L. Bacharach: "Evaluation of Drug Activities: Pharmacometrics", Academy Press, London.
5. Nodine Siegler, Animal and Clinical Pharmacological Techniques in Drug Evaluation.
6. Goldstein: "Principles of Drug Action", John Wiley and Sons, New York.

**PPH 421: PHARMACOGNOSY AND PHYTOCHEMISTRY - III**  
**(Chemistry of Natural Products)**

Hours per week: 3  
Credit: 2

End Examination: 60 Marks  
Midsem: 40 Marks

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

**PPH 423: PHARMACOLOGY - II**

Hours per week: 3  
Credit: 2

End Examination: 60 Marks  
Midsem: 40 Marks

1. Bioassay of acetylcholine using isolated ileum/rectus abdominis muscle preparation by matching method
2. Bioassay of acetylcholine using isolated ileum/rectus abdominis muscle preparation by bracketing method
3. Bioassay of acetylcholine using isolated ileum/rectus abdominis muscle preparation by interpolation method
4. Bioassay of acetylcholine using isolated ileum/rectus abdominis muscle preparation by three point method
5. Bio assay of histamine using guinea pig ileum preparation by matching /bracketing /interpolation method (using software)
6. Bio assay of antagonist (atropine/ pancuronium )
7. Cardiotoxic activity of drugs using isolated frog heart (using software)
8. To study the effects of drugs on normal and hypodynamic frog heart. (using software)

9. Calculation of dose ration (EC50) of acetylcholine in presence and absence of atropine /pancuronium using isolated ileum/rectus abdominis muscle preparation
10. Calculation of PA<sub>2</sub> value for atropine /pancuronium using acetylcholine as agonist employing isolated ileum/frog rectus abdominis muscle.

### **PPH 491: PROJECT WORK**

Credit: Nil

End Semester Assessment: 100 Marks

Selection of Topic, Literature Review, Methodology

### **PPH 471: PHARMACY PROFESSION - HEALTH CARE SYSTEM (Self Study)**

Credit: 2

End Semester Assessment: 100 Marks



## B. Pharm – VIII SEMESTER

### PPH 402: PHARMACEUTICAL ANALYSIS - II

Hours per week: 3L  
Credit: 3

End Examination: 60 Marks  
Midsem: 40 Marks

#### UNIT – I

**Potentiometry:** Electric potential, electro chemical cell, theory, reference electrodes, indicator electrodes (ion selective electrodes ), construction and working of electrodes, measurement of potential and pH, relation of pH to potential, types of potentiometric titrations and curves, method of deduction of end- point, applications in pharmacy

**Conductometry:** Introduction, conductivity cell, conductometric titrations and curves, applications.

**Polarography:** Instrumentation, dropping mercury electrode (DME), residual current, diffusion current and limiting current, polarographic wave, Ilkovic's equation, effect of oxygen on polarographic wave, polarographic maxima and suppressors, applications.

#### UNIT – II

**UV-Visible spectroscopy:** Introduction, Beer Lambert's law, Woodward-Fieser rule, chromophores, auxochromes, bathochromic shift, hypsochromic shift, hyperchromic and hypochromic effects, effect of solvents. Single beam and double beam spectrophotometers- Principle, Instrumentation and applications

**Infrared spectroscopy:** Principle, Instrumentation and applications. Fourier transform technique (FTIR)

**X-ray diffraction:** Brief theory, instrumentation and applications

#### UNIT – III

**Flame photometry:** Theory, nebulization, flame, flame temperatures, effect of solvent, interferences, flame spectrometric techniques and instrumentation, limitations, pharmaceutical applications.

**Nephelometry and Turbidimetry:** General principles involved, factors affecting measurements, instrumentation, applications in pharmacy.

**Spectrofluorimetry:** Theory, concept of singlet and triplet electronic states, internal and external conversions, intersystem crossing, factors affecting fluorescence, quenching, instrumentation- study of fluorimeter, spectrofluorimeter, applications.

**Polarimetry:** Introduction, polarimeter, applications in pharmacy.

#### UNIT – IV

Proton nuclear magnetic resonance spectrometry –Principle, instrumentation, applications.

Mass spectrometry- Principle, instrumentation, applications.

## UNIT – V

Introduction to chromatographic techniques- Classification, separation techniques and hyphenated techniques,

Column chromatography, paper chromatography, TLC and Ion Exchange chromatography- Theory, principle, techniques and applications

HPLC, HPTLC and GC –Theory, principle, instrumentation and application

Thermal methods of analysis- TGA, DTA and DSC - Principle, instrumentation and applications

### Books Recommended:

1. H. Beckett & J. B. Stenlake: “Practical Pharmaceutical Chemistry”, 4th edition, Part-2, CBS Publishers, New Delhi, 2005.
2. Robert. D. Brown: “Introduction to Instrumental Analysis”, Pharma Book Syndicate, 2006
3. D.A. Skoog, F.J. Holler, T.A. Nieman: “Principles of Instrumental Analysis”, 5<sup>th</sup> edition Thomson, Brooks/Cole, 2005
4. T. Riley, C. Tomlinson, “Principles of Electro analytical methods”, John Wiley & Sons.
5. Willard, Meritt, Dean, Settle, Wadworth, Instrumental method of Analysis, 7<sup>th</sup> edition, CBS Publishers, New Delhi.
6. Ewing’s: “Analytical Instrumentation Hand Book”, 3<sup>rd</sup> edition, Marcel Dekker, 2005.
7. R.M. Silverstein & G.C. Bassler: “Spectrometric identification of organic compounds”, 6<sup>th</sup> edition, John Wiley & Sons, 2004.
8. Dyer J. R: “Applications of Absorption Spectroscopy of Organic Compounds”, 1<sup>st</sup> edition, PHI learning Pvt. Ltd, 2010.
9. Egon Stahl: “Thin Layer chromatography”, 2<sup>nd</sup> edition, Springer publications
10. L.R. Snyder: “Practical HPLC Method Development” 2<sup>nd</sup> edition, John Wiley & Sons, Canada
11. “Indian Pharmacopoeia” Government of India, Ministry of Health & Family Welfare, the Indian Pharmacopoeia Commission, Ghaziabad, 2007.
12. “United States Pharmacopoeia”, USP 32 – NF 27, Vol 1 & 2, Asian Edition, 2009.
13. British Pharmacopoeia”, British Pharmacopoeia commission, The Stationary Office, 6th edition, 2009.

## PPH 404: NOVEL DRUG DELIVERY SYSTEMS

Hours per week: 3L

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

## UNIT – I

Controlled release drug delivery: Terminology, potential advantages, Fundamentals of controlled drug delivery systems, drug properties relevant to formulation. Factors to be considered in the design of controlled release dosage forms.

## **UNIT – II**

### **Oral Controlled Drug Delivery Systems**

Fundamentals, dissolution controlled, diffusion controlled, ion exchange resins, osmotic based system, pH independent systems & altered density systems

### **Mucoadhesive Drug Delivery Systems**

Mechanism of bioadhesion, mucoadhesive materials, formulation & evaluation of mucoadhesive systems.

## **UNIT – III**

### **Transdermal Drug Delivery Systems**

Introduction, types of TDDS, materials employed, evaluation of TDDS

## **UNIT – IV**

### **Ocular Drug Delivery Systems**

Approaches of topical ocular drug delivery, intraocular drug delivery

## **UNIT – V**

### **Targeted Drug Delivery Systems**

Introduction, Fundamentals & applications: liposomes, niosomes resealed erythrocytes & nanoparticles, microspheres, prodrugs, implant systems, multiple emulsions, monoclonal anti bodies

### **Books Recommended:**

1. Y. W. Chien: “Novel Drug Delivery System”, 2<sup>nd</sup> edition (Revised and Expanded), vol. 50, Drugs & the Pharmaceutical Sciences, Marcel Dekker, New York, 2007.
2. J. R. Robinson and V. H. Lee Ed.: “Controlled Drug Delivery – Fundamentals and Applications” 2<sup>nd</sup> edition (Revised and Expanded), vol. 29, Drugs & the Pharmaceutical Sciences, Marcel Dekker, New York, 2005.
3. L. V. Allen, N. G. & Popovich H. C. Ansel: “Ansel’s Pharmaceutical Dosage Forms and Drug Delivery Systems”, 8<sup>th</sup> edition, Lippincott William & Wilkins, USA, 2005.
4. N. K. Jain: “Advances in Controlled and Novel Drug Delivery”, 1<sup>st</sup> edition, CBS Publishers & Distributors, New Delhi,  
S. P. Vyas & R. K. Khar: “Targeted & Controlled Drug Delivery – Novel Carrier Systems”, 1<sup>st</sup> edition, CBS Publishers & Distributors, New Delhi, 2007.

## **PPH 406: PHARMACEUTICAL MANAGEMENT**

Hours per week: 3L

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

## **UNIT – I**

Introduction to Management- Management Thought – Functions and Principles of Management; Corporate social responsibility.

Plant location and layout of an industry: Various factors affecting locational aspects, layout of building and equipment. Product layout versus process layout and compliance of pollution control measures.

## **UNIT – II**

Production, planning and control – scientific purchasing, quality control, problems of productivity, stores organization, location of stores, receiving, inspection of materials and issue from the store, control of stores and stocks, stores accounting and records. Personnel management – selection, appointment, training, transfer, promotion, demotion policies, remuneration, job evaluation, human relations.

## **UNIT – III**

Sales organization: Market, definition, different approaches to the study of marketing, institutional approach, market planning, product planning, method of marketing, wholesalers, retailers, functional approach, efficiency in marketing, commodity approach.

Distribution policies: Selective and Exclusive distribution, pricing and discount policies, credit policies, trade indication marks, patent policies. Sales promotion policies – detailing to physician, professional persons, sampling, window and interior display, product advertising, sales promotion publicity.

## **UNIT- IV**

Budgets and budgetary controls: Elements of accounting, double entry book keeping, books of accounts, trial balance, final accounts of business and profit, profit and loss accounts, appropriation accounts, balance sheets.

## **UNIT – V**

Drug Store Management: Selection of site, space, layout and legal requirements. Storage of drugs of various schedules and maintenance of records as per requirement. Hospital supplies, requirements for dispensing extemporaneous preparations. Importance and objectives of purchasing, selection of suppliers, credit information, tenders, contracts and price determination, removal of expired drugs. Patient counseling – maintenance of records.

### **Books Recommended:**

1. Remington's Pharmaceutical Sciences.
2. Pharmaceutical marketing in India, concepts strategy cases by Subba Rao Chaganti Published by Pharma book syndicate.
3. Charles Hill & Steven McShane: "Principles of Management", TMH, New Delhi 2008.
4. Pharmaceutical Industrial Management : by R.M. Mehta, Vallabh Prakasan, New Delhi 2008.

## **PPH 442: COMPUTER AIDED DRUG DESIGN**

Hours per week: 3L

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

## **UNIT – I**

Introduction to role of drug design in drug discovery.

**Structure Activity Relationships in drug design:** Qualitative versus quantitative approaches, advantages and disadvantages; Random screening, nonrandom

screening, drug metabolism studies, clinical observations, rational approaches to lead discovery; Homologation, chain branching, ring chain transformations, bioisosterism.

## **UNIT – II**

**Computational Chemistry:** Basic concept of computational chemistry like Quantum Mechanics (ab initio method, Density Function Theory and Semi-empirical methods), Molecular Mechanics, Force Fields, Energy Minimization, Conformational Search, Molecular Dynamics, Monte Carlo Simulations.

## **UNIT – III**

**Computer-Aided Drug Design:** Ligand based Drug Design or Analog-based approach:

2D-QSAR, 3D-QSAR.

**QSAR:** Electronic effects; Hammett equation, Lipophilicity effects; Hansch equation, Steric Effects; Taft Equation; Experimental and theoretical approaches for the determination of physico-chemical parameters, parameter inter-dependence; Regression analysis, 3D-QSAR-examples CoMFA and CoMSIA.

**Pharmacophore modeling**

## **UNIT – IV**

**Structure-based drug design or Receptor-based approach:** Target identification, Target selection.

**Molecular Docking:-** Rigid docking, flexible docking, manual docking, Fragment based drug design, Homology modelling/Protein modelling.

**Virtual Screening Techniques and Applications**

## **UNIT – V**

**Drug metabolism based drug design:** Aims of prodrug design, Types of prodrugs, fundamental groups involved in prodrug designing, Bioprecursor products.

### **Books Recommended:**

1. Wolff ME, (Ed) "The Basis of Medicinal Chemistry, Burger's Medicinal Chemistry" John Wiley & Sons, New York.
2. Foye WO "Principles of Medicinal chemistry", Lea & Febiger.
3. Comprehensive Medicinal Chemistry by Hansch & Leo, Vol. 4.
4. Smith HJ, Williams H, (Eds), "Introduction to the principles of Drug Design" Wright Boston.
5. Silverman R.B. "The organic Chemistry of Drug Design and Drug Action" Academic Press New York.
6. Robert GCK (ed.), "Drug Action at the Molecular Level" University Park Press, Baltimore.
7. Martin YC. "Quantitative Drug Design" Dekker, New York.
8. Lien EJ. SAR "Side effects and Drug Design" Dekker, New York.
9. William H, Malick JB "Drug Discovery and Development" Humana Press Clifton.
10. Delgado JN, Remers WA eds "Wilson & Gisvolds's Text Book of Organic Medicinal & Pharmaceutical Chemistry" Lippincott, New York.

11. Koro Ikovas A, Burckhalter JH. "Essentials of Medicinal Chemistry" Wiley Interscience.
12. Ariens EJ. "Drug Design" Academic Press, New York.
13. Olson EC "Computer Assisted Drug Design" American Chemical Society ACS Symposium Series 112.
14. Roberts SM, Price B.J.Eds. "Medicinal Chemistry. The Role of Organic Chemistry in Drug Research, Academic Press New York.
15. Roth HJ, Kleemann A. Pharmaceutical Chemistry. Vol-I., Drug synthesis. New York: Ellis Horwood Limited; 1988.

### **PPH 444: PHARMACOTHERAPEUTICS**

Hours per week: 3L

End Examination: 60 Marks

Credit: 3

Midsem: 40 Marks

#### **UNIT – I**

**Cardiovascular system:** Hypertension, Congestive cardiac failure, Angina Pectoris, Myocardial infarction, Hyperlipidaemias, Electrophysiology of heart and Arrhythmias

#### **UNIT – II**

**Musculoskeletal disorders** Rheumatoid arthritis, Osteoarthritis, Gout, Spondylitis, Systemic lupus erythematosus.

**Renal system** Acute Renal Failure, Chronic Renal Failure, Renal Dialysis, Drug induced renal disorders

#### **UNIT – III**

**Nervous system:** Epilepsy, Parkinsonism, Stroke, Alzheimer's disease. Pain management including Pain pathways, neuralgias, headaches.

#### **UNIT – IV**

**Psychiatry disorders:** Schizophrenia, Affective disorders, Anxiety disorders, Sleep disorders, Obsessive Compulsive disorders

#### **UNIT – V**

**Drug interactions:** Drug-drug interaction and food drug interaction

#### **Books Recommended:**

1. Roger and Walker: "Clinical Pharmacy and Therapeutics", Churchill Livingstone Publication.
2. Joseph T. Dipiro et al: "Pharmacotherapy – A Pathophysiologic Approach", Appleton & Lange.
3. S. L. Robins: "Pathologic Basis of Disease" W. B. Saunders Publication.
4. Green and Harris: "Pathology and Therapeutics for Pharmacists – A Basis for Clinical Pharmacy Practice", Chapman and Hall Publication.
5. Eric T. Herfindal: "Clinical Pharmacy and Therapeutics", Williams and Wilkins Publication.
6. Lloyd Young and Koda: "Applied Therapeutics – The Clinical Use of Drugs", - Kimble MA
7. Avery's Drug Treatment, 4th Edn, 1997, Adis International Limited.

## PPH 422: PHARMACEUTICAL ANALYSIS - II

Hours per week: 3

End Examination: 60 Marks

Credit: 2

Midsem: 40 Marks

1. Experiments based on potentiometry and conductometry
2. Calibration of colorimeter, UV-Visible spectrophotometer.
3. Determination of absorption maxima for a given solution of the drug (KMnO<sub>4</sub>)
4. Quantitative determination of official drugs and pharmaceuticals by UV-Visible spectrophotometry in tablets, capsules, injections, suspensions, etc.
5. Estimation of riboflavin using fluorimeter
6. Estimation of quinine sulphate using fluorimeter.
7. Study of the quenching effect of halides on quinine fluorescence.
8. Nephelometric determination of sulphates.
9. Determination of sodium/potassium by flame photometry
10. Determination of dextrose by polarimetry
11. Infra-red spectral graphs / peak identification of samples with different functional groups (-COOH, -COOR, -CONHR, -NH<sub>2</sub>, -NHR, -OH, -CHO, -C=O,)
12. Identification of simple compounds (containing 6-10 carbons) based on the IR & <sup>1</sup>H-NMR spectra (to be taken from literature).
13. Experiments based on paper chromatography, TLC and Column chromatography
14. Quantitative analysis of drugs by HPLC

## PPH 424: NOVEL DRUG DELIVERY SYSTEMS

Hours per week: 3

End Examination: 60 Marks

Credit: 2

Midsem: 40 Marks

1. Preparation & Evaluation of Microspheres (2 Expt.)
2. Preparation & Evaluation of Matrix Tablets (2 Expt.)
3. Formulation & Evaluation of Film Coated Tablets (2 Expt.)
4. Formulation & Evaluation of Enteric Coated Tablets (2 Expt.)
5. Evaluation of Marketed SR Formulation (2 Expt.)
6. Formulation & Evaluation of Mucoadhesive Drug Delivery System (2 Expt.)

## **PPH 492: PROJECT WORK**

Credit: 6

End Semester Assessment: 50 Marks

Continuous Assessment: 50 Marks

Project dissertation (Preface, Objectives General Introduction, Drug profile, Review of Literature, Plan of work, Methodology/ Experimental work and Investigations, Interpretation and analysis of data, Results and Discussion, Summary & Conclusion)

## **PPH 494: INDUSTRIAL TRAINING / VISITS**

Credit: 2

Continuous Assessment: 100 Marks

A student has to undergo summer training in an industry/ Research institution/ Hospital/ Drug store/ Central institute/ Clinical Trial Unit or any other unit as may be approved by the Institution for a period of six weeks after the VI Semester during summer holidays and submit a report.