



SYLLABUS

B. PHARMACY

Himachal Pradesh Technical University,
Hamirpur

HIMACHAL PRADESH TECHNICAL UNIVERSITY, HAMIRPUR

COURSE: B. PHARMACY

SCHEME OF TEACHING AND EVALUATION

SEMESTER I

| S. No. | Subject Name | Subject Code (Theory) | Subject Code (Practical) | Theory (Hrs) | Practical/Tutorial (Hrs) | Marks | | | |
|--------------------|--|-----------------------|--------------------------|----------------------|--------------------------|-----------------------|------------|----------------|------------------|
| | | | | | | Theory | | Practical | |
| | | | | | | Internal | University | Internal | University |
| 1 | Pharmaceutical Inorganic Chemistry | BP-111 | BP-111P | 3 | 3 | 30 | 70 | 50 | 50 |
| 2 | Pharmaceutical Organic Chemistry – I | BP-112 | BP-112P | 3 | 3 | 30 | 70 | 50 | 50 |
| 3 | Anatomy, Physiology and Health Education – I | BP-113 | BP-113P | 3 | 3 | 30 | 70 | 50 | 50 |
| 4 | Introductory Pharmaceutics | BP-114 | BP-114P | 3 | 3 | 30 | 70 | 50 | 50 |
| 5 | Pharmacognosy – I | BP-115 | BP-115P | 3 | 3 | 30 | 70 | 50 | 50 |
| 6 | Remedial Mathematics* | BP-116 | --- | 3 | --- | 30 | 70 | --- | --- |
| 7 | Remedial Biology* | BP-117 | BP-117P | 3 | 3 | 30 | 70 | 50 | 50 |
| Total | | | | 18 | 15 | 180 | 420 | 250/300 | 250 / 300 |
| Grand Total | | | | 33 Hrs / Week | | 1100* / 1200** | | | |

* Students from Medical stream will study Remedial Mathematics and those from non-Medical stream will study Remedial Biology
 ** Students studying Remedial Mathematics will have 1100 total marks / Students studying Remedial Biology will have 1200 total marks

SEMESTER II

| S. No. | Subject Name | Subject Code (Theory) | Subject Code (Practical) | Theory (Hrs) | Practical (Hrs) | Marks | | | |
|--------------------|---|-----------------------|--------------------------|----------------------|-----------------|-------------|------------|------------|------------|
| | | | | | | Theory | | Practical | |
| | | | | | | Internal | University | Internal | University |
| 1 | Pharmaceutical Organic Chemistry – II | BP-121 | BP-121P | 3 | 3 | 30 | 70 | 50 | 50 |
| 2 | Anatomy, Physiology and Health Education – II | BP-122 | BP-122P | 3 | 3 | 30 | 70 | 50 | 50 |
| 3 | Unit Operations – I | BP-123 | BP-123P | 3 | 3 | 30 | 70 | 50 | 50 |
| 4 | Hospital Pharmacy | BP-124 | --- | 3 | --- | 30 | 70 | --- | --- |
| 5 | Pharmacognosy – II | BP-125 | BP-125P | 3 | 3 | 30 | 70 | 50 | 50 |
| 6 | Environmental Study and Disaster Management | BP-126 | --- | 3 | --- | 30 | 70 | --- | --- |
| Total | | | | 18 | 12 | 180 | 420 | 200 | 200 |
| Grand Total | | | | 30 Hrs / Week | | 1000 | | | |

SEMESTER III

| S. No. | Subject Name | Subject Code (Theory) | Subject Code (Practical) | Theory (Hrs) | Practical (Hrs) | Marks | | | |
|--------------------|-----------------------------------|-----------------------|--------------------------|----------------------|-----------------|-------------|------------|------------|------------|
| | | | | | | Theory | | Practical | |
| | | | | | | Internal | University | Internal | University |
| 1 | Pharmaceutical Analysis – I | BP-231 | BP-231P | 3 | 3 | 30 | 70 | 50 | 50 |
| 2 | Unit Operations – II | BP-232 | BP-232P | 3 | 3 | 30 | 70 | 50 | 50 |
| 3 | Physical Pharmacy – I | BP-233 | BP-233P | 3 | 3 | 30 | 70 | 50 | 50 |
| 4 | Pharmacognosy – III | BP-234 | BP-234P | 3 | 3 | 30 | 70 | 50 | 50 |
| 5 | Pharmaceutical Statistics | BP-235 | --- | 3 | --- | 30 | 70 | --- | --- |
| 6 | Computer Science and Applications | BP-236 | BP-236P | 3 | 3 | 30 | 70 | 50 | 50 |
| Total | | | | 18 | 15 | 180 | 420 | 250 | 250 |
| Grand Total | | | | 33 Hrs / Week | | 1100 | | | |

SEMESTER IV

| S. No. | Subject Name | Subject Code (Theory) | Subject Code (Practical) | Theory (Hrs) | Practical (Hrs) | Marks | | | |
|--------------------|--------------------------------------|-----------------------|--------------------------|----------------------|-----------------|-------------|------------|------------|------------|
| | | | | | | Theory | | Practical | |
| | | | | | | Internal | University | Internal | University |
| 1 | Pharmaceutical Analysis – II | BP-241 | BP-241P | 3 | 3 | 30 | 70 | 50 | 50 |
| 2 | Pharmaceutical Microbiology | BP-242 | BP-242P | 3 | 3 | 30 | 70 | 50 | 50 |
| 3 | Physical Pharmacy – II | BP-243 | BP-243P | 3 | 3 | 30 | 70 | 50 | 50 |
| 4 | Pharmacognosy – IV | BP-244 | BP-244P | 3 | 3 | 30 | 70 | 50 | 50 |
| 5 | Pathophysiology | BP-245 | --- | 3 | --- | 30 | 70 | --- | --- |
| 6 | Human Values and Professional Ethics | BP-246 | BP-246P | 3 | 3 | 30 | 70 | 50 | 50 |
| Total | | | | 18 | 15 | 180 | 420 | 250 | 250 |
| Grand Total | | | | 33 Hrs / Week | | 1100 | | | |

SEMESTER V

| S. No. | Subject Name | Subject Code (Theory) | Subject Code (Practical) | Theory (Hrs) | Practical (Hrs) | Marks | | | |
|--------------------|--------------------------------------|-----------------------|--------------------------|----------------------|-----------------|-------------|------------|------------|------------|
| | | | | | | Theory | | Practical | |
| | | | | | | Internal | University | Internal | University |
| 1 | Biochemistry | BP-351 | BP-351P | 3 | 3 | 30 | 70 | 50 | 50 |
| 2 | Medicinal Chemistry – I | BP-352 | BP-352P | 3 | 3 | 30 | 70 | 50 | 50 |
| 3 | Pharmacology – I | BP-353 | BP-353P* | 3 | 3 | 30 | 70 | 50 | 50 |
| 4 | Pharmaceutical Biotechnology | BP-354 | --- | 3 | --- | 30 | 70 | --- | --- |
| 5 | Pharmaceutical Industrial Management | BP-355 | --- | 3 | --- | 30 | 70 | --- | --- |
| 6 | Herbal Drug Technology | BP-356 | BP-356P | 3 | 3 | 30 | 70 | 50 | 50 |
| Total | | | | 18 | 12 | 180 | 420 | 200 | 200 |
| Grand Total | | | | 30 Hrs / Week | | 1000 | | | |

* **BP-353P:** Software based experiments should be used instead of actual animal experiments wherever possible

SEMESTER VI

| S. No. | Subject Name | Subject Code (Theory) | Subject Code (Practical) | Theory (Hrs) | Practical (Hrs) | Marks | | | |
|--------------------|---|-----------------------|--------------------------|----------------------|-----------------|------------|------------|------------|------------|
| | | | | | | Theory | | Practical | |
| | | | | | | Internal | University | Internal | University |
| 1 | Medicinal Chemistry – II | BP-361 | BP-361P | 3 | 3 | 30 | 70 | 50 | 50 |
| 2 | Chemistry of Natural Products | BP-362 | BP-362P | 3 | --- | 30 | 70 | --- | --- |
| 3 | Pharmacology – II | BP-363 | BP-363P* | 3 | 3 | 30 | 70 | 50 | 50 |
| 4 | Pharmaceutical Technology – I | BP-364 | BP-364P | 3 | 3 | 30 | 70 | 50 | 50 |
| 5 | Clinical Pharmacy | BP-365 | --- | 3 | --- | 30 | 70 | --- | --- |
| 6 | Pharmaceutical Jurisprudence and Intellectual Property Rights | BP-366 | BP-366P | 3 | --- | 30 | 70 | --- | --- |
| Total | | | | 18 | 09 | 180 | 420 | 150 | 150 |
| Grand Total | | | | 27 Hrs / Week | | 900 | | | |
| 7 | Industrial Training** | BP-367 | 1 Month (Total duration) | | | | | | |

* **BP-363P:** Software based experiments should be used instead of actual animal experiments wherever possible

****Industrial Training:** The total duration of industrial training is 1 Month. To be attended at the end of 6th and / or 7th Semesters, either in one stretch or two stretches, during end-semester vacations; At the end of 8th Semester, the students have to submit a report and make a presentation, which will be evaluated by the external examiner.

SEMESTER VII

| S. No. | Subject Name | Subject Code (Theory) | Subject Code (Practical) | Theory (Hrs) | Practical (Hrs) | Marks | | | |
|--------------------|---------------------------------------|-----------------------|--------------------------|--------------------------|-----------------|-------------|------------|------------|------------|
| | | | | | | Theory | | Practical | |
| | | | | | | Internal | University | Internal | University |
| 1 | Medicinal Chemistry – III | BP-471 | BP-471P | 3 | 3 | 30 | 70 | 50 | 50 |
| 2 | Pharmacology – III | BP-472 | BP-472P* | 3 | 3 | 30 | 70 | 50 | 50 |
| 3 | Pharmaceutical Technology – II | BP-473 | BP-473P | 3 | 3 | 30 | 70 | 50 | 50 |
| 4 | Biopharmaceutics and Pharmacokinetics | BP-474 | BP-474P | 3 | 3 | 30 | 70 | 50 | 50 |
| 5 | Communication Skills | BP-475 | BP-475P | 3 | 3 | 30 | 70 | 50 | 50 |
| 6 | Project** | BP-476 | | --- | 3 | --- | --- | 50 | 50 |
| Total | | | | 15 | 18 | 150 | 350 | 300 | 300 |
| Grand Total | | | | 33 Hrs / Week | | 1100 | | | |
| 7 | Industrial Training*** | BP-367 | | 1 Month (Total duration) | | | | | |

* **BP-472P:** Software based experiments should be used instead of actual animal experiments wherever possible

** **Project:** It can be a small project carried out for two semesters and evaluated at the end of VIII Semester. The project is to be carried out in the following areas:

1. Pharmaceutics and Drug Delivery Systems
2. Pharmaceutical Chemistry
3. Phytochemistry and Pharmacognosy
4. Pharmacology
5. Pharmaceutical Analysis
6. Community Pharmacy (Hospital / Drug Store)

The project report should not be less than 20 pages and should not exceed 50 pages excluding tables, figures and references. The project evaluation is based on the project report, presentation made by the student and viva voce.

*****Industrial Training:** The total duration of industrial training is 1 Month. To be attended at the end of 6th and / or 7th Semesters, either in one stretch or two stretches, during end-semester vacations; At the end of 8th Semester, the students have to submit a report and make a presentation, which will be evaluated by the external examiner.

SEMESTER VIII

| S. No. | Subject Name | Subject Code (Theory) | Subject Code (Practical) | Theory (Hrs) | Practical (Hrs) | Marks | | | |
|--------|---|-----------------------|--------------------------|----------------------|-----------------|-------------|------------|------------|------------|
| | | | | | | Theory | | Practical | |
| | | | | | | Internal | University | Internal | University |
| 1 | Instrumental Methods of Analysis | BP-481 | BP-481P | 3 | 3 | 30 | 70 | 50 | 50 |
| 2 | Novel Drug Delivery Systems | BP-482 | BP-482P | 3 | 3 | 30 | 70 | 50 | 50 |
| 3 | Quality Control and Quality Assurance | BP-483 | BP-483P | 3 | 3 | 30 | 70 | 50 | 50 |
| 4 | Industrial Pharmacognosy | BP-484 | BP-484P | 3 | 3 | 30 | 70 | 50 | 50 |
| 5 | Industrial training Evaluation* | BP-367 | | --- | --- | --- | --- | 50 | 50 |
| 6 | Project (Continuation from previous Semester)** | BP-476 | | --- | 3 | --- | --- | 50 | 50 |
| | Total | | | 12 | 15 | 120 | 350 | 300 | 300 |
| | Grand Total | | | 27 Hrs / Week | | 1000 | | | |

* Industrial training evaluation will be based on the report submitted and presentations made by the students
 ** The project evaluation is based on the project report, presentation made by the student and viva voce.

INSTRUCTIONS TO QUESTION PAPER SETTERS

The question paper will consist of THREE sections A, B and C.

- Section A** will contain THREE **Essay Type Questions** of 10 marks each, out of which the student has to answer ANY TWO.
- Section B** will contain TEN **Short Answer Type Questions** carrying 5 marks each, out of which the student has to answer ANY EIGHT.
- Section C** will contain FIVE **Short Note Type Questions** carrying 2 marks each. In this section, all the questions are COMPULSORY.

The questions should be normally selected from all the chapters of the subject. The **weightage** is based on the **teaching hours** specified against each chapter.

HIMACHAL PRADESH TECHNICAL UNIVERSITY, HAMIRPUR

COURSE: B. PHARMACY

DETAILED SYLLABUS

SEMESTER-I

PHARMACEUTICAL INORGANIC CHEMISTRY (BP-111)

| | | | |
|--------------------------|---|---------------------------|----------------|
| Course Code | BP-111 | Weekly Workload: L-3, P-0 | |
| Name of the Course | PHARMACEUTICAL INORGANIC CHEMISTRY | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs/ Week)

- Limit Tests:** Limit tests for iron, arsenic, lead, heavy metals chloride, sulphate. (3 Hrs)
- Gastrointestinal Agents:** An outline of methods of preparation, uses, sources of impurities, tests for purity and identity of Acidifying agents, Antacids, Protectives and Adsorbents, Cathartics.(4 Hrs)
- Intra- and Extra-cellular Electrolytes:** An outline of methods of preparation, uses, sources of impurities, tests for purity and identity of Physiological ions, Electrolytes used for replacement therapy.(5 Hrs)
- Essential and Trace Elements:** An outline of methods of preparation, uses, sources of impurities, tests for purity and identity of Transition elements and their compounds of pharmaceutical importance, Iron and haematinics, Mineral supplements.(5 Hrs)
- Topical Agents:** An outline of methods of preparation, uses, sources of impurities, tests for purity and identity of Protectives, Astringents and Anti-infectives.(3 Hrs)
- Gases and Vapours:** An outline of methods of preparation, uses, sources of impurities, tests for purity and identity of Oxygen, Anesthetics and Respiratory stimulants.(4 Hrs)

7. **Dental Products:** An outline of methods of preparation, uses, sources of impurities, tests for purity and identity of Dentifrices, Anti-caries agents.(3 Hrs)
8. **Complexing and Chelating Agents:** Preparations, properties and assay of EDTA.(2 Hrs)
9. **Miscellaneous Agents:** An outline of methods of preparation, uses, sources of impurities, tests for purity and identity of Sclerosing agents, expectorants, emetics, poisons and antidotes, sedatives etc. (5 Hrs)
10. **Pharmaceutical Aids:** An outline of methods of preparation, uses, sources of impurities, tests for purity and identity of Anti-oxidants, preservatives, filter aids, adsorbents, diluents, excipients, suspending agents, colorants etc.(6 Hrs)

Books Recommended

Note: Recent editions of the following books to be referred

1. Block JH, Roche E, Soine TO, Wilson CO. Inorganic Medicinal and Pharmaceutical Chemistry. Philadelphia: Lea and Febiger.
2. Vogel. Vogel's Textbook of Micro and Semmicro Qualitative Inorganic Analysis. Hyderabad: Orient Longman.
3. Atherden LM. Bentley and Driver's Textbook of Pharmaceutical Chemistry. New Delhi: Oxford University Press.

PHARMACEUTICAL INORGANIC CHEMISTRY PRACTICAL (BP-111P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-111P | Weekly Workload: L-0, P-3 | |
| Name of Course | PHARMACEUTICAL INORGANIC CHEMISTRY PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. The background and systematic qualitative analysis of inorganic mixtures of up to four radicals. Six Mixtures to be analyzed, preferably by semi-micro methods. **(4 Expts)**
2. All identification tests for pharmacopoeial inorganic pharmaceuticals and qualitative tests for cations and anions should be covered. **(2 Expts)**
3. Limit tests for chlorides, sulfates, iron, arsenic, lead, heavy metals. **(4 Expts)**

PHARMACEUTICAL ORGANIC CHEMISTRY – I (BP-112)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-112 | Weekly Workload: L-3, P-0 | |
| Name of the Course | PHARMACEUTICAL ORGANIC CHEMISTRY | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Structure and Properties:** Atomic structure, Atomic orbitals, Molecular orbital theory, wave equation, Molecular orbitals, Bonding and Antibonding orbitals, Covalent bond, Hybrid orbitals, Intramolecular forces, Bond dissociation energy, Polarity of bonds, Polarity of molecules, structure and physical properties, Intermolecular forces, Acids and bases. **(7 Hrs)**
- Reactive Intermediates:** Carbocations, carbanions, carbenes, nitrene and nitrenium ions. **(3 Hrs)**
- Aliphatic Compounds:** Structure, nomenclature, preparation and reactions of alkanes, alkenes, dienes and alkynes. **(4 Hrs)**
- Alicyclic Compounds:** Structure, nomenclature, preparation and reactions of cycloalkanes. **(2 Hrs)**
- Aromatic Compounds:** Structure, nomenclature, preparation and reactions of benzene, polynuclear aromatic compounds, arenes. **(6 Hrs)**
- Alkyl Halides:** Structure, nomenclature, preparation and reactions of aliphatic and aromatic alkyl halides. **(3 Hrs)**
- Alcohols:** Structure, nomenclature, preparation and reactions of aliphatic alcohols, aromatic alcohols and phenols. **(4 Hrs)**
- Ethers, Esters and Epoxides:** Structure, nomenclature, preparation and reactions of alcohols, ethers, esters and epoxides. **(2 Hrs)**
- Amines:** Structure, nomenclature, preparation and reactions of aliphatic and aromatic amines. **(3 Hrs)**
- Aldehydes and Ketones:** Structure, nomenclature, preparation and reactions of Aldehydes and ketones. **(3 Hrs)**
- Carboxylic Acids:** Structure, nomenclature, preparation and reactions of carboxylic acids. Functional derivatives of carboxylic acids. **(3 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

- Mann FC, Saunders BC. Practical Organic Chemistry. London: ELBS/ Longman.
- Morrison TR, Boyd RN. Organic Chemistry. New Delhi: Prentice Hall India.
- Roberts JD, Caserio MC. Basic Principles of Organic Chemistry. New York: WA. Benjamin Inc.
- Furniss NS, Hannaford AJ, Smith PWG, Tatehell AR. Vogel's Textbook of Practical Organic Chemistry. London: ELBS/Longman.
- Sykes PA. A Guidebook to Mechanisms in Organic Chemistry. Hyderabad: Orient Longman.

PHARMACEUTICAL ORGANIC CHEMISTRY – I PRACTICAL (BP-112P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-112P | Weekly Workload: L-0, P-3 | |
| Name of Course | PHARMACEUTICAL ORGANIC CHEMISTRY – I PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Synthesis of selected organic compounds: Aspirin, anthraquinone from anthracene, beta naphthyl benzoate from beta naphthol, benzyl alcohol and sodium / potassium benzoate from benzaldehyde. **(4 Expts)**
2. Identification of organic compounds: Identification and their derivatization of at least 6 organic compounds of different classes. **(6 Expts)**

ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION – I (BP-113)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-113 | Weekly Workload: L-3, P-0 | |
| Name of the Course | ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Introduction:** Scope of anatomy and physiology and basic terminology used, Structure of cell, its components and their functions. **(4 Hrs)**
- Elementary Tissues of the Human Body:** Epithelial, connective, muscular and nervous tissues, their sub-types and their characteristics. **(4 Hrs)**
- Osseous System:** Structure, composition and functions of skeleton Classification of joints, types of movements of joints, Disorders of joints. **(4 Hrs)**
- Skeletal Muscles:** Gross anatomy; physiology of muscle contraction, physiological properties of skeletal muscles and their disorders. **(4 Hrs)**
- Haemopoietic System:** Composition and functions of blood and its elements, their disorders, blood groups and their significance, mechanism of coagulation, disorders of platelets and coagulation. **(7 Hrs)**
- Lymph and Lymphatic System:** Composition, formulation and circulation of lymph; disorders of lymph and lymphatic system. Basic physiology and functions of spleen. **(5 Hrs)**
- Cardiovascular System:** Basic anatomy of the heart, Physiology of heart, blood vessels and circulation. Basic understanding of Cardiac cycle, heart sounds and understanding of Cardiac cycle, heart sounds and electrocardiogram. Blood pressure and its regulation. Brief outline of cardiovascular disorder like hypertension, hypotension, arteriosclerosis, angina, myocardial infarction, congestive heart failure and cardiac arrhythmias. **(16 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

- Tortora GJ, Derrickson B. Principles of Anatomy and Physiology. New York: John Wiley & Sons.
- Ross and Wilson. Anatomy and Physiology in Health and Illness. Sydney: Churchill Livingstone.
- Guyton AC, Hall JE. Textbook of Medical Physiology. New York: WB Sanders Co.
- Difore SH. Atlas of Normal Histology. Philadelphia: Lea and Febiger.
- Chatterjee CC. Human Physiology, Calcutta: Medical Allied Agency.
- Ghai CL. Textbook of Practical Physiology. New Delhi: Jay Pee Brothers.
- Vander AJ, Sherman JH, Lucians DS. Human Physiology. New Delhi: Tata McGraw Hill.

ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION – I PRACTICAL (BP-113P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-113P | Weekly Workload: L-0, P-3 | |
| Name of Course | ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION – I PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Study of human skeleton. **(1 Expt)**
2. Study of different systems with the help of charts and models. **(1 Expt)**
3. Microscopic study of different tissues. **(2 Expts)**
4. Estimation of haemoglobin in blood. **(1 Expt)**
5. Determination of bleeding time, clotting time. **(1 Expt)**
6. RBC Count, Total leucocyte count, Differential leucocyte count. **(2 Expts)**
7. Erythrocyte sedimentation rate. **(1 Expt)**.
8. Recording of body temperature, pulse rate and blood pressure, basic understanding of Electrocardiogram-PQRST waves and their significance.**(1 Expt)**

INTRODUCTORY PHARMACEUTICS (BP-114)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-114 | Weekly Workload: L-3, P-0 | |
| Name of the Course | INTRODUCTORY PHARMACEUTICS | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- History of Pharmacy:** History of pharmacy profession in India and the world, Pharmacy as a career, Pharmaceutical education in India and abroad, Pharmacopoeia of India and other Pharmacopoeias, Other official books. **(2 Hrs)**
- Dosage Forms:** Introduction to different dosage forms, their classification with examples (official formulations) their applications. **(5 Hrs)**
- Extemporaneous Preparations:** Definitions, general formulation, manufacturing procedures and official products of solutions, aromatic waters, syrups, spirits, elixirs, lotions, liniments, Infusion, decoction, tincture and extracts, methods of preparation of dry, soft and liquid extracts of IP., gargles, mouth washes, douches, draught. **(10 Hrs)**
- Prescription:** Definition, various parts of prescription, Handling of prescription, sources of errors in prescription, General dispensing procedures including labelling of dispensing products. **(2 Hrs)**
- Dispensing:** Typical prescriptions like mixtures, solutions, emulsions, creams, ointments, powders, capsules, pastes, jellies, suppositories, ophthalmic, pastilles, lozenges, pills, lotions, liniments, inhalations, paints, sprays, tablet triturates etc. **(8 Hrs)**
- Pharmaceutical Calculations:** Posology, calculation of doses for infants, adults and elderly patients; Enlarging and reducing recipes percentage solutions, alligation, alcohol dilution, proof spirit, isotonic solutions and displacement value. **(5 Hrs)**
- Incompatibilities:** Physical, therapeutic and chemical incompatibilities, inorganic incompatibilities including incompatibilities of metals and their salts, non-metals, acids, alkalis, organic incompatibilities. Purine bases, alkaloids, pyrazolone derivatives, aminoacids, quaternary ammonium compounds, carbohydrates, glycosides, anaesthetics, dyes, surface active agents, correction of incompatibilities. Therapeutic incompatibilities. **(4 Hrs)**
- Community Pharmacy:** Organization and structure of retail and wholesale drug store types of drug store and design, legal requirements for establishment, maintenance and drug store, dispensing of proprietary products, maintenance of records of retail and wholesale, patient counselling, role of pharmacist in community healthcare and education. **(4 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

- Carter SJ. Cooper and Gunn's Tutorial Pharmacy. New Delhi: CBS Publishers.
- Carter SJ. Cooper and Gunn's Dispensing Pharmacy. New Delhi: CBS Publishers.
- Indian Pharmacopoeia 1962. New Delhi: Indian Pharmacopoeia Commission.
- Gaud RS, Gupta GD. Practical Pharmaceutics. New Delhi: CBS Publishers.

INTRODUCTORY PHARMACEUTICS PRACTICAL (BP-114P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-114P | Weekly Workload: L-0, P-3 | |
| Name of Course | INTRODUCTORY PHARMACEUTICS PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Dispensing of prescription falling under the categories: Mixtures, solutions, emulsions, suspensions, creams, ointments, powders, suppositories, ophthalmic, paste, jellies, lozenges, lotions, liniments, tinctures. **(4 Expts)**
2. Identification of various types of incompatibilities in prescription, correction thereof and dispensing of such prescriptions. **(3 Expts)**
3. Dispensing for paediatric and geriatric patients. **(1 Expt)**
4. Dispensing of prescriptions involving adjustment of tonicity. **(2 Expts)**

PHARMACOGNOSY – I (BP-115)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-115 | Weekly Workload: L-3, P-0 | |
| Name of the Course | PHARMACOGNOSY – I | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40Hrs: 3 Hrs / Week)

- 1. Introduction:** Definition, history, scope and development of Pharmacognosy. **(2 Hrs)**
- 2. Microscopy:** Various tools used in microscopy (microscopes, micrometers, camera lucida, microphotography), general use of different reagents used in microscopy. Details of mountants, clearing agents, chemo-microscopic reagents. **(5 Hrs)**
- 3. Sources of Drugs:** Biological, marine, mineral and plant tissue culture as source of drugs. **(5 Hrs)**
- 4. Classification of Drugs:** Alphabetical, morphological, taxonomical, chemical and pharmacological classification of crude drugs. **(3 Hrs)**
- 5. Cultivation, Collection, Processing and Storage of Crude Drugs:** Factors influencing cultivation of medicinal plants. Pest management and natural pest control agents. Plant hormones and their applications. Polyploidy, mutation, hybridization and plant breeding with reference to medicinal plants. **(8Hrs)**
- 6. Adulteration:** Adulteration of crude drugs and their detection by organoleptic, microscopic, physical, chemical and biological methods of evaluation. **(7 Hrs)**
- 7. Plant Taxonomy:** Study of the following families of plants, with examples of medicinally or economically important plants, Apocynaceae (Vinca, Kurchi, Stropanthus), Solanaceae (Belladonna, Hyoscyamus, Withania), Rutaceae (Orange peel, Lemon peel, Bael), Umbellifereae (Coriander, Fennel, Caraway), Leguminosae (Acacia catechu, Methi, Mulethi), Rubiaceae (Cinchona, Coffee, Pale catechu), Liliaceae (Aloevera, Shatavari, Lahsun), Zingiberaceae (Curcuma, Ginger), Papaveraceae (Opium) and Labiatae (Tulsi, Peppermint). **(10 hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Trease GE, Evans WC. Pharmacognosy. UK: Baillier & Tindall.
2. Wallis TE. Analytical Microscopy. London: J and A Churchill Ltd.
3. Handa SS, Kapoor VK. Textbook of Pharmacognosy. New Delhi: Vallabh Prakashan.
4. Medicinal Plants of India. New Delhi: ICMR.
5. Indian Herbal Pharmacopoeia. Vol. I & II. New Delhi: ICMR & RRL.
6. Quality Standards of Indian Medicinal Plants. New Delhi: ICMR.

PHARMACOGNOSY – I PRACTICAL (BP-115P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-115P | Weekly Workload: L-0, P-3 | |
| Name of Course | PHARMACOGNOSY – I PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Types, care and use of microscopes.(1 Expt)
2. Morphological characteristics of plant families mentioned in theory.(3 Expts)
3. Microscopic measurements of cells and Cell contents: Starch grains, calcium oxalate crystals and phloem fibres.(3 Expts)
4. Determination of leaf constants such as stomatal index, stomatal number, vein-islet number, vein-termination number and palisade ratio.(3 Expts)

REMEDIAL MATHEMATICS (BP-116)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-116 | Weekly Workload: L-3, P-0 | |
| Name of the Course | REMEDIAL MATHEMATICS | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Equations Reducible to Quadratic Equations:** Quadratic equations, Nature of roots, Method of solving a quadratic equation and equations reducible to quadratic equations. **(5 Hrs)**
- Determinants:** Determinants, Properties of determinants, application of determinants in solving a system of simultaneous linear equations, solution of non-homogenous system by Cramer's rule. **(5 Hrs)**
- Matrices:** Matrices, Types of matrices, Addition of matrices, Subtraction and multiplication of matrices, Transpose of matrix, Adjoint of matrix, Inverse of matrix, Unit matrix, solution of systems of linear equations by matrix method. **(6 Hrs)**
- Functions, Limit and Continuity:** Type of functions, domain and range of a function, limit of a function, properties of limits, evaluation of limit of a function, continuity of a function at a point, Types of Discontinuity. **(6 Hrs)**
- Differentiation:** Definition of Derivatives, formation of Derivatives, Law of derivatives, Delta method, chain rule, repeated derivatives, derivative of implicit functions and explicit functions. **(6 Hrs)**
- Integration:** Integration, Graphical representation, Integration of algebraic Functions, logarithmic and exponential functions, integration of functions using substitution method, Integration by parts and partial fractions. **(6 Hrs)**
- Trigonometry:** Measurement of angles, trigonometric ratios, Trigonometric functions of standard angles, Trigonometric ratios of complementary angles and supplementary angles, allied angles, compound angles, multiple and sub-multiple angles; Conditional identities. **(6 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

- Schaum's Differential Equations. Singapore: Mc Graw Hill.
- Grewal BS. Higher Engineering Mathematics. New Delhi: Khanna Publishers.

REMEDIAL BIOLOGY (BP-117)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-117 | Weekly Workload: L-3, P-0 | |
| Name of the Course | REMEDIAL BIOLOGY | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40Hrs: 3 Hrs / Week)

- Introduction and Scope:** Introduction to biology, scope and significance of biology in pharmaceutical sciences. **(2 Hrs)**
- System of Classification:** Preparation and preservation of herbarium sheets, binomial nomenclature, methods of classification of plants. **(2 Hrs)**
- Plant cell:** Plant cell, its structure and non-living cell inclusions. **(6 Hrs)**
- Cell division:** Mitosis and Meiosis, Cell cycle. **(6 Hrs)**
- Plant tissues:** Different types of plant tissues and their functions. **(6 Hrs)**
- Plant Morphology:** Morphology, histology and uses of different plant parts such as root, stem, bark, wood, leaf, flower, fruit and seeds. Modification of root and stem. **(13 Hrs)**
- Parasites:** Structure and life history of parasites as illustrated by entamoeba, trypanosome, plasmodium, taenia, ascaris. **(5 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

- Sardana S, Sharma OP. Text Book of Pharmaceutical Biology. New Delhi: Birla Publications.
- Wallis TE. Analytical Microscopy. London: J and A Churchill Ltd.

REMEDIAL BIOLOGY PRACTICAL (BP-117P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-117P | Weekly Workload: L-0, P-3 | |
| Name of Course | REMEDIAL BIOLOGY PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Study of morphology of various parts of plants studied in theory. **(2 Expts)**
2. Structure of tissues, mentioned in theory with the help of specimen/charts. **(2 Expts)**
3. Preparation of microscopic slides and histological study of roots, stems and leaves of monocot and dicot plants. **(3 Expts)**
4. Preparation of herbarium sheets. **(3 Expts)**

HIMACHAL PRADESH TECHNICAL UNIVERSITY, HAMIRPUR
COURSE: B. PHARMACY
DETAILED SYLLABUS

SEMESTER-II

PHARMACEUTICAL ORGANIC CHEMISTRY – II (BP-121)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-121 | Weekly Workload: L-3, P-0 | |
| Name of the Course | PHARMACEUTICAL ORGANIC CHEMISTRY – II | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Stereochemistry:** Isomerism and nomenclature and associated physicochemical properties, optical activity, stereoisomerism, specification of configuration, Reactions involving stereoisomers, chirality, chiral reagents, conformations. **(6 Hrs)**
- Reaction Mechanisms:** Addition reactions, Elimination reactions, Substitution reactions (nucleophilic and electrophilic substitutions). **(5 Hrs)**
- Pericyclic Reactions:** Cycloaddition and Sigmatropic reactions, Electrocyclic reactions, Orbital symmetry rules. **(5 Hrs)**
- Drug Synthesis:** Catalysis by transition metal complexes, Stereoselective and stereospecific reactions, new organic reagents used in drug synthesis. **(6 Hrs)**
- Heterocyclic Compounds:** Chemistry, preparations and properties of some important heterocyclics containing 5 & 6 atoms with one or two heteroatoms like O, N, S. **(6 Hrs)**
- Lipids:** Classification, physical properties and chemical reactions of lipids. **(4 Hrs)**
- Carbohydrates:** Classification, structure, physical properties, chemical reactions. Synthesis and inter conversions of monosaccharides. **(6 Hrs)**
- Proteins:** Classification, structure and chemical reactions. **(4 Hrs)**
- Nucleic Acids:** Classification, structure and chemical reactions of nucleic acids. Nucleotides and nucleosides. **(14 Hrs)**

Books Recommended

- Mann FC, Saunders BC. Practical Organic Chemistry. London: ELBS/ Longman.
- Morrison TR, Boyd RN. Organic Chemistry. New Delhi: Prentice Hall India.
- Vogel AI. Textbook of Practical Organic Chemistry. London: ELBS/ Longman.
- Eliel EL. Stereochemistry of Organic Compounds. New York: McGraw Hill.
- Finar IL. Organic Chemistry. Vol. I & II. London: ELBS/Longman.
- Sykes PA. Guidebook to Mechanisms in Organic Chemistry. Hyderabad: Orient Longman.

PHARMACEUTICAL ORGANIC CHEMISTRY – II PRACTICAL (BP-121P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-121P | Weekly Workload: L-0, P-3 | |
| Name of Course | PHARMACEUTICAL ORGANIC CHEMISTRY – II PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Synthesis of at least five compounds involving various heterocyclic ring systems. **(5 Expts)**
2. Stereoselective synthesis of compounds. **(1 Expt)**
3. Resolution of racemic DL-alanine. **(1 Expt)**
4. Determination of physicochemical constants for oils and fats. **(1 Expt)**
5. Workshop on molecular modelling of primary, secondary and tertiary structures of proteins, molecular modelling on double helical structure of nucleic acid showing hydrogen bonding. **(2 Expts)**

ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION – II (BP-122)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-122 | Weekly Workload: L-3, P-0 | |
| Name of the Course | ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION – II | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Digestive System:** Gross anatomy of the gastro-intestinal tract, functions of its different parts including those of liver, pancreas and gall bladder, various gastrointestinal secretions and their role in the absorption and digestion of food, Disorders of digestive system. **(6 Hrs)**
- Respiratory System:** Anatomy of respiratory organs and its functions, respiration, mechanism and regulation of respiration, respiratory volumes and vital capacity. **(4 Hrs)**
- Central Nervous System:** Functions of different parts of brain and spinal cord. Neurohumoral transmission in the central nervous system, reflex action electroencephalogram, specialized functions of the brain, Cranial nerves and their functions. **(4 Hrs)**
- Autonomic Nervous System:** Physiology and functions of the autonomic nervous system. Mechanism of neurohumoral transmission in the ANS. **(3 Hrs)**
- Urinary System:** Various parts, structures and functions of the kidney and urinary tract, Physiology of urine formation and acid-base balance, Diseases of the urinary system. **(4 Hrs)**
- Reproductive System:** Male and female reproductive systems and their hormones, physiology of menstruation, coitus and fertilization, Spermatogenesis and oogenesis, Pregnancy, its maintenance and parturition. **(4 Hrs)**
- Endocrine System:** Basic anatomy and physiology of Pituitary, Thyroid, Parathyroid. Adrenals, Pancreas, Testes and ovary, their hormones and functions. **(4 Hrs)**
- Sense Organs:** Basic anatomy and physiology of the eye (vision), ear (hearing), taste buds, nose (smell) and skin (superficial receptors). **(4 Hrs)**
- Health Education: *Classification of food requirements:*** Balanced diet, nutritional deficiency disorders, their treatment and prevention, specifications for drinking water.
Family planning: Medical termination of pregnancy.
Communicable diseases: Brief outline, causative agents, modes of transmission and prevention of Chicken pox, diphtheria, tuberculosis, poliomyelitis, malaria, filariasis, rabies, tetanus, leprosy, syphilis, gonorrhoea, and AIDS.
First aid: Emergency treatment of shock, snake bites, burns, poisoning, and resuscitation methods. **(7 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Tortora GJ, Derrickson B. Principles of Anatomy and Physiology. New York: John Wiley & Sons.
2. Ross and Wilson. Anatomy and Physiology in Health and Illness. Sydney: Churchill Livingstone.
3. Guyton AC, Hall JE. Textbook of Medical Physiology. New York: WB Sanders Co.
4. Difore SH. Atlas of Normal Histology. Philadelphia: Lea and Febiger.
5. Chatterjee CC. Human Physiology, Calcutta: Medical Allied Agency.
6. Ghai CL. Textbook of Practical Physiology. New Delhi: Jay Pee Brothers.
7. Vander AJ, Sherman JH, Lucians DS. Human Physiology. New Delhi: Tata McGraw Hill.

ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION – II PRACTICAL (BP-122P)

| | | | |
|-----------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-122P | Weekly Workload: L-0, P-3 | |
| Name of Course | ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION – II PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Simple experiments involved in the analysis of normal and abnormal urine: Collection of specimen, appearance, determination of pH, Sugars, proteins, urea and creatinine. **(3 Expts)**
2. Physiological experiments on nerve-muscle preparations. **(4 Expts)**
3. Determination of vital capacity, experiments on spirometry. **(3 Expts)**

UNIT OPERATIONS – I (BP-123)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-123 | Weekly Workload: L-3, P-0 | |
| Name of the Course | UNIT OPERATIONS – I | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs /Week)

- 1. Introduction:** Introduction to unit operations, basic laws. **(3 Hrs)**
- 2. Fluid Flow:** Types of flow, Reynold's number, Viscosity, Concept of boundary layer, basic equations of fluid flow, valves, flow meters, manometers and measurement of flow and pressure. **(5 Hrs)**
- 3. Material Handling Systems:** Liquid handling - Different types of pumps; Gas handling-Variety types of fans, blowers and compressors; Solid handling-Bins, Bunkers, Conveyors, Air transport. **(6 Hrs)**
- 4. Filtration and Centrifugation:** Theory of filtration, filter aids, filter media, industrial filters including filter press, rotary filter, edge filter, etc. Factors affecting filtration, optimum cleaning cycle in batch filters. Principles of centrifugation, industrial centrifugal filters, and centrifugal sedimenters. **(5 Hrs)**
- 5. Crystallization:** Characteristics of crystals like-purity, size, shape, geometry, habit, forms, size, and factors affecting these properties, solubility curves and calculation of yields. Material and heat balances around Swenson Walker crystallizer. Supersaturation theory and its limitations, Nucleation mechanisms, crystal growth. Study of various types of crystallizer, tanks, agitated batch, Swenson Walker, Single vacuum, and crystal crystallizer, Caking of crystals and its prevention. **(6 Hrs)**
- 6. Dehumidification and Humidity Control:** Basic concepts and definition, wet bulb and adiabatic saturation temperatures, Psychrometric chart and measurement of humidity, application of humidity measurement in pharmacy, equipment for dehumidification operations. **(6 Hrs)**
- 7. Refrigeration and Air Conditioning:** Principle and applications of refrigeration and air conditioning. **(2 Hrs)**
- 8. Material of Construction:** General study of composition, corrosion, resistance, Properties and applications of the materials of construction with special reference to stainless steel and glass. **(4 Hrs)**
- 9. Industrial Hazards and Safety Precautions:** Mechanical, Chemical, Electrical, fire and dust hazards. Industrial dermatitis, Accident records etc. **(3 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Badger WL, Banchero JT. Introduction to Chemical Engineering. London: McGraw Hill.
2. McCabe WL, Smith JC, Harriott P. Unit Operations of Chemical Engineering. London: McGraw Hill.
3. Subrahmanyam CVS. Pharmaceutical Engineering. New Delhi: Vallabh Prakashan.
4. Carter SJ. Cooper and Gunn's Tutorial Pharmacy. New Delhi: CBS Publishers.
5. Brown CG. Unit Operations (Indian Ed.). New Delhi: CBS Publishers.
6. Bhatt ND, Panchal VM. Machine Drawing. Anand: Charocar Publishing House.

UNIT OPERATIONS – I PRACTICAL (BP-123P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-123P | Weekly Workload: L-0, P-3 | |
| Name of Course | UNIT OPERATIONS – I PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Measurement of flow of fluids and their pressure, determination Reynold's number. **(2 Expts)**
2. Evaluation of filter media, determination of rate of filtration. **(1 Expt)**
3. Experiment to demonstrate application of centrifugation. **(1 Expt)**
4. Thermometers and Psychrometric charts. **(1 Expt)**
5. Determination of humidity - use of Dry Bulb and Wet Bulb. **(1 Expt)**
6. Elementary Knowledge of Engineering Drawing - Concept of orthographic and isometric views of elevation and third angle projection. Notation and abbreviation used in engineering drawing. **(2 Expts)**
7. Basic Engineering Drawing Practice - Bolts, nuts, rivetted fronts, screws, worn screws as per specification. **(1 Expt)**
8. Drawing of simple pharmaceutical machinery parts. **(1 Expt)**

HOSPITAL PHARMACY (BP-124)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-124 | Weekly Workload: L-3, P-0 | |
| Name of the Course | HOSPITAL PHARMACY | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs /Week)

- Organization and Structure:** Organization of a hospital and hospital pharmacy, Responsibilities of pharmacist, Pharmacy and therapeutic committee, Budget preparation and Implementation. **(5 Hrs)**
- Hospital Formulary:** Contents, preparation and revision of hospital formulary. **(2 Hrs)**
- Drug Store Management and Inventory Control:** Organization of drug store, Types of materials stocked, storage conditions, Purchase and Inventory Control principles, purchase procedures, Purchase order, procurement and stocking. **(6 Hrs)**
- Drug distribution Systems in Hospitals:** Out-patient dispensing - methods adopted, Dispensing of drugs to in-patients, Types of drug distribution systems, Charging policy, labelling, Dispensing of drugs to ambulatory patients, Dispensing of controlled drugs. **(6 Hrs)**
- Central Sterile Supply Unit and Its Management:** Types of materials for sterilization, packing of materials prior to sterilization, sterilization equipments, Supply of sterile materials. **(4 Hrs)**
- Manufacture of Sterile and Nonsterile Products:** Policy making of manufacturable items, demand and costing, personnel requirements, manufacturing practice, master formula card, production control, manufacturing records. **(5 Hrs)**
- Drug Information Services:** Sources of Information on drugs, disease, treatment schedules, procurement of information, Computerized services (e.g., MEDLINE), Retrieval of information, Medication error. **(5 Hrs)**
- Records and Reports:** Prescription filling, drug profile, patient medication profile, cases on drug interaction and adverse reactions, idiosyncratic cases etc. **(3 Hrs)**
- Nuclear Pharmacy:** Introduction to Radio- pharmaceuticals, radio-active half-life, Units of radio-activity Production of radio-pharmaceuticals, methods of isotopic tagging, preparation of radio-isotopes in laboratory using radiation dosimetry, radio-isotope generators, Permissible radiation dose level, Radiation hazards and their prevention, specifications for radio-active laboratory. **(4 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

- Hassan WE. Hospital Pharmacy. Philadelphia: Lea & Febiger.
- Remington's: The Science and Practice of Pharmacy. Easton (PA): Mack Publishing Co.
- Turco S, King RE. Sterile Dosage Forms. Philadelphia: Lea & Febiger.
- Allwodd MC, Fell JT. Textbook of Hospital Pharmacy. Oxford: Blackwell.
- Chittion HM, Witcofski RL. Nuclear Pharmacy. Philadelphia: Lea & Febiger.

PHARMACOGNOSY – II (BP-125)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-125 | Weekly Workload: L-3, P-0 | |
| Name of the Course | PHARMACOGNOSY – II | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Phytoconstituents of Medicinal Importance:** Introduction, classification, isolation, chemical tests, of alkaloids, terpenoids, glycosides, volatile oils, tannins and resins. **(8 Hrs)**
- Carbohydrates and Derived Products:** Agar, xanthangum, Guar gum, Acacia, Honey, Isabgol, pectin, starch, sterculia, Tragacanth. **(7 hrs)**
- Lipids:** Bees wax, castor oil, cocoa butter, cod-liver oil, hydnocarpus oil, kokum butter, lard, linseed oil, rice-bran oil and wool fat. **(7Hrs)**
- Tannins:** Pale catechu, Black catechu, Harde, bahera, Ashoka, Arjuna, Gall. **(6 Hrs)**
- Fibres:** Study of fibres used in pharmacy such as cotton, silk, wool, nylon, glass wool, polyester and asbestos. **(5 Hrs)**
- Pharmaceutical Aids:** Study of pharmaceutical aids like talc, diatomite, kaolin, bentonite, gelatin and natural colours. **(4 Hrs)**
- Pharmacopoeial Studies:** IP, BHP, API, IHP, USP and Chinese Pharmacopoeia. **(3 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

- Harborne JB. Phytochemical Methods. London: Chapman & Hall.
- Trease GE, Evans WC. Pharmacognosy. UK: Baillier & Tindall.
- Wallis TE. Textbook of Pharmacognosy. London: J & A Churchill Ltd.
- Kokate CK. Practical Pharmacognosy. New Delhi: Vallabh Prakashan.
- Iyengar MA. Pharmacognosy of Powdered Crude Drugs. Manipal.

PHARMACOGNOSY – II PRACTICAL (BP-125P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-125P | Weekly Workload: L-0, P-3 | |
| Name of Course | PHARMACOGNOSY – II PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Identification and morphological characterization of crude drugs belonging to tannins. **(2 Expts)**
2. Identification and morphological characterization of crude drugs belonging to carbohydrates. **(2 Expts)**
3. Identification and morphological characterization of crude drugs belonging to lipids. **(2 Expts)**
4. Study of fibres and pharmaceutical aids. **(4 Expts)**

ENVIRONMENTAL STUDY AND DISASTER MANAGEMENT (BP-126)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-126 | Weekly Workload: L-3, P-0 | |
| Name of the Course | ENVIRONMENTAL STUDY AND DISASTER MANAGEMENT | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Introduction to Environment:** Definition; natural and manmade environments and inter-relationships amongst and between them, components of environment and relationship between different components, Relationship between man and environment, impact of technology on environment, environmental degradation. **(5 Hrs)**
- Biodiversity:** Introduction, genetic, species and ecosystem diversity, biogeographic classification of India, value and importance of biodiversity, threats to biodiversity, endangered and endemic species in India, conservation of biodiversity. **(4 Hrs)**
- Environmental Pollution:** **Air Pollution:** Composition of air, structure of atmosphere, ambient air quality standards, classification of air pollutants, sources of common air pollutants like SPM, SO₂, NOX, natural and anthropogenic sources, effects of common air pollutants, carbon credit. **Noise Pollution:** Introduction, sources of noise pollution, ambient noise levels, effects of noise pollution on human being and wildlife, noise pollution controls, noise standards. **Water Pollution:** Introduction, water quality standards, sources of water pollution, classification of water pollutants, effects of water pollutants, eutrophication, measures to control water pollution. **(6 Hrs)**
- Energy Resources:** Understanding natural resources, renewable and non-renewable resources, sustainable energy resources, destruction versus conservation, forest resources, water resources, food resources, energy resources and land resources, conventional energy sources and their problems, advantages and limitations non-conventional energy sources, problems due to overexploitation of energy resources. **(5 Hrs)**
- Social Issues and Environment:** Sustainable development and practices of improving environment, laws and acts for environmental protection, waste management. **(6 Hrs)**
- Natural Disasters:** Introduction, floods, earthquakes and landslides, cyclones and thunderstorms, tsunami, drought, heat waves, sandstorms. **(2 Hrs)**
- Manmade Disasters:** War and terrorism, riots and demonstrations, residential and industrial fires, transportation accidents, nuclear power accidents, hazardous materials and toxic emission, utility failure. **(4 Hrs)**

8. **Problems Regarding Victims:** Saving victims – first 24hours, conducting medical relief operations, managing relief operations, psychological issues, carrying out rehabilitation work. **(4 Hrs)**
9. **Planning for Disaster Management:** Local disaster management cell, preparation of a business recovery plan, government response in disaster. **(2 Hrs)**
10. **Information Technology and Environment:** Role of information technology and human health, role of an individual in conservation of natural resources and in disaster management. **(2 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Nebel BJ, Wright RT. Environmental science – the way the world works. New Jersey: Prentice Hall.
2. Botkin DB, Keller EA. Environmental science. New York: John Wiley & Sons.
3. Satish M. Citizen's guide to disaster management. New Delhi: Macmillan Publishers.
4. Duggal KN. Elements of public health engineering. New Delhi: S Chand & Co.
5. Trivedi RK, Goel PK. Introduction to air pollution. Hyderabad: BS Publications.
6. Rao CS. Environmental pollution control engineering. New Delhi: Wiley Eastern.

HIMACHAL PRADESH TECHNICAL UNIVERSITY, HAMIRPUR

COURSE: B. PHARMACY

DETAILED SYLLABUS

SEMESTER-III

PHARMACEUTICAL ANALYSIS - I (BP-231)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-231 | Weekly Workload: L-3, P-0 | |
| Name of the Course | PHARMACEUTICAL ANALYSIS – I | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs/ Week)

- Introduction:** Significance of quantitative analysis in quality control, Different techniques of analysis, Preliminaries and definitions. (2 Hrs)
- Volumetric Analysis:** Fundamentals of volumetric analysis, methods of expressing concentration, primary and secondary standards. Significant figures, Rules for retaining significant digits, types of errors, Mean, Standard deviation, Statistical Treatment of small data sets, Selection of sample, Precision and accuracy. (7 Hrs)
- Acid Base Titrations:** Concept of acid-base, Role of solvent, Ionization, Law of mass action, Ionic product of water, pH, Relative strengths of acids and bases, Common-ion effect, Hydrolysis of salts. (5 Hrs)
- Buffers and Indicators:** Buffer solutions, Henderson-Hasselbalch equation, Neutralization curves, Acid-base indicators, Theory of indicators, Choice of indicators, Mixed indicators, Polyprotic system, Polyamine and amino acid systems, Amino acid titration, applications in assay of H_3PO_4 , NaOH, $CaCO_3$ etc. (4 Hrs)
- Oxidation-Reduction Titrations:** Concepts of Oxidation and reduction, Redox reactions, Strengths and equivalent weights of oxidizing and reducing agents, Theory of Redox titrations, Redox indicators. (4 Hrs)

6. **Iodometry, Iodimetry and Electrochemical Techniques:** Cell representations, Measurement of electrode potential, Oxidation-reduction curves, Iodimetry and Iodometry, Titrations involving ceric sulphate, potassium iodate, potassium bromate, potassium permanganate; titanouschloride and Sodium 2, 6-dichlorophenol indophenol.(5 Hrs)
7. **Precipitation Titrations:** Precipitation reactions, Solubility products, Effects of acids, temperature and solvent upon the solubility of a precipitate. Argentometric titrations and titrations involving ammonium or potassiumthiocyanate, mercuric nitrate, and barium sulphate indicators, Gay-Lussac method; Mohr's method, Volhard's method and Fajan's method.(6 Hrs)
8. **Gravimetric Analysis:** Precipitation techniques, Solubility products; the colloidal state, Supersaturation coprecipitation, Post-precipitation, Digestional washing of the precipitate, Filtration, Filter papers and crucibles, Ignition, Thermogravimetric curves, Specific examples like barium sulphate, aluminium as aluminium oxide, calcium as calcium oxalate and magnesium as magnesium pyrophosphate, Organic precipitants.(7 Hrs)

Books Recommended

Note: Recent editions of the following books to be referred

1. Beckett AH, Stenlake JB. Practical Pharmaceutical Chemistry, London: Athlone Press.
2. Jeffery GH, Bessett J, Mendham J, Denney RC. Vogel's Textbook of Quantitative Inorganic Analysis including Elementary Instrumental Analysis. London: ELBS and Longman.
3. Atherden LM. Bentley and Driver's Textbook of Pharmaceutical Chemistry. New Delhi: Oxford University Press.
4. Gary DC. Analytical Chemistry. New York: John Wiley and Sons.
5. Connors KA. Textbook of Pharmaceutical Analysis. New York: John Wiley and Sons.
6. Kalthoff IM, Stenger VA. Volumetric Analysis – Titration Methods. Vol.2. New York: Wiley Interscience.
7. Indian Pharmacopoeia. Ghaziabad: The Indian Pharmacopoeia Commission.

PHARMACEUTICAL ANALYSIS - I PRACTICAL (BP-231P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-231P | Weekly Workload: L-0, P-3 | |
| Name of Course | PHARMACEUTICAL ANALYSIS – I PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Standardization of analytical weights and calibration of volumetric apparatus. **(1 Expt)**
2. Preparation and standardization of acids and bases; exercises related with determination of acids and bases separately or in mixture form. **(3 Expts)**
3. Preparation and standardization of redox titrants potassium permanganate, potassium dichromate, iodine, and sodium thiosulphate. Determination of oxidizing and reducing agents in given samples. Exercises involving potassium iodate, potassium bromate, iodine solution, titanouschloride, sodium 2, 6- dichlorophenol indophenol, and ceric ammonium sulphate. **(3 Expts)**
4. Preparation and standardization of titrants like silver nitrate and, ammonium thiocyanate. Titrations according to Mohr's, Volhard's and Fajan's methods. **(2 Expts)**
5. Preparation of gooch crucible for filtration and use of sintered glass crucible. Determination of water of hydration. **(1 Expt)**

UNIT OPERATIONS – II (BP-232)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-232 | Weekly Workload: L-3, P-0 | |
| Name of the Course | UNIT OPERATIONS – II | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Stoichiometry:** Unit processes material and energy balances, molecular units, mole fraction, gas laws, mole volume, primary and secondary quantities, equilibrium state, rate process, steady and unsteady states, dimensionless equations, dimensionless formulae, dimensionless groups, different types of graphic representation. **(6 Hrs)**
- Heat Transfer:** Source of heat, heat transfer, steam and electricity as heating media, determination of requirement of amount of steam/electrical energy, steam pressure, Boiler capacity. **(6 Hrs)**
- Evaporation:** Basic concept of phase equilibria, factor affecting evaporation, evaporators, film evaporators, single effect and multiple effect evaporators. **(4 Hrs)**
- Distillation:** Rault's law, phase diagrams, volatility; simple steam and flash distillations, principles of rectification, McCabe Thiele method for calculations of number of theoretical plates, Azeotropic and extractive distillation. **(6 Hrs)**
- Drying:** Moisture content and mechanism of drying, rate of drying and time of drying calculations; classification and types of dryers, dryers used in pharmaceutical industries. **(4 Hrs)**
- Size Reduction and Size Separation:** Definition, objectives of size reduction, factors affecting size reduction, laws governing energy and power requirements of a mills including ball mill, hammer mill, fluid energy mill etc. **(6 Hrs)**
- Mixing:** Theory of mixing, solid-solid, solid-liquid and liquid-liquid mixing equipments. **(3 Hrs)**
- Automated Process Control Systems:** Process variables, temperature, pressure, flow, level and vacuum and their measurements. Elements of automatic process control and introduction to automatic process control systems. Elements of computer aided manufacturing (CAM). **(3 Hrs)**
- Reactors:** Fundamentals of reactors design for chemical reactions. **(2 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

- Badger WL, Banchero JT. Introduction to Chemical Engineering. London: McGraw Hill.
- Subrahmanyam CVS. Pharmaceutical Engineering. New Delhi: Vallabh Prakashan.
- Brown CG. Unit Operations. New Delhi: CBS Publishers.
- McCabe WL, Smith JC, Harriott P. Unit Operations of Chemical Engineering. London: McGraw Hill.

UNIT OPERATIONS – II PRACTICAL (BP-232P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-232P | Weekly Workload: L-0, P-3 | |
| Name of Course | UNIT OPERATIONS – II PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Determination of overall heat transfer coefficient. **(1 Expt)**
2. Determination of rate of evaporation. **(1 Expt)**
3. Experiments based on steam, extractive and azeotropic distillations. **(2 Expts)**
4. Determination of rate of drying, free moisture content and bound moisture content. **(1 Expt)**
5. Experiments to illustrate the influence of various parameters on the rate of drying. **(2 Expts)**
6. Experiments to illustrate principles of size reduction, Laws governing energy and power requirements of size Reduction. **(2 Expts)**
7. Experiments to illustrate solid-solid mixing, determination of mixing efficiency using different types of mixers. **(1 Expt)**

PHYSICAL PHARMACY – I (BP-233)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-233 | Weekly Workload: L-3, P-0 | |
| Name of the Course | PHYSICAL PHARMACY – I | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Matter and Properties of Matter:** States of matter, change in the state of matter, latent heats and vapor pressure, sublimation-critical point, Eutectic mixtures, gases, aerosol-inhalers, relative humidity, liquid complexes, liquid crystals, glassy state, crystalline and amorphous solids, polymorphism. **(10 Hrs)**
- The Liquid State and solutions:** Physical properties (surface tension, parachor, viscosity, refractive index, optical rotation, dipole moments and chemical constituents), Ideal and real solutions, solutions of gases in liquids, colligative properties, partition coefficient, conductance and its measurement, Debye Huckel theory. **(10 Hrs)**
- Thermodynamics:** First law, thermochemistry, second law, Entropy and disorder, third law, free energy functions and applications, absolute temperature scale, thermochemical equations. **(8 Hrs)**
- Buffers:** Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity. **(5 Hrs)**
- Kinetics:** General considerations and concepts, law of mass action, rate and order of reaction, molecularity of reaction, study of zero, pseudo zero and first order kinetics, half-life determination, determination of order of reaction. **(3 Hrs)**
- Drug Stability:** Physical degradation of drugs, chemical decomposition of drugs – modes and preventive measures, influence of temperature, light, solvent, catalytic species and other factors on reaction rate. Stability testing of dosage forms by conventional Arrhenius approach. **(4 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

- Martin A, Bustamante P, Chun AHC. Physical Pharmacy. New Delhi: B.I. Waverly Pvt. Ltd.
- Brey WS. Physical Chemistry and Biological Applications. London: Academic Press.
- Shoemaker DP, Garland CW. Experiments in Physical Chemistry. New York: McGraw Hill.
- Subramanyam CVS. Principles of Physical Pharmacy. New Delhi: Vallabh Prakashan.
- Subramanyam CVS. Text book of Physical Pharmacy. New Delhi: Vallabh Prakashan.
- Puri BR, Sharma LR, Pathania MS. Principles of Physical Chemistry. New Delhi: Chand and Co.
- Kitckner JA. Findley's Physical Chemistry. London: Green & Co.
- Williams, V.R. and Williams, H.S. Basic Physical Chemistry for the Life Sciences. W.H. Freeman

PHYSICAL PHARMACY – I PRACTICAL (BP-233P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-233P | Weekly Workload: L-0, P-3 | |
| Name of Course | PHYSICAL PHARMACY – I PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Determination of refractive index of given liquids. **(1 Expt)**
2. Determination of specific rotation of sucrose at various concentrations and determine the intrinsic rotation. **(1 Expt)**
3. Determination of heat of solution, heat of hydration and heat of neutralization. **(1 Expt)**
4. Determination of cell constant and perform conductometric titration. **(2 Expts)**
5. Determination of rate constant of simple reaction like hydrolysis of ethyl acetate / aspirin. **(1 Expt)**
6. Determination of effect of temperature on rate of reaction. **(1 Expt)**
7. Preparation of some pharmaceutical buffers. **(2 Expts)**
8. Determination of partition coefficient of given drugs. **(1 Expt)**

PHARMACOGNOSY – III (BP-234)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-234 | Weekly Workload: L-3, P-0 | |
| Name of the Course | PHARMACOGNOSY – III | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Volatile Oils:** Mentha, Coriander, Cinnamon, Lemon peel, Orange peel, Lemon grass, Citronella, Caraway, Dill, Clove, Fennel, Nutmeg, Eucalyptus, Chenopodium, Cardamom, Sandal wood. **(10 Hrs)**
- Resins and Resin Combinations:** Colophony, Podophyllum, Cannabis, Ginger, Turmeric, Jalap, Storax, Benzoin, Asafoetida, Capsicum, Balsam Tolu, Balsam Peru. **(8 Hrs)**
- Glycosides:** Study of the biological sources, cultivation, collection, commercial varieties, chemical constituents, substitutes, adulterants, uses, diagnostic macroscopic and microscopic features and specific chemical tests of following groups of drugs containing glycosides: **(11 Hrs)**
 - Saponins:** Liquorice, ginseng, dioscorea, and senega,
 - Cardioactive sterols:** Digitalis, squill, strophanthus and thevetia.
 - Anthraquinone cathartics:** Aloe, senna, rhubarb and cascara.
 - Others:** Psoralea, gentian, saffron, chirata, quassia.
- Phytochemical Screening:** Screening of alkaloids, saponins, cardenolides and bufadienolides, flavonoids and leucoanthocyanidins, tannins and polyphenols, anthraquinones, cynogenetic glycosides, amino acids in plant extracts. **(4 Hrs)**
- Enzymes:** Biological sources, preparation, identification tests and uses of the following enzymes: Diastase, papain, pepsin, trypsin, pancreatin. **(4 Hrs)**
- Bitters and Sweeteners:** Plant bitters (Chirata, Gentian, Kalmegh, Piccorhiza) and non-carbohydrate sweeteners (Liquorice, Gymnema). **(4 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

- Harborne JB. Phytochemical Methods. London: Chapman & Hall.
- Trease GE, Evans WC. Pharmacognosy. UK: Baillier & Tindall.
- Wallis TE. Textbook of Pharmacognosy. London: J & A Churchill Ltd.
- Kokate CK. Practical Pharmacognosy. New Delhi: VallabhPrakashan.
- Iyengar MA. Pharmacognosy of Powdered Crude Drugs. Manipal.
- Khandelwal KR. Practical Pharmacognosy. Pune: Nirali Prakashan.
- Kokate CK, Purohit AP, Gokhale SB. Pharmacognosy. Pune: Nirali Prakashan.

PHARMACOGNOSY – III PRACTICAL (BP-234P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-234P | Weekly Workload: L-0, P-3 | |
| Name of Course | PHARMACOGNOSY – III PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Identification of crude drugs listed in theory. **(2 Expts)**
2. Microscopic studies of seven selected crude drugs and their powders mentioned under the category of volatile oils in theory and their chemical tests. **(2 Expts)**
3. Diagnostic macroscopic and Microscopic study of some important glycoside containing crude drugs as outlined above. Study of powdered drugs. **(2 Expts)**
4. Study of fibres and pharmaceutical aids. **(2 Expts)**
5. General chemical tests for alkaloids, glycosides, steroids, flavonoids and tannins. **(2 Expts)**

PHARMACEUTICAL STATISTICS (BP-235)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-235 | Weekly Workload: L-3, P-0 | |
| Name of the Course | PHARMACEUTICAL STATISTICS | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Biometrics:** Data collection, Random and non-random sampling methods, significant digits and rounding of numbers; Measures of central tendency (mean, mode, median), Histograms. **(6 Hrs)**
- Measures of Dispersion:** Methods of studying variation (range, quadratic deviation, mean deviation, standard deviation), Coefficient of variation, confidence limits. **(6 Hrs)**
- Measurement of Skewness:** Karl Pearson's coefficient of skewness, Bowley's coefficient of skewness, Kelly's coefficient of skewness. **(6 Hrs)**
- Correlation Analysis:** Types of correlation, Methods of studying correlation. **(6 Hrs)**
- Regression Analysis:** Regression lines, regression equations. **(6 Hrs)**
- Test of Hypothesis:** Setting of hypotheses (test for successes) Test for hypothesis, standard error and sampling distribution estimation, test of significance for large and small samples. Chi square test, t-test, F- test and analysis of variance. **(10 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

- Bolton S. Pharmaceutical Statistics: Practical and Clinical Applications. New York: Informa Healthcare.
- Meier PC, Zund RE. Statistical Methods in Analytical Chemistry. Wiley-Interscience.
- Sundar Rao PSS, Richard J. An Introduction to Biostatistics: A Manual for Students in Health Sciences. New Delhi: Prentice-Hall.
- Gupta SP. Statistical Methods. New Delhi: Sultan Publications.

COMPUTER SCIENCE AND APPLICATIONS (BP-236)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-236 | Weekly Workload: L-3, P-0 | |
| Name of the Course | COMPUTER SCIENCE AND APPLICATIONS | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Fundamentals of Computer:** Introduction to computers, Characteristics of computers, Historical perspective of computers, Computer generations, Types of computers and uses, Software and Hardware, Basic organization of a computer system and functions performed by each unit. Various Input devices like Keyboard, Mouse, Joystick, Electronic pen, Trackball etc. and output devices Printers, Monitors. Memory storage: Memory Cells, Semiconductor and Magnetic core memory, ROM and its types, RAM, Cache and Virtual Memory. Secondary Storage devices and their organization (Hard disk, Floppy disk, CD and DVD). **(10 Hrs)**
- Operating System:** Definition, Need and organization of OS, Functions performed by operating system. Type of Operating System. DOS, windows, Directories and files. Commands (internal & external). Icons, Clipboard. Folders, Major differences between a DOS and Windows. **(4 Hrs)**
- Data Communication and Networks:** Basic elements of a communication system, Data transmission mode, Network Topologies (ring, star, fully connected and Bus), LAN and WAN, Bounded and unbounded communication media, Internet, Services provided by internet, Potential uses and abuses of internet, terminologies and tools used for internet. **(6 Hrs)**
- Programming Languages:** Classifications, Low level and high level languages, merits and pitfalls of languages, object oriented languages. Syntax and semantics. Basic steps involved in software development, Compiler and interpreter. **(5 Hrs)**
- Computer Virus:** Definition, Causes and symptoms of virus, Types of viruses, Detections, prevention and cure against viruses using antivirus software packages. **(2 Hrs)**
- Role of Computers in Pharmacy:** Use of computer in various pharmaceutical and clinical applications like drug information services hospital and community pharmacy, drug design, pharmacokinetics and data analysis. **(2 Hrs)**
- Ms Office Package:**
Word Processing Package: Features and uses of MS -Word processing, File handling(opening, creating, saving printing and editing), Formatting, Printing setups, Table Handling, Mail Marge, Spell check, file protection etc. in MS-Word. **(3 Hrs)**

Spreadsheet Package: Basics of spreadsheet, feature and uses of Excel, Worksheet , formatting Sheets, Data(Sort and Filter), Calculation and graphing using formulae and function, Goal seek, scenario etc. **(3 Hrs)**

Presentation Package: Introduction to power point, features and uses of PowerPoint, creating a new presentation, editing and formatting, working with slides in different views, Animation, Transitions, Action buttons, Macros, Insert (text, slide, picture). **(3 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Sinha PK, Sinha P. Computer Fundamentals. New Delhi: BPB Publications.
2. Rajaraman V. Fundamental of Computers. New Delhi: Prentice Hall (India).

COMPUTER SCIENCE AND APPLICATIONS (BP-236)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-236 | Weekly Workload: L-0, P-3 | |
| Name of Course | COMPUTER SCIENCE AND APPLICATIONS | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/Week)

Note: Minimum of 10 experiments to be carried out

1. Basics of operating system, MS-DOS(Internal and External DOS commands), MS Windows(my computer, recycle bin, accessories etc.). **(3 Expts)**
2. Word-processing using MS Word. **(2 Expts)**
3. Spreadsheet calculations using MS Excel. **(3 Expts)**
4. Graphic applications using MS Power Point. **(2 Expts)**

HIMACHAL PRADESH TECHNICAL UNIVERSITY, HAMIRPUR

COURSE: B. PHARMACY

DETAILED SYLLABUS

SEMESTER-IV

PHARMACEUTICAL ANALYSIS – II (BP-241)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-241 | Weekly Workload: L-3, P-0 | |
| Name of the Course | PHARMACEUTICAL ANALYSIS – II | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Non-aqueous Titrations:** Theoretical considerations, scope and limitations, Acid base equilibria in non-aqueous media, titration of weak bases, titration of weak acids, indicators (Note: Pharmaceutical products should be selected for illustrating application in drug analysis and quality control). (4 Hrs)
- Complexometric Titrations:** Concept of complexation and chelations, Werner's coordination number, electronic structure of some complex ions, stability constants, titration curves, masking and demasking agents, types of complexometric titrations, metal ion indicators and application in drug analysis. (4 Hrs)
- Miscellaneous Methods of Analysis:** Diazotisation titrations, Kjeldahl method of nitrogen estimation, Karl-Fischer titration, Oxygen flask combustion, gasometry. (6 Hrs)
- Potentiometry:** Theoretical consideration, ion-selective electrodes, measurement of potential, location of the end-point, instrumentation, analytical application, pH meter, definition of pH, relationship between pH and potential, equipment and applications. (3 Hrs)

5. **Conductometry:** Ohm's law, specific resistance, specific conductance, conductivity cell, ionic conductivity, change of conductivity during titration, change in volume during conductometric titration, method and instrumentation. **(2 Hrs)**
6. **Coulometry:** Principles and application controlled potential coulometry, cell design, instrumentation, method, electrode selection and advantages and limitations. **(2 Hrs)**
7. **Polarography:** Theory, mass transport processes, current potential relationship, polarization choice of electrode, effect of oxygen, instrumentation and calculation of concentration. **(3 Hrs)**
8. **Amperometry:** Principle, instrumentation and pharmaceutical applications. **(3 Hrs)**
9. **Chromatography:** Fundamentals of the TLC, HPTLC, GLC, Paper chromatography and column chromatography with relevant examples of pharmaceutical and/or natural products. **(8 Hrs)**
10. **Extraction procedures:** Liquid-solid extraction, Liquid-Liquid extraction, separation of mixtures by extraction, distribution law, successive extraction separation of drugs from excipients. **(5 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Beckett AH, Stenlake JB. Practical Pharmaceutical Chemistry. London: Athlone Press.
2. Chatten LG. (Editor). Pharmaceutical Chemistry. Vol. I & II. New York: Marcel Dekker.
3. Connors KA. Textbook of Pharmaceutical Analysis. New York: John Wiley & Sons.
4. Kolthoff IM, Stenger VA. Volumetric Analysis. Vol.II. Titration Methods. New York: Interscience.

PHARMACEUTICAL ANALYSIS – II PRACTICAL (BP-241P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-241P | Weekly Workload: L-0, P-3 | |
| Name of Course | PHARMACEUTICAL ANALYSIS – II PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Non-aqueous Titrations: Preparation and standardization of perchloric acid and sodium/potassium/lithium methoxide solutions; Estimations of some pharmacopoeial products. **(2 Expts)**
2. Complexometric Titrations: Preparations and standardization of EDTA solution, exercises related to pharmacopoeial assays by complexometric titrations. **(2 Expts)**
3. Miscellaneous Determinations: Exercises involving diazotisation, Kjeldahl, Karl-Fischer, Oxygen flask combustion and gasometry methods. Determination of alcohol content in liquid galenicals, procedure (BPC) shall be covered. **(2 Expts)**
4. Exercises based on acid base titration in aqueous and nonaqueous media, oxidation-reduction titrations using potentiometric technique, Determination of acid-base disassociation constants and plotting of titration curves using pH meter. **(2 Expts)**
5. Exercises involving polarimetry. **(1 Expt)**
6. Exercises involving conductometric and polarographic techniques. **(1 Expt)**

PHARMACEUTICAL MICROBIOLOGY(BP-242)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-242 | Weekly Workload: L-3, P-0 | |
| Name of the Course | PHARMACEUTICAL MICROBIOLOGY | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Introduction:** Introduction to microbiology, Scope of microbiology in medicine, health care and pharmacy. **(2 Hrs)**
- Microbial Structure:** Structure of bacteria, fungi, and viruses. **(6 Hrs)**
- Microbial Taxonomy:** Classification and taxonomy of bacteria, fungi and viruses. **(4 Hrs)**
- Identification of Microbes:** Microscopy and staining techniques, colony characterization, electron microscopy. **(6 Hrs)**
- Microbial Cultivation:** Nutrition requirements, isolation and cultivation of bacteria, fungi and viruses. **(4 Hrs)**
- Microbial Genetics:** Introduction to genes, transformation, transduction, conjugation, gene mutation and mutagenesis. **(3 Hrs)**
- Disinfection and Sterilization:** Disinfection, factors influencing disinfectant action, dynamics of disinfection, disinfectants and antiseptics and their evaluation, sterilization methods, sterility testing of pharmaceutical products. **(8 Hrs)**
- Immunology:** Antigens, haptens, immunoglobulins, humoral and cellular immunity, antigen-antibody reactions, hypersensitivity, Active and passive immunity, primary and secondary defensive mechanisms of body. **(5 Hrs)**
- Microbial Assays:** Microbial assays of antibiotics and vitamins. **(2 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

- Hugo and Russel. Pharmaceutical Microbiology. Oxford: Balckwell.
- Pelczar PC. Microbiology. New Delhi: Tata McGraw Hill.
- Ananthanarayan A, Panickar J. Textbook of Microbiology. Hyderabad: Orient Longman.
- Prescott LM, Harley GP, Klein DA. Microbiology. Oxford: VC Brown Publishers.
- Indian Pharmacopoeia. New Delhi: Controller of Publications.
- Stainer RY, Adelberg EA, Ingraham JL. General Microbiology. London: Macmillan Press.
- Rawlins. Bentley's Pharmaceutics. New Delhi: CBS Publishers.

PHARMACEUTICAL MICROBIOLOGY PRACTICAL (BP-242P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-242P | Weekly Workload: L-0, P-3 | |
| Name of Course | PHARMACEUTICAL MICROBIOLOGY PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Preparation of culture media, sub-culturing of common aerobic and anaerobic bacteria, fungus and yeast. **(2 Expts)**
2. Staining methods – Gram's Staining, Acid fast staining, bacterial motility testing. **(2 Expts)**
3. Isolation and identification of microbes. **(1 Expt)**
4. Sterilization techniques and their validation. **(2 Expts)**
5. Evaluation of antiseptics and disinfectants, testing the sterility of pharmaceutical products as per I.P. requirements. **(2 Expts)**
6. Microbial assay of antibiotics or vitamins. **(1 Expt)**

PHYSICAL PHARMACY – II (BP-243)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-243 | Weekly Workload: L-3, P-0 | |
| Name of the Course | PHYSICAL PHARMACY – II | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- 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, surfaceactive agents, concept of HLB, solubilization, detergency, adsorption at solid interfaces, solid-gas and solid-liquid interfaces, complex films, electrical properties of interface. **(6 Hrs)**
- Viscosity and Rheology:** Newtonian systems, Law of flow, kinematic viscosity, effect of temperature; Non-Newtonian systems: plastic, pseudoplastic, dilatant; thixotropy, thixotropic systems in formulation, determination of viscosity; Viscometers: capillary, falling sphere, rotational. **(6 Hrs)**
- Colloidal Dispersions:** Definition, types, properties of colloids, protective colloids, applications of colloids in pharmacy. **(7 Hrs)**
- Suspensions and Emulsions:** Interfacial properties of suspended particles, settling insuspensions, theory of sedimentation, effect of Brownian movement, sedimentation parameters, wetting of particles, controlled flocculation, flocculation in structured vehicles, sedimentation behavior of flocculated suspensions, rheological considerations; Emulsions-types, theories, physical stability. **(8 Hrs)**
- Micromeritics and Powder Rheology:** Particle size and distribution, average particle size, number and weight distribution, particle number, methods for determining particle size: optical microscopy, sieving, sedimentation, measurement of particle volume, specific surface, methods of determining surface area: permeability, adsorption, Derived properties of powders: porosity, packing arrangement, densities, bulkiness and flow properties. **(9 Hrs)**
- Complexation and Protein Binding:** Classification of complexes, methods of preparation and analysis, applications. Significance of protein binding, kinetics of protein binding. **(4 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

- Martin A, Cammarata A, Swarbrick J. Physical Pharmacy. Mumbai: Varghese & Co.
- Martin A, Bustamante P, Chun AHC. Physical Pharmacy. 4th Edition. New Delhi: BI Waverley Ltd.
- Shotton E, Ridgaway K. Physical Pharmaceutics. London: Oxford University Press.
- Subhramanyam. C.V.S. Textbook of Physical Pharmaceutics. Vallabh Prakashan, New Delhi.
- Gennaro AR. Remington's Pharmaceutical Sciences. Pennsylvania: Mack Publishing Co.

PHYSICAL PHARMACY – II PRACTICAL (BP-243P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-243P | Weekly Workload: L-0, P-3 | |
| Name of Course | PHYSICAL PHARMACY – II PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Determination of particle size, particle size distribution using microscopy, sieve analysis and Anderson pipette methods. **(3 Expts)**
2. Determination of derived properties of powders like True density, Bulk density, Porosity, Compressibility and Angle of repose. **(3 Expts)**
3. Determination of surface/interfacial tension, spreading coefficient, HLB value and critical micellar concentration of surfactants. **(3 Expts)**
4. Preparation and stability studies of suspensions / emulsions. **(1 Expt)**
5. Study of rheological properties of various types of systems using different Viscometers. **(1 Expt – desirable)**

PHARMACOGNOSY – IV (BP-244)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-244 | Weekly Workload: L-3, P-0 | |
| Name of the Course | PHARMACOGNOSY – IV | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Alkaloids:** Systematic study of source, cultivation, collection, processing, commercial varieties, chemical constituents, substitutes, adulterants, uses, diagnostic macroscopic and microscopic features and specific chemical tests of following drugs: **(12 Hrs)**
 - Pyridine - piperidine: Tobacco, areca and lobelia.
 - Tropane: Belladonna, hyoscyamus, datura, duboisia, coca and withania
 - Quinoline and isoquinoline: Cinchona, ipecac, opium.
 - Indole : Ergot, rauwolfia, catharanthus, nux-vomica and physostigma
 - Imidazole: Pilocarpus
 - Steroidal: Veratrum and kurchi
 - Alkaloidal amine: Ephedra and colchicum.
 - Glycoalkaloid: Solanum.
 - Purines: Coffee, tea and cola.
- Biosynthesis of Phyto-constituents:** General techniques of biosynthetic studies for formation of primary and secondary plant metabolites and basic metabolic pathways like Shikimic acid pathway, Mevalonate pathway, Acetate pathway. General biosynthetic pathways of natural products like alkaloids, glycosides, terpenoids and flavonoids. **(9 Hrs)**
- Traditional Crude Drugs:** Studies of traditional drugs, common vernacular names, botanical sources, morphology, chemical nature of chief constituents, pharmacology, categories and common uses and marketed formulations of following indigenous drugs: Amla, Satavari, Giloe, Bhilawa, Kalijiri, Bach, Rasna, Punarnava, Chitrack, Apamarg, Gokhru, Shankhapushpi, Brahmi, Adusa, Methi, Lahsun, Palash, Shilajit, Nagarmotha, Neem, Malkangni, Tulsi, Vidang, Banafsha. **(10 Hrs)**
- Basic Principles of Alternative System of Medicine:** Ayurveda, Siddha, Unani, Chinese, and Homeopathy. Introduction to ayurvedic preparations like Arishtas, Asvas, Gutikas, Tailas, Churnas, Lehyas and Bhasmas. **(8 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Harborne JB. Phytochemical Methods. London: Chapman & Hall.
2. Trease GE, Evans WC. Pharmacognosy. UK: Baillier &Tindall.
3. Wallis TE. Textbook of Pharmacognosy. London: J &AChurchill Ltd.
4. Kokate CK. Practical Pharmacognosy. New Delhi: Vallabh Prakashan.
5. Iyengar MA. Pharmacognosy of Powdered Crude Drugs. Manipal.
6. Khandelwal KR. Practical Pharmacognosy. Pune: Nirali Prakashan.
7. Kokate CK, Purohit AP, Gokhale SB. Pharmacognosy. Pune: Nirali Prakashan.

PHARMACOGNOSY – IV PRACTICAL (BP-244P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-244P | Weekly Workload: L-0, P-3 | |
| Name of Course | PHARMACOGNOSY –IV PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Identification of crude drugs listed in the theory. **(2 Expts)**
2. Diagnostic macroscopic and microscopic study of characters of eight- selected drugsgiven in theory in entire and powdered form. **(4 Expts)**
3. Standardization of some traditional drug formulations. **(2 Expts)**
4. Evaluation of Marketed Herbal Formulations. **(2 Expts)**

PATHOPHYSIOLOGY (BP-245)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-245 | Weekly Workload: L-3, P-0 | |
| Name of the Course | PATHOPHYSIOLOGY | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

Note: In pathophysiology of different diseases, the molecular basis should be discussed, wherever applicable.

- Basic Principles of Cell Injury and Adaptation:** Causes of Cellular injury, pathogenesis, morphology of cell injury. Intercellular alterations in lipids, proteins and carbohydrates, Cellular adaptation, atrophy, hypertrophy. **(10 Hrs)**
- Basic Mechanisms Involved in Inflammation and Repair:** Alterations in vascular permeability and blood flow, migration of WBCs, acute and chronic inflammation, mediators of inflammation, brief outline of the process of repair. **(10 Hrs)**
- Pathophysiology of Joint Disorders:** Rheumatoid arthritis, gout. **(1 Hr)**
- Pathophysiology of CNS Disorders:** Epilepsy, psychosis, depression. **(1 Hr)**
- Pathophysiology of Disorders of CVS:** Hypertension, angina, congestive heart failure, atherosclerosis, myocardial infarction and different types of anemias. **(2 Hrs)**
- Pathophysiology of Endocrine Disorders:** Diabetes, thyroid disorders. **(1 Hr)**
- Pathophysiology of Disorders of GIT:** Peptic ulcer, ulcerative colitis, hepatic disorders. **(1 Hr)**
- Pathophysiology of Urinogenital Disorders:** Acute and chronic renal failure, urinary tract infections, sexually transmitted diseases. **(1 Hr)**
- Pathophysiology of Neoplasms:** Common types of neoplasms. **(2 Hrs)**
- Pathophysiology of Respiratory Diseases:** Asthma and tuberculosis. **(1 Hr)**

Books Recommended

Note: Recent editions of the following books to be referred

- Cotran RS, Kumar V, Collins T. Robbins' Pathological Basis of Disease.
- Gennaro A. Remington's: The Science and Practice of Pharmacy. Pennsylvania: Mack Publishing.
- Wilson JD. Harrison's Principles of Internal Medicine. New York: McGraw Hill.
- Dipiro JT. Pharmacotherapy. A Pathological Approach. Stanford: Appleton & Lange.
- Gilman AG, Goodman LS, Rall TW, Murad F. The Pharmacological Basis of Therapeutics. New York: McMillan.

HUMAN VALUES AND PROFESSIONAL ETHICS (BP-246)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-246 | Weekly Workload: L-3, P-0 | |
| Name of the Course | HUMAN VALUES AND PROFESSIONAL ETHICS | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Course Objectives

This introductory course input is intended:

- To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Value based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.

Course Methodology

- The methodology of this course is universally adaptable, involving a systematic and rational study of the human being vis-à-vis the rest of existence.
- It is free from any dogma or value prescriptions.
- It is a process of self-investigation and self-exploration, and not of giving sermons.
- Whatever is found as truth or reality is stated as proposal and the students are facilitated to verify it in their own right based on their Natural Acceptance and Experiential Validation.
- This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and within the student himself/herself finally.
- This self-exploration also enables them to evaluate their pre-conditionings and present beliefs.

Theory (26 Hrs: 2 Hrs / Week)

1. Need, Basic Guidelines, Content and Process for Value Education (6 Hrs)

- Understanding the need, basic guidelines, content and process for Value Education
- Self-exploration—what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations

- d. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
- e. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- f. Method to fulfill the above human aspirations: understanding and living in **harmony** at various levels

2. Understanding Harmony in the Human Being - Harmony in Myself! (6 Hrs)

- a. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- b. Understanding the needs of Self ('I') and 'Body' - *Sukh* and *Suvidha*
- c. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- d. Understanding the characteristics and activities of 'I' and harmony in 'I'
- e. Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail
- f. Programs to ensure *Sanyam* and *Swasthya*

3. Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship (6 Hrs)

- a. Understanding harmony in the Family- the basic unit of human interaction
- b. Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*; Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship
- c. Understanding the meaning of *Vishwas*; Difference between intention and competence
- d. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship
- e. Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitva* as comprehensive Human Goals
- f. Visualizing a universal harmonious order in society- Undivided Society (*Akhand Samaj*), Universal Order (*Sarvabhaum Vyawastha*)- from family to world family!

4. Understanding Harmony in the Nature and Existence - Whole existence as Co-existence (4 Hrs)

- a. Understanding the harmony in the Nature
- b. Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulation in nature
- c. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space
- d. Holistic perception of harmony at all levels of existence

5. Implications of the above Holistic Understanding of Harmony on Professional Ethics (6 Hrs)

- a. Natural acceptance of human values
- b. Definitiveness of Ethical Human Conduct
- c. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- d. Competence in professional ethics:
 - i) Ability to utilize the professional competence for augmenting universal human order,
 - ii) Ability to identify the scope and characteristics of people-friendly and ecofriendly production systems,

- iii) Ability to identify and develop appropriate technologies and management patterns for above production systems.
- e. Case studies of typical holistic technologies, management models and production systems
- f. Strategy for transition from the present state to Universal Human Order:
 - i) At the level of individual: as socially and ecologically responsible engineers, technologists and managers
 - ii) At the level of society: as mutually enriching institutions and organizations

Books Recommended

Note: Recent editions of the following books to be referred

1. Illich I. Energy & Equity. Worcester: The Trinity Press.
2. George S. How the Other Half Dies. New Delhi: Penguin.
3. Dhar PL, Gaur RR. Science and Humanism. New Delhi: Commonwealth Publishers.
4. Seebauer EG, Berry RL. Fundamentals of Ethics for Scientists & Engineers. Oxford: Oxford University Press.

HUMAN VALUES AND PROFESSIONAL ETHICS PRACTICAL (BP-246P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-246P | Weekly Workload: L-0, P-3 | |
| Name of Course | HUMAN VALUES AND PROFESSIONAL ETHICS PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

Practice Session (2 Hrs/Week)

PS 1: Introduce yourself in detail. What are the goals in your life? How do you set your goals in your life? How do you differentiate between right and wrong? What have been your achievements and shortcomings in your life? Observe and analyze them.

PS 2: Now-a-days, there is a lot of voice about many techno-genic maladies such as energy and natural resource depletion, environmental pollution, global warming, ozone depletion, deforestation, soil degradation, etc. – all these seem to be man-made problems threatening the survival of life on Earth – What is the root cause of these maladies & what is the way out in your opinion?
On the other hand, there is rapidly growing danger because of nuclear proliferation, arms race, terrorism, criminalization of politics, large scale corruption, scams, breakdown of relationships, generation gap, depression & suicidal attempts, etc – what do you think, is the root cause of these threats to human happiness and peace – what could be the way out in your opinion?

PS 3: Observe that each one of us has Natural Acceptance, based on which one can verify right or not right for him. Verify this in case of:
What is Naturally Acceptable to you in relationship- Feeling of respect or disrespect?
What is Naturally Acceptable to you – to nurture or to exploit others?
Is your living the same as your natural acceptance or different?
Out of the three basic requirements for fulfillment of your aspirations- right understanding, relationship and physical facilities, observe how the problems in your family are related to each. Also observe how much time & effort you devote for each in your daily routine.

PS 4: List down all your desires. Observe whether the desire is related to Self (I) or Body. If it appears to be related to both, see which part of it is related to Self (I) and which part is related to Body.

PS 5: Observe that any physical facility you use, follows the given sequence with time:
Necessary & tasteful → unnecessary & tasteful → unnecessary & tasteless → intolerable
In contrast, observe that any feeling in you is either naturally acceptable or not acceptable at all. If naturally acceptable, you want it continuously and if not acceptable, you do not want it any moment!
List down all your activities. Observe whether the activity is of 'I' or of Body or with the participation of both 'I' and Body.

Observe the activities within 'I'. Identify the object of your attention for different moments (over a period of say 5 to 10 minutes) and draw a line diagram connecting these points. Try to observe the link between any two nodes.

PS 6: Chalk out programs to ensure that you are responsible to your body- for the nurturing, protection and right utilization of the body. Find out the plants and shrubs growing in and around your campus. Find out their use for curing different diseases.

PS 7: Form small groups in the class and in that group initiate dialogue and ask the eight questions related to trust. The eight questions are:

- | | |
|--|---|
| 1a. Do I want to make myself happy? | 1b. Am I able to make myself always happy? |
| 2a. Do I want to make the other happy? | 2b. Am I able to make the other always happy? |
| 3a. Does the other want to make him happy? | 3b. Is the other able to make him always happy? |
| 4a. Does the other want to make me happy? | 4b. Is the other able to make me always happy? |
| <i>What is the answer?</i> | <i>What is the answer?</i> |

Intention (Natural Acceptance)

Competence

Let each student answer the questions for himself and everyone else. Discuss the difference between intention and competence. Observe whether you evaluate your intention & competence as well as the others' intention & competence.

PS 8: Observe on how many occasions you are respecting your related ones (by doing the right evaluation) and on how many occasions you are disrespecting by way of under-evaluation, over-evaluation or otherwise evaluation.

Also observe whether your feeling of respect is based on treating the other as yourself or on differentiations based on body, physical facilities or beliefs.

PS 9: Write a note in the form of story, poem, skit, essay, narration, dialogue to educate a child. Evaluate it in a group.

Develop three chapters to introduce 'social science- its need, scope and content' in the primary education of children

PS 10: List down units (things) around you. Classify them in four orders. Observe and explain the mutual fulfillment of each unit with other orders.

PS 11: Make a chart for the whole existence. List down different courses of studies and relate them to different units or levels in the existence.

Choose any one subject being taught today. Evaluate it and suggest suitable modifications to make it appropriate and holistic.

PS 12: Choose any two current problems of different kind in the society and suggest how they can be solved on the basis of natural acceptance of human values. Suggest steps you will take in present conditions.

PS 13: Suggest ways in which you can use your knowledge of Technology/Engineering/ Management for universal human order, from your family to the world family.

Suggest one format of humanistic constitution at the level of nation from your side.

HIMACHAL PRADESH TECHNICAL UNIVERSITY, HAMIRPUR

COURSE: B. PHARMACY

DETAILED SYLLABUS

SEMESTER-V

BIOCHEMISTRY (BP-351)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-351 | Weekly Workload: L-3, P-0 | |
| Name of the Course | BIOCHEMISTRY | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs/ Week)

- Biochemical Organization of Cell:** Biochemical organization of the cell and transport process across cell membrane. **(2 Hrs)**
- Biological Oxidation:** The concept of free energy, bioenergetics, production of ATP and its biological significance, Enzymes and co-enzymes involved in oxidation reduction & its control, respiratory chain, its role in energy capture and its control, Inhibitors of respiratory chain and oxidative phosphorylation, Mechanism of oxidative phosphorylation. **(5 Hrs)**
- Enzymes and Co-enzymes:** Nomenclature, enzyme kinetics and its mechanism of action, mechanism of inhibition, enzymes and iso-enzymes in clinical diagnosis. **(3 Hrs)**
- Carbohydrate Metabolism:** Glycolysis and fermentation, Gluconeogenesis and glycogenolysis, Metabolism of galactose and galactosemia and Pentosephosphate pathway. **(6 Hrs)**
- The Citric Acid Cycle:** Significance, reactions and energetic of the cycle, Amphibolic role of the cycle, and Glyoxalic acid cycle. **(2 hrs)**
- Lipid Metabolism:** Oxidation of fatty acids, beta-oxidation and energetics, alpha-oxidation, omega-oxidation, Biosynthesis of ketone bodies and their utilization, Biosynthesis of saturated and

unsaturated fatty acids, Control of lipid metabolism, Essential fatty acids and eicosanoids (prostaglandins, thromboxanes and leukotrienes), phospholipids and sphingolipids. **(8Hrs)**

7. **Metabolism of Ammonia and Nitrogen Containing Monomers:** Nitrogen balance, Biosynthesis of amino acids, Catabolism of amino acids, Conversion of amino acids to specialized products, Assimilation of ammonia, Urea cycle, metabolic disorders of urea cycle, Metabolism of sulphur containing amino acids, Porphyrin biosynthesis, formation of bile pigments, hyperbilirubinemia, Purine biosynthesis and Pyrimidine biosynthesis. **(9 Hrs)**
8. **Biosynthesis of Nucleic Acids:** Biosynthesis of DNA and RNA. **(2 Hrs)**
9. **Genetic Code and Protein Synthesis:** Genetic code, Components of protein synthesis, and Inhibition of protein synthesis. **(3 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Conn EE, Stumpf PK. Outlines of Biochemistry. New York: John Wiley & Sons.
2. Lehninger AL. Principles of Biochemistry. New Delhi: CBS Publishers.
3. Plumer DT. An Introduction to Practical Biochemistry. New Delhi: Tata McGraw Hill.
4. Berg JM, Tymoczko JL, Stryer L. Stryer's Biochemistry. New York: WH Freeman & Co.
5. Jayaraman J. Laboratory Manual in Biochemistry. New Delhi: Wiley Eastern Ltd.
6. Murray RK, Granner DK, Mayes PA, Rodwell VW. Harper's Illustrated Biochemistry. New York: Lange / McGraw Hill.

BIOCHEMISTRY PRACTICAL (BP-351)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-351P | Weekly Workload: L-0, P-3 | |
| Name of Course | BIOCHEMISTRY PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Preparation of standard buffers (citrate, phosphate and carbonate) and measurement of pH. **(1 Expt)**
2. Separation of amino acids by two-dimensional paper chromatography or gel electrophoresis. **(1 Expt)**
3. Separation of lipids by TLC. **(1 Expt)**
4. Quantitative estimation of amino acids / proteins. **(1 Expt)**
5. Identification of C-terminal amino acids of a protein. **(1 Expt)**
6. Determination of glucose by using glucose oxidase. **(1 Expt)**
7. Enzymatic hydrolysis of glycogen by alpha- and beta-amylases. **(1 Expt)**
8. The isolation and determination of RNA and DNA. **(1 Expt)**
9. Effect of temperature on the activity of alpha - amylase. **(1 Expt)**
10. Estimation of SGOT, SGPT, ALP and BRN in the serum. **(1 Expt)**

MEDICINAL CHEMISTRY – I (BP-352)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-352 | Weekly Workload: L-3, P-0 | |
| Name of the Course | MEDICINAL CHEMISTRY – I | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Basic Principles of Medicinal Chemistry:** Physico-chemical aspects (Optical, geometric and bioisosterism) of drug molecules and biological action. **(2 Hrs)**
- Drug-receptor Interactions:** Theory of receptors, Structure of receptors, Drug-receptor interaction including transduction mechanisms. **(2Hrs)**
- Drug Metabolism:** Metabolic pathways, metabolic reactions, phase I and II biotransformations, Concept of pro-drugs, synthesis, applications of pro-drugs in pharmacy including pharmaceutical and pharmacokinetic applications. **(5 Hrs)**
- Quantitative Structure-Activity Relationships (QSAR):** Brief account of various descriptors, (Lipophilic, Electronics, Steric, Topological) Hansch and Free-Wilson approaches. **(4 Hrs)**
- Computer-Aided Drug Designing:** Fundamentals of computer-aided Drug Design (CADD) and Molecular modelling. Advantages of CADD, Software used for molecular modelling. **(4Hrs)**
- Drug Design:** Introduction, Concept of lead compound, Rational approaches for drug design – Quantum mechanical, molecular orbital, molecular connectivity, Methods of variation, Drug Design and development. **(3 Hrs)**
- Chemistry of Drugs:** Synthetic procedures of selected drugs, mode of action, uses, structure activity relationship including physicochemical properties of the following classes of drugs:
 - Drugs acting at Synaptic and neuro-effector junction sites:** Cholinergics and Anticholinesterases, Adrenergic drugs, Antispasmodic and antiadrenergic drugs, Neuromuscular blocking agents. **(11Hrs)**
 - Drugs acting on the Central Nervous System:** General Anesthetics, Local Anesthetics, Hypnotics and Sedatives, Opioid analgesics, antitussives, anticonvulsants, antiparkinsonism drugs, CNS stimulants, Psychopharmacological agents (neuroleptics, antidepressants, anxiolytics). **(9Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

- Foye WC. Principles of Medicinal Chemistry. Philadelphia: Lea & Febiger.
- Beale JM, Block JH. Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry. Philadelphia: Lippincott Williams and Wilkins.
- Hansch C. Comprehensive Medicinal Chemistry -Quantitative Drug Design. Vol. IV. Oxford: Pergamon Press.
- Jurs PC. Computer Software Application in Chemistry. New York: John Wiley & Sons.
- Pops and Perruns. Computer Aided Drug Design. New York: Academic Press.
- Wolff ME. Burger's Medicinal Chemistry. New York: John Wiley & Sons.

MEDICINAL CHEMISTRY – I PRACTICAL (BP-352P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-352P | Weekly Workload: L-0, P-3 | |
| Name of Course | MEDICINAL CHEMISTRY – I PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Synthesis of selected drugs from the course content. **(4 Expts)**
2. Spectral analysis of the drugs synthesized. **(2 Expts)**
3. Establishing the pharmacopoeial standards of the drugs synthesized. **(3 Expts)**
4. Determination of partition coefficients and dissociation constants of synthesized drugs. **(1 Expt)**

PHARMACOLOGY –I(BP-353)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-353 | Weekly Workload: L-3, P-0 | |
| Name of the Course | PHARMACOLOGY – I | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- General Pharmacology:** Introduction to Pharmacology, Sources of drugs, Dosage forms and routes of administration, mechanism of action, Combined effect of drugs, Factors modifying drug action, tolerance and dependence, Pharmacogenetics. Absorption, Distribution, Metabolism and Excretion of drugs, Principles of Basic and Clinical pharmacokinetics, Adverse Drug Reactions and treatment of poisoning, ADME drug interactions. **(10 Hrs)**
- Pharmacology of Peripheral Nervous System:** Neurohumoral transmission (autonomic and Somatic), Parasympathomimetics, Parasympatholytics, Sympathomimetics, Adrenergic Receptor and neuron blocking agents, Ganglionic, stimulants and blocking agents, Neuromuscular blocking Agents, Local anesthetic Agents. **(12 Hrs)**
- Pharmacology of Central Nervous System:** Neurohumoral transmission in the CNS, General Anesthetics, Alcohols and disulfiram, Sedatives, hypnotics, Anti-anxiety agents and Centrally acting muscle relaxants, Psychopharmacological agents (anti-psychotics) antidepressants anti maniacs and hallucinogens. **(6 Hrs)**
- Antiepileptic / Anti-Parkinsonian Drugs:** Classification, mechanism of action, pharmacological action, adverse reactions and applications of anti-epileptics drugs and anti-Parkinsonian drugs. **(6 Hrs)**
- Analgesics / Antipyretics:** Classification, mechanism of action, pharmacological action, adverse reactions and applications of Analgesics, Antipyretics, Anti-inflammatory and Anti-gout drugs, Narcotic analgesics and antagonists. **(4 Hrs)**
- CNS Stimulants:** Classification, mechanism of action, pharmacological action, adverse reactions and applications of CNS stimulants. Drug Addiction and Drug Abuse. **(2 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

- Rang MP, Dale MM, Ritter JM. Pharmacology. New York: Churchill Livingstone.
- Brunton LL, Lazo JS, Parker KL. Goodman and Gilman's The Pharmacological Basis of Therapeutics. New York: McGraw Hill.
- Mycek MJ, Harvey RA, Champe PC. Lippincott's Illustrated Reviews -Pharmacology. Philadelphia: Lippincott Williams & Wilkins.
- Tripathi KD. Essential of medical Pharmacology, New Delhi: Jaypee Brothers Medical Publishers,
- Ghosh MN. Fundamentals of Experimental Pharmacology. Kolkata: Scientific Book Agency.
- Kulkarni SK. Handbook of Experimental Pharmacology. New Delhi: Vallabh Prakashan.

PHARMACOLOGY –I PRACTICAL (BP-353P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-353P | Weekly Workload: L-0, P-3 | |
| Name of Course | PHARMACOLOGY – I PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3Hrs / Week)

Note: Minimum of 10 experiments to be carried out

** Software based experiments should be used instead of actual animal experiments wherever possible

1. Preparation of different solutions for experiments. Drug dilutions, use of molar and w/v solutions in experimental pharmacology. **(1 Expt)**
2. Study of commonly used instruments in experimental pharmacology. **(1 Expt)**
3. Study of common laboratory animals and anesthetics used in animal studies. Bleeding and intravenous injection, intragastric administration. Procedures for rendering animals unconscious-stunning of rodents, pithing of frogs, chemical euthanasia. **(1 Expt)**
4. Experiments on intact preparations Study of different routes of administration of drugs in mice/rats. To study the effect of hepatic microsomal enzyme inhibitors and induction on the pentobarbitone sleeping time in mice. **(2 Expts)**
5. Experiments on Central Nervous system: Recording of spontaneous motor activity, stereotypy, analgesia, anticonvulsant activity, anti-inflammatory activity, and muscle relaxant activity of drugs using simple experiments. **(2 Expts)**
6. Effects of autonomic drugs on rabbit's eye. **(1 Expt)**
7. Effects of various agonists and antagonists and their characterization using isolated preparations like frog's rectus abdominis muscle and isolated ileum preparations of rat / guinea pig. **(2 Expts)**

PHARMACEUTICAL BIOTECHNOLOGY (BP-354)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-354 | Weekly Workload: L-3, P-0 | |
| Name of the Course | PHARMACEUTICAL BIOTECHNOLOGY | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Introduction to Biotechnology:** Historical development of biotechnology, areas of biotechnology research, therapeutic and pharmaceutical applications of biotechnology. **(3 Hrs)**
- Genetic Engineering:** Enzymes and other molecular tools used in genetic engineering, technique of gene cloning, medical and pharmaceutical applications. **(7 Hrs)**
- Hybridoma Technology:** Introduction to monoclonal antibodies, principle and production of monoclonal antibodies by hybridoma technology, medicinal applications of monoclonal antibodies, monoclonal antibody engineering. **(8 Hrs)**
- Fermentation :** Introduction to fermentation, microorganisms used, types of cultures used in fermentation, design of fermenters, Production of antibiotics (Penicillin, streptomycin), Vitamins (Vitamin B2 and B12), Solvents (Ethanol) by fermentation. **(12 Hrs)**
- Microbial Biotransformations:** Introduction, types of reactions mediated by microorganisms, design of biotransformation processes, selection of organisms, biotransformation process and its improvements with special reference to steroids. **(5 Hrs)**
- Enzyme Immobilization:** Advantages of immobilization, techniques of immobilization, factors affecting immobilized enzyme kinetics, applications of immobilized enzymes, immobilization of bacteria and plant cells. **(5 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

- Smith JE. Biotechnology. Cambridge: Cambridge University Press.
- Trevan MD, Boffey S, Goulding KH, Stanbury P. (Eds). Biotechnology – The Biological Principles. New Delhi: Tata McGraw Hill.
- Prescot LM, Harley JP, Klein DA. Microbiology. Oxford: WMCB Brown Publications.
- Crueger W, Crueger A. Biotechnology – A Textbook of Industrial Microbiology. New Delhi: Panima Publishing.
- Reed G. (Ed). Prescott & Dunn's Industrial Microbiology. New Delhi: CBS Publishers.
- Stanbury P, Whitaker A. Principles of Fermentation Technology. Oxford: Pergamon Press.

PHARMACEUTICAL INDUSTRIAL MANAGEMENT (BP-355)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-355 | Weekly Workload: L-3, P-0 | |
| Name of the Course | PHARMACEUTICAL INDUSTRIAL MANAGEMENT | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40Hrs: 3 Hrs / Week)

- Concept of Management:** Administrative Management (Planning, Organizing, Staffing, Directing and Controlling), Entrepreneurship development, Operative Management (Personnel, Materials, Production, Financial, Marketing, Time/space, Margin/Morale). Principles of Management (Co-ordination, Communication, Motivation, Decision-making, leadership, Innovation, Creativity, Delegation of Authority / Responsibility, Record Keeping). Identification of key points to give maximum thrust for development and perfection. **(6 Hrs)**
- Accountancy:** Principles of Accountancy, Ledger posting and book entries, preparation of trial balance, columns of a cash book, Bank reconciliation statement, rectification of errors, Profits and loss account, balance sheet, purchase, keeping and pricing of stocks, treatment of cheques, bills of exchange, promissory notes and hundies, documentary bills. **(6 Hrs)**
- Economics:** Principles of economics with special reference to the laws of demand and supply, demand schedule, demand curves, labor welfare, general principles of insurance and inland and foreign trade, procedure of exporting and importing goods. **(6 Hrs)**
- Pharmaceutical Marketing:** Functions, buying, selling, transportation, storage, finance, feedback, information, channels of distribution, wholesale, retail, departmental store, multiple shop and mail order business. **(6 Hrs)**
- Salesmanship:** Principles of sales promotion, advertising, ethics of sales, merchandising, literature, detailing. Recruitment, training, evaluation, compensation to the pharmacist. **(2 Hrs)**
- Market Research:** Measuring & Forecasting Market Demands-Major concept in demand measurement, Estimating current demand, Geodemographic analysis, Estimating industry sales, Market share & Future demand, Market Segmentation & Market Targeting. **(4 Hrs)**

7. **Materials Management:** A brief exposure or basic principles of materials management- major areas, scope, purchase, stores, inventory control and evaluation of materials management. **(4 Hrs)**
8. **Production Management:** A brief exposure of the different aspects of Production Management- Visible and Invisible inputs, Methodology of Activities, Performance Evaluation. **(6 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Koontz, O'Donnel. Principles of Management. New Delhi: Tata McGraw Hill.
2. Kotler P. Marketing Management. New Delhi: Pearson Hall.
3. Kotler P, Armstrong. Principles of Marketing. New Delhi: PHI Learning Pvt Ltd.
4. Gennaro AD. Remington's: The Science & Practice of Pharmacy, New York: Mack Publishing.
5. Subrahmanyam CVS. Pharmaceutical Production and Management. New Delhi: Vallabh Prakashan.
6. Mehta RM. Pharmaceutical Production Management. New Delhi: Vallabh Prakashan.

HERBAL DRUG TECHNOLOGY (BP-356)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-356 | Weekly Workload: L-3, P-0 | |
| Name of the Course | HERBAL DRUG TECHNOLOGY | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Introduction:** Definition of Herbal drug, Importance of Herbal therapies, Herbal versus conventional drugs, Efficacy and Safety in herbal drugs, Toxicity in Herbals and their interactions. Adverse reactions and safety in herbal medicine, Assessment by drug regulators, Herbal drugs regulations in India. **(6 Hrs)**
- Extraction Techniques:** Extraction of Plant Material, Soxhlet extraction, Droplet-Counter-Current (DCC) extraction, Supercritical fluid extraction, Preparation and type of extracts. **(4 Hrs)**
- Chromatography of Herbal Drugs:** Application of chromatographic techniques such as Paper, TLC, HPTLC, GLC, HPLC, Column, DCCC in the isolation, purification and evaluation of herbal drugs. Role of marker compounds. **(8 Hrs)**
- Phytochemical Screening of Crude Drugs:** Extraction, isolation, purification, analytical profiles of following phytoconstituents. Vasaka, kalmegh, Aswagandha, Ginger, Liquorice, Brahmi, Curcuma, Methi, Giloe and Gymnema. **(10 Hrs)**
- Regulatory Requirements:** Regulatory requirements of herbal medicines, infrastructure, quality control and evaluation parameters, WHO guidelines for regulatory control for import and export of herbal products. **(6 Hrs)**
- Standardization and Quality control of Herbal Drugs:** Standardization parameters, quality assurance and stability testing of Herbal drugs as per WHO / ICH guidelines applicable to the various herbal drugs. **(6 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

- Chaudhari RD. Herbal Drug Industry. New Delhi: Eastern publication
- Mukherjee PK. Quality control Herbal Drugs. New Delhi: Business Horizons,
- Mukherjee PK, Verpoorte R. GMP for Botanicals. New Delhi: Business Horizons.
- Rajpal V. Standardization of Botanicals. New Delhi: Eastern Publications.
- Wagner H, Bladt S. Plant Drug Analysis – A Thin Layer Chromatography Atlas. New York: Springer.
- WHO. Quality Control Methods for Medicinal Plant Materials. Geneva: World Health Organization.

HERBAL DRUG TECHNOLOGY PRACTICAL (BP-356P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-356P | Weekly Workload: L-0, P-3 | |
| Name of Course | HERBAL DRUG TECHNOLOGY PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Isolation, separation, and purification of various groups of chemical constituents of pharmaceutical significance. **(3 Expts)**
2. Paper and thin layer chromatographic evaluations of herbal drug constituents. **(2 Expts)**
3. Column Chromatography for separation of phytoconstituents (Demonstration). **(1 Expt)**
4. Standardization of drugs – determination of foreign matter, total ash, acid insoluble ash, alcohol soluble extractive, water soluble extractives, moisture content (loss on drying), swelling index, foaming index. **(4 Expts)**

HIMACHAL PRADESH TECHNICAL UNIVERSITY, HAMIRPUR

COURSE: B. PHARMACY

DETAILED SYLLABUS

SEMESTER-VI

MEDICINAL CHEMISTRY – II (BP-361)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-361 | Weekly Workload: L-3, P-0 | |
| Name of the Course | MEDICINAL CHEMISTRY – II | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Cardiovascular Agents:** Nomenclature, stereochemistry, Synthesis, mode of action, uses, structure activity relationship, physicochemical properties of cardiovascular drugs like cardiac glycosides, antihypertensives, antianginal drugs, antiarrhythmics and vasodilators. **(5 Hrs)**
- Drugs acting on Hemopoietic System:** Nomenclature, stereochemistry, Synthesis, mode of action, uses, structure activity relationship, physicochemical properties of anticoagulants and anti-platelet drugs. **(3 Hrs)**
- Drugs Acting on Urinary System:** Nomenclature, stereochemistry, Synthesis, mode of action, uses, structure activity relationship, physico-chemical properties of Diuretics. **(2 Hrs)**
- Autocoids:** Nomenclature, stereochemistry, Synthesis, mode of action, uses, structure activity relationship, physico-chemical properties of antihistaminic drugs, eicosanoids. **(5 Hrs)**

5. **Anti-inflammatory Drugs:** Nomenclature, stereochemistry, Synthesis, mode of action, uses, structure activity relationship, physico-chemical properties of opioid analgesics and non-steroidal anti-inflammatory agents. **(7 Hrs)**
6. **Steroids and Related Drugs:** Nomenclature of steroids, stereochemistry, synthesis, mode of action, uses, structure activity relationship, physico-chemical properties of androgens, anabolic steroids, estrogens, progestational agents, adrenocorticoids. **(8 Hrs)**
7. **Drugs Affecting Uterine Motility:** Oxytocics (including oxytocin, ergot alkaloids and prostaglandins). **(7 Hrs)**
8. **Antidiabetic Drugs:** Insulin and oral hypoglycaemic agents. **(3 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Foye WC. Principles of Medicinal Chemistry. Philadelphia: Lea & Febiger.
2. Beale JM, Block JH. Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry. Philadelphia: Lippincott Williams and Wilkins.
3. Hansh C. Comprehensive Medicinal Chemistry - Quantitative Drug Design. Vol. IV. Oxford: Pergamon Press.
4. Wolff ME. Burger's Medicinal Chemistry. New York: John Wiley & Sons.
5. Nogrady T. Medicinal Chemistry – A Biochemical Approach. Oxford: Oxford University Press.
6. Lednicer D, Mitscher LA. The Organic Chemistry of Drug Synthesis. Vol. 1. New York: John Wiley & Sons.

MEDICINAL CHEMISTRY – II PRACTICAL (BP-361P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-361P | Weekly Workload: L-0, P-3 | |
| Name of Course | MEDICINAL CHEMISTRY – II PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Synthesis of selected drugs from the course content involving two or more steps and their spectral analysis. **(6 Expts)**
2. Establishing the Pharmacopoeial standards of the drugs synthesized. **(3 Expts)**
3. Workshop on stereo model use of some selected drugs. **(1 Expt)**

CHEMISTRY OF NATURAL PRODUCTS (BP-362)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-362 | Weekly Workload: L-3, P-0 | |
| Name of the Course | CHEMISTRY OF NATURAL PRODUCTS | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Terpenoids:** Chemistry, and pharmacological activity of medicinally important monoterpenes (Citral, Camphor, Menthol), sesquiterpenes (Farniol), diterpenes (Abietic Acid), and triterpenoids (Amyrins). **(8 Hrs)**
- Carotenoids:** α -carotenoids, β -carotenes, vitamin A, and xanthophylls of medicinal importance. **(6 Hrs)**
- Glycosides:** Chemistry, pharmacological activity of digitoxin, digoxin, sennosides and diosgenin. **(6 Hrs)**
- Alkaloids:** Chemistry, and pharmacological activity of atropine and related compounds, quinine, reserpine, morphine, papaverine, ephedrine, ergot and vinca alkaloids. **(10 Hrs)**
- Antibiotics:** Chemistry and therapeutic activity of penicillin, streptomycin and tetracycline. **(5 Hrs)**
- Flavonoids:** Chemistry and pharmacological activity of medicinally important flavonoids such as flavones, flavonols, quercetin, isoflavones. **(5 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

- Finar IL. Organic Chemistry. Vol.II. London: ELBS/Longman.
- Harborne JB. Phytochemical Methods. London: Chapman & Hall.
- Manitto P. The Biosynthesis of Natural Products. Chichester: Ellis Horwood.
- De Mayo P. The Chemistry of Natural Products. New York: Wiley Interscience.
- Pridham JB. Terpenoids in Plants. New York: Academic Press.
- Pridham JB, Swain T. Biosynthetic Pathways in Higher Plants. New York: Academic Press.
- Rabinson T. The Biochemistry of Alkaloids, Springer Verlag, New York.

PHARMACOLOGY – II (BP-363)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-363 | Weekly Workload: L-3, P-0 | |
| Name of the Course | PHARMACOLOGY – II | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Pharmacology of Cardiovascular System:** Digitalis and cardiac glycosides, Antihypertensive drugs, Antianginal and Vasodilator drugs including calcium channel blockers and beta adrenergic antagonists, Antiarrhythmic drugs, Antihyperlipedemic drugs, Drugs used in the therapy of shock. **(12 Hrs)**
- Drugs Acting on Hemopoietic System:** Hematinics, Anticoagulants, Vitamin K and hemostatic agents, Fibrinolytic and anti-platelet drugs, Blood and plasma volume expanders. **(6 Hrs)**
- Drugs Acting on Urinary System:** Fluid and electrolyte balance, Diuretics. **(5 Hrs)**
- Autocoids:** Histamine, 5-HT and their antagonists, Prostaglandins, thromboxanes and leukotrienes, Pentagastrin, Cholecystokinin, Angiotensin, Bradykinin. **(5 Hrs)**
- Pharmacology of Endocrine System:** Hypothalamic and pituitary hormones, Thyroid hormones and anti-thyroid drugs, parathormone, calcitonin and Vitamin D. **(5 Hrs)**
- Antidiabetic Agents:** Insulin, oral hypoglycaemic agents and glucagon. **(3 Hrs)**
- Steroids and Related Drugs:** ACTH, corticosteroids, Androgens and anabolic steroids, Estrogens, progesterone and oral contraceptives, Drugs acting on the uterus. **(4 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

- Rang MP, Dale MM, Ritter JM. Pharmacology. New York: Churchill Livingstone.
- Brunton LL, Lazo JS, Parker KL. Goodman and Gilman's The Pharmacological Basis of Therapeutics. New York: McGraw Hill.
- Mycek MJ, Harvey RA, Champe PC. Lippincott's Illustrated Reviews - Pharmacology. Philadelphia: Lippincott Williams & Wilkins.
- Tripathi KD. Essential of medical Pharmacology, New Delhi: Jaypee Brothers Medical Publishers.
- Ghosh MN. Fundamentals of Experimental Pharmacology. Scientific Book Agency, Kolkatta.
- Kulkarni SK. Handbook of Experimental Pharmacology. Vallabh Prakashan, Delhi.

PHARMACOLOGY – II PRACTICAL (BP-363P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-363P | Weekly Workload: L-0, P-3 | |
| Name of Course | PHARMACOLOGY – II PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

** Software based experiments should be used instead of actual animal experiments wherever possible

1. Experiments on Isolated Preparations: **(6 Expts)**
 - a) To record the concentration response curve (CRC) of acetylcholine using rectus abdominis muscle preparation of frog.
 - b) To study the effects of physostigmine and d-tubocurarine on the CRC of acetylcholine using rectus abdominis muscle preparation of frog.
 - c) To record the CRC of 5-HT on rat fundus preparation.
 - d) To record the CRC of histamine on guinea pig ileum preparation.
 - e) To record the CRC of noradrenaline on rat anococcygeus muscle preparation.
 - f) To record the CRC of oxytocin using rat uterus preparation.
2. Pharmacology of Cardiovascular System: **(2 Expts)**
 - a) To study the inotropic and chronotropic effects of drugs on isolated frog heart.
 - b) To study the effects of drugs on normal and hypodynamic frog heart.
3. Blood Pressure of anaesthetized Dog/Cat/Rat: To demonstrate the effects of various drugs on the B.P. and respiration including the Vasomotor Reversal of Dale and nicotinic action of acetylcholine. **(2 Expts)**

PHARMACEUTICAL TECHNOLOGY – I (BP-364)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-364 | Weekly Workload: L-3, P-0 | |
| Name of the Course | PHARMACEUTICAL TECHNOLOGY – I | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- 1. Preformulation:** Introduction to preformulation, study of physical properties of drugs like organoleptic properties, physical form, particle size, shape, density, wetting, dielectric constant, solubility, dissolution and their effect on formulation, stability and bioavailability. **(8 Hrs)**
- 2. Stability:** Stability testing of various pharmaceutical products as per international guidelines such as ICH, WHO, CPMP and USFDA. Stabilization of pharmaceutical products. Pro-drug approach for solving stability problems. **(5 Hrs)**
- 3. Liquid Dosage Forms:** Introduction, Types of additives used in formulations -vehicles, stabilizers, preservatives, suspending agents, emulsifying agents, solubilizer, colors, flavours and others, manufacturing, packaging and evaluation of clear liquids, suspensions and emulsions official in pharmacopoeia. **(5 Hrs)**
- 4. Semisolid Dosage Forms:** Definition, types, mechanisms of drug penetration, factors influencing penetration, semisolid bases and their selection. General formulation of semisolids, clear gels manufacturing procedure, evaluation and packaging. **(4 Hrs)**
- 5. Suppositories:** Ideal requirements, bases, manufacturing procedure, packaging and evaluation. **(2 Hrs)**
- 6. Extraction and Galenical Products:** Principle and method of extraction, preparation of infusion, tinctures, dry and soft liquid extracts. **(3 Hrs)**
- 7. Blood Products and Plasma Substitutes:** Collection, processing and storage of whole human blood, concentrated human RBCs, dried human plasma, human fibrinogen, human thrombin, human normal immunoglobulin, human fibrin, foam plasma substitutes -ideal requirements, properties of plasma substitutes like PVP, dextran, etc. **(3 Hrs)**

- 8. Cosmeticology and Cosmetic Preparations:** Fundamentals of cosmetic science, structure and functions of skin and hair. Formulation, preparation and packaging of cosmetics for skin, hair, dentifrice and manicure preparations like nail polish, Lipsticks, eye lashes, baby care products. **(10 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Aulton ME. *Pharmaceutics-The Science of Dosage Form Design*. London: ELBS/Churchill Livingstone.
2. Lachman L, Lieberman HA, Kanig JL. *The Theory and Practice of Industrial Pharmacy*. Philadelphia: Lea & Febiger.
3. Ansel HC. *Introduction to Pharmaceutical Dosage Forms*. Mumbai: Verghese & Co.
4. Banker GS, Rhodes CT. *Modern Pharmaceutics*. New York: Marcel Dekker.
5. Jellinek JS. *Formulation and Function of Cosmetics*. New York: John Wiley & Sons.
6. Rawlins EA. *Bentley's Textbook of Pharmaceutics*. London: ELBS.
7. Thomssen SG. *Modern Cosmetics*, Mumbai: Universal Publishing.

PHARMACEUTICAL TECHNOLOGY – I PRACTICAL (BP-364P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-364P | Weekly Workload: L-0, P-3 | |
| Name of Course | PHARMACEUTICAL TECHNOLOGY – I PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Preparation, evaluation and packaging of liquid orals (solutions, suspensions and emulsions), ointments, suppositories, eye drops, eye ointments, galenicals, extracts. **(6 Expts)**
2. Formulation of various types of cosmetics for skin, hair, dentifrices and manicure preparations. **(4 Expts)**

CLINICAL PHARMACY (BP-365)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-365 | Weekly Workload: L-3, P-0 | |
| Name of the Course | CLINICAL PHARMACY | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Introduction:** Introduction to Clinical Pharmacy, drug-drug and drug-food interactions. **(2 Hrs)**
- Basic Concepts of Pharmacotherapy:** Clinical Pharmacokinetics and individualization of Drug Therapy; Drug Delivery Systems and their Biopharmaceutic & Therapeutic Considerations; Drug Use During Infancy and in the Elderly (Pediatrics & Geriatrics); Drug use during Pregnancy; Drug induced Diseases; The Basics of Drug Interactions; General Principles of Clinical Toxicology; Interpretation of Clinical Laboratory Tests. **(10 Hrs)**
- Cardiovascular and Hematopoietic Disorders:** Management of Hypertension, Congestive Heart Failure, Angina, Acute Myocardial Infarction, Cardiac arrhythmias, different types of anemias. **(4 Hrs)**
- Management of CNS Disorders:** Epilepsy, Parkinsonism, Schizophrenia, Depression. **(2 Hrs)**
- Management of Respiratory Diseases:** Asthma, tuberculosis and other Upper Respiratory Infections. **(3 Hrs)**
- Management of Gastrointestinal Disorders:** Pepticulcer, Ulcerative colitis, Hepatitis, Cirrhosis, Enteric Infections. **(3 Hrs)**
- Endocrine Disorders:** Diabetesmellitus, Thyroid Disorders. **(2 Hrs)**
- Urinogenital Infections:** Management of Urinary Tract Infections. **(2 Hrs)**
- Joint and Connective Tissue Disorders:** Rheumatic Diseases, Gout and Hyper-uricemia. **(2 Hrs)**
- Neoplastic Diseases:** AcuteLeukaemias, Hodgkin's disease. **(2 Hrs)**
- Therapeutic Drug Monitoring:** Introduction to therapeutic drug monitoring, its significance and methods of monitoring. **(5Hrs)**

12. Essential Drugs and Rational Drug Use: Definitions, Concept of essential drugs and rational use of drugs, List of essential drugs by WHO, WHO guidelines on rational use of drugs and their combinations. **(3 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Herfindel ET, Hirshman JL. Clinical Pharmacy and Therapeutics. New York: Lippincott Williams & Wilkins.
2. Gennaro AD. Remington's: The Science and Practice of Pharmacy. Pennsylvania: Mack Publishing Co.
3. Dipiro JL. Pharmacotherapy: A Pathophysiological Approach. Elsevier.
4. Katzung BG. Basic and Clinical Pharmacology. New York: Prentice Hall.
5. Laurence DR, Bennet PN. Clinical Pharmacology. London: Churchill Livingstone.
6. Rowland M, Tozer TN. Clinical Pharmacokinetics. New York: Lea and Febiger.
7. Winter M.E. Basic Clinical Pharmacokinetics. San Francisco: Applied Therapeutics Inc.

PHARMACEUTICAL JURISPRUDENCE AND INTELLECTUAL PROPERTY RIGHTS (BP-366)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-366 | Weekly Workload: L-3, P-0 | |
| Name of the Course | PHARMACEUTICAL JURISPRUDENCE AND INTELLECTUAL PROPERTY RIGHTS | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

Note: The teaching of all the below acts should cover the latest amendments.

- Introduction:** Brief review of Pharmaceutical Legislations, Drugs & Pharmaceutical Industry, and Pharmaceutical Education. **(3 Hrs)**
- An elaborate study of the following: (7 Hrs)**
 - Pharmaceutical Ethics
 - Pharmacy Act 1948.
 - Drugs and Cosmetics Act 1940 and Rules 1945.
 - Medicinal & Toilet Preparations (Excise Duties) Act 1955.
 - Narcotic Drugs & Psychotropic Substances Act 1985 & Rules.
 - Drugs Price Control Order.
- A brief study of the following with special reference to the main provisions: (10 Hrs)**
 - Poisons Act 1919
 - Drugs and Magic Remedies (Objectionable Advertisements) Act 1954
 - Medical Termination of Pregnancy Act 1970 & Rules 1975.
 - Prevention of Cruelty to Animals Act 1960.
 - States Shops & Establishments Act & Rules.
 - Insecticides Act 1968.
 - AICTE Act 1987.
 - Factories Act 1948.
 - Minimum Wages Act 1948.
- Intellectual Property-Concepts and Fundamentals:** The emergence and growth of the concepts regarding intellectual property (IP), intellectual property protection (IPP) and intellectual property rights (IPR); economic importance, mechanism for protection of intellectual property-patents. **(5 Hrs)**

10. Patenting: Copyright and trade mark protection, criteria for patentability, Indian Patent Act 1970 and amendments to Indian Patent Act 1970, basic considerations, filing of a patent application, grant of patent. **(5 Hrs)**

11. Trade Related Aspects of Intellectual Property Rights: Intellectual property and international trade, concept behind WTO (World Trade Organization), WIPO (World Intellectual Property Organization), GATT (General Agreement on Tariff and Trade), TRIPs (Trade Related Intellectual Property Rights), TRIMS (Trade Related Investment Measures) and GATS (General Agreement on Trades in Services), status in India and other developing countries. **(10 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Jain, NK. Textbook of Forensic Pharmacy. New Delhi: Vallabh Prakashan.
2. Mithal BM. Textbook of Forensic Pharmacy. Kolkatta: National Book Depot.
3. Bharti HK. Drugs & Pharmacy Laws in India. Indore: Sadhna Mandir.
4. Wadedhra BL. Law Relating to Patents, Trademarks, Copyright Design and Geographical Indications. New Delhi: Universal Law Publishing.
5. Bansal P. IPR Handbook for Pharma Students and Researchers. Hyderabad: Pharma Book Syndicate.
6. Trivedi PR. Encyclopedias of Intellectual Property Rights. New Delhi: Jnanada Prakashan.
7. Acts related to Pharmacy Education and Practice: AICTE Act 1987, Drug and Cosmetics Act, 1940 and Rules 1945, Drugs and Magic Remedies (Objectionable Advertisements) Act 1954, Drugs Price Control Order (DPCO), Factories Act 1948, Insecticides Act 1968, Medicinal & Toilet Preparations (Excise Duties) Act 1955, Medical Termination of Pregnancy Act (MTPA) 1970 & Rules 1975, Minimum Wages Act 1948, Narcotic Drugs & Psychotropic Substances Act 1985 & Rules, Pharmacy Act 1948, Poisons Act 1919.

HIMACHAL PRADESH TECHNICAL UNIVERSITY, HAMIRPUR

COURSE: B. PHARMACY

DETAILED SYLLABUS

SEMESTER-VII

MEDICINAL CHEMISTRY- III(BP-471)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-471 | Weekly Workload: L-3, P-0 | |
| Name of the Course | MEDICINAL CHEMISTRY – III | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs/ Week)

- Anticancer Chemotherapy:** Synthesis of selected drugs, mode of action, uses, structure activity relationship of anticancer agents including antimetabolites. **(6 Hrs)**
- Anti-infective Agents:** Synthesis of selected drugs, mode of action, uses, structure activity relationship of different classes of antibiotics, chemotherapeutic agents used in protozoal, parasitic and other infections, including antimetabolites like sulfonamides. **(8 Hrs)**
- Antiviral Drugs:** Synthetic procedures of selected drugs, mode of action, uses, structure activity relationship (including physicochemical aspects; biochemical approaches in drug designing to be discussed wherever applicable) of anti-viral agents including anti-HIV drugs. **(4 Hrs)**
- Immunomodulators:** Synthesis, mode of action, uses, structure activity relationship of immunosuppressives and immunostimulants. **(4 Hrs)**
- Amino Acids, Peptide, Nucleotides and Related Drugs:** Synthesis, mode of action, uses, structure activity relationship of thyroid and anti-thyroid drugs, peptidomimetics and nucleotidomimetics. **(5 Hrs)**

6. **Drugs Acting on GIT:** Synthesis, mode of action, uses, structure activity relationship of antiulcer agents, emetics and anti-emetics. **(4 Hrs)**
7. **Drugs acting on Respiratory System:** Synthesis, mode of action, uses, structure activity relationship of anti-asthmatics, expectorants and antitussives. **(4 Hrs)**
8. **Diagnostic agents and Pharmaceutical Aids:** Synthesis, mode of action and uses of radiographic contrast media, iodinated organic compounds, diagnostic dyes, miscellaneous diagnostic agents, coloring agents, flavoring agents and antioxidants. **(5 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Foye WC. Principles of Medicinal Chemistry. Philadelphia: Lea & Febiger.
2. Beale JM, Block JH. Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry. Philadelphia: Lippincott Williams and Wilkins.
3. Hansh C. Comprehensive Medicinal Chemistry -Quantitative Drug Design. Vol. IV. Oxford: Pergamon Press.
4. Jurs PC. Computer Software Application in Chemistry. New York: John Wiley & Sons.
5. Pops and Perruns. Computer Aided Drug Design. New York: Academic Press.
6. Wolff ME. Burger's Medicinal Chemistry. New York: John Wiley & Sons.

MEDICINAL CHEMISTRY- III PRACTICAL (BP-471P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-471P | Weekly Workload: L-0, P-3 | |
| Name of Course | MEDICINAL CHEMISTRY – III PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- Performing a practical exercises assigned by the examiner
- Viva-voce examination
- Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

- Synthesis of selected four drugs from the theory syllabus. **(4 Expts)**
- Determination of Pharmacopoeal standards for the synthesized drugs. **(4 Expts)**
- Spectral studies of synthesized drugs. **(2 Expts)**

PHARMACOLOGY – III (BP-472)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-472 | Weekly Workload: L-3, P-0 | |
| Name of the Course | PHARMACOLOGY – III | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Drugs Acting on Gastrointestinal Tract:** Antacids, Anti Secretory and Anti-ulcer drugs; Laxatives and anti-diarrhoeal drugs; Appetite Stimulants and Suppressants; Emetics and anti-emetics; Miscellaneous-Carminatives, demulcents, protectives, adsorbents, astringents, digestants, enzymes and mucolytics. **(8 Hrs)**
- Drugs acting on Respiratory System:** Anti-asthmatic drugs including bronchodilators; Anti-tussives and expectorants, Respiratory stimulants. **(10 Hrs)**
- Chemotherapy:** Introduction and General Principles of Chemotherapy. Antimetabolites like Sulfonamides. **(1 Hr)**
- Chemotherapy Using Antibiotics:** Introduction to antibiotics, Penicillins, Cephalosporins, Chloramphenicol, Erythromycin, Quinolones and Miscellaneous Antibiotics. **(4 Hrs)**
- Chemotherapy of Mycobacterial Infections:** Chemotherapy of tuberculosis and leprosy. **(2 Hrs)**
- Chemotherapy of Fungal / Viral Infections:** Fungal diseases, clotrimoxazole, viral diseases and antiviral drugs. **(3 Hrs)**
- Chemotherapy of Urinogenital Infections:** Urinary tract infections, sexually transmitted diseases. **(2 Hrs)**
- Chemotherapy of Cancer:** Drugs used for the chemotherapy of different types of cancers. **(3 Hrs)**
- Immunomodulators:** Immunosuppressive agents and immunostimulants. **(2 Hrs)**
- Principles of Toxicology:** Definition of poison, general principles of treatment of poisoning with particular reference to barbiturates, opioids, organophosphorous and atropine poisoning. Heavy metals and heavy metal antagonists. **(5 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

- Rang MP, Dale MM, Ritter JM. Pharmacology. New York: Churchill Livingstone.
- Brunton LL, Lazo JS, Parker KL. Goodman and Gilman's The Pharmacological Basis of Therapeutics. New York: McGraw Hill.
- Mycek MJ, Harvey RA, Champe PC. Lippincott's Illustrated Reviews -Pharmacology. Philadelphia: Lippincott Williams & Wilkins.
- Tripathi KD. Essential of medical Pharmacology, New Delhi: Jaypee Brothers Medical Publishers.
- Ghosh MN. Fundamentals of Experimental Pharmacology. Kolkata: Scientific Book Agency.
- Kulkarni SK. Handbook of Experimental Pharmacology. Vallabh Prakashan, Delhi.

PHARMACOLOGY – III PRACTICAL (BP-472P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-472P | Weekly Workload: L-0, P-3 | |
| Name of Course | PHARMACOLOGY – III PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. To calculate the pA₂ value of atropine using acetylcholine as an agonist on rat ileum preparation. **(1 Expt)**
2. To calculate the pA₂ value of mepyramine or chlorpheniramine using histamine as agonist on guinea pig ileum. **(2 Expts)**
3. To estimate the strength of the test sample of agonist/drug (e.g. Acetylcholine, Histamine, 5-HT, Oxytocin) using a suitable isolated muscle preparation employing Matching bioassay, Bracketing assay, Three point assay and Four point bioassay. **(5 Expts)**
4. To study the anti-secretory and anti-ulcer activity using pylorus ligation technique. **(2 Expts)**

PHARMACEUTICAL TECHNOLOGY – II (BP-473)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-473 | Weekly Workload: L-3, P-0 | |
| Name of the Course | PHARMACEUTICAL TECHNOLOGY – II | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Capsules:** Advantages and disadvantages of capsule dosage form, material for production of hard gelatin capsules, size of capsules, method of capsule filling, soft gelatin, capsule shell and capsule content, importance of base adsorption factor, minim per gram factor in soft gelatin capsules, quality control, stability testing and storage of capsule dosage forms. **(6 Hrs)**
- Microencapsulation:** Types of microcapsules, importance of microencapsulation in pharmacy, microencapsulation by phase separation, coacervation, multi orifice, spray drying, spray congealing, polymerisation complex emulsion, air suspension technique, coating pan and other techniques, evaluation of micro capsules. **(3 Hrs)**
- Tablets:** Formulation of different types of tablets, granulation, technology on large-scale by various techniques, physics of tablets making, different types of tablet compression machinery and the equipments employed, evaluation of tablets. **Coating of Tablets:** Types of coating, film forming materials, formulation of coating solution, equipments for coating, coating process, evaluation of coated tablets. Stability kinetics and quality assurance of tablets. **(10 Hrs)**
- Parenteral Products:** Routes of administration, water for injection, pyrogenicity, non-aqueous vehicles, isotonicity and methods of its adjustment; Formulation details, containers and closures - selection, prefilling treatment, washing, preparation of solution and suspensions, filling and sealing of ampoules, vials, intravenous infusion fluids, lyophilization and preparation of sterile powders, equipment for large scale manufacture and evaluation of parenteral products; Aseptic techniques-source of contamination and methods of prevention, design of aseptic area, laminar flow bench services and maintenance; Sterility testing of parenterals. **(10 Hrs)**

5. **Pharmaceutical Aerosols:** Definition, propellants, general formulation, manufacturing' and packaging methods, pharmaceutical applications. **(4 Hrs)**
6. **Ophthalmic Preparations:** Requirements, formulation, methods of preparation, containers, evaluation. **(4 Hrs)**
7. **Surgical Products:** Definition, primary wound dressing, absorbents, surgical cotton, surgical gauzes etc., bandages, adhesive tape, protective cellulosic hemostastics, official dressings, absorbable and nonabsorbable sutures, ligatures and catguts. Medical prosthetics and organ replacement materials. **(5 Hrs)**
8. **Packaging of Pharmaceutical Products:** Packaging components, types, specifications and methods of evaluation, stability aspects of packaging. Packaging equipments, factors influencing choice of containers, legal and other official requirements for containers, package testing. **(6 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Aulton ME. *Pharmaceutics: The Science of Dosage Form Design.* London: ELBS/Churchill Livingstone.
2. Lachman L, Lieberman HA, Kanig JL. *The Theory and Practice of Industrial Pharmacy.* Philadelphia: Lea & Febiger.
3. Ansel HC. *Introduction to Pharmaceutical Dosage Forms.* Mumbai: VM Verghese & Co.
4. Banker GS, Rhodes CT. *Modern Pharmaceutics.* New York: Marcel Dekker.
5. Carter SJ. *Cooper & Gunn's Tutorial Pharmacy.* New Delhi: CBS Publishers.
6. Rawlins EA. *Bentley's Textbook of Pharmaceutics.* London: Churchill Livingstone / ELBS.

PHARMACEUTICAL TECHNOLOGY – II PRACTICAL (BP-473P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-473P | Weekly Workload: L-0, P-3 | |
| Name of Course | PHARMACEUTICAL TECHNOLOGY – II PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Experiments to illustrate preparation, stabilization, physical and biological evaluation of pharmaceutical products like:
 - a. Powders. **(1 Expt)**
 - b. Capsules. **(2 Expts)**
 - c. Tablets. **(2 Expts)**
 - d. Parenterals. **(2 Expts)**
 - e. Micro capsules. **(1 Expt)**
2. Evaluation of materials used in pharmaceutical packaging. **(2 Expts)**

BIOPHARMACEUTICS AND PHARMACOKINETICS (BP-474)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-474 | Weekly Workload: L-3, P-0 | |
| Name of the Course | BIOPHARMACEUTICS AND PHARMACOKINETICS | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40Hrs: 3 Hrs / Week)

- Introduction:** Introduction to biopharmaceutics and pharmacokinetics and their role in formulation development and clinical setting. **(2 Hrs)**
- Absorption of Drugs:** Passage of drugs across biological barrier (passive diffusion, active transport, facilitated diffusion and pinocytosis), factors influencing absorption – physicochemical, physiological and pharmaceutical. **(4 Hrs)**
- Drug Distribution:** Drug distribution in the body, apparent volume of distribution, plasma proteinbinding, kinetics of plasma protein binding. **(4 Hrs)**
- Drug Excretion:** Concept of clearance, mechanism of renal clearance, clearance ratio, determination of renal clearance, extraction ratio, hepatic clearance, biliary excretion, extra hepatic circulation.**(5Hrs)**
- Pharmacokinetics:** Significance of plasma drug concentration measurement. Compartment model – definition and scope, pharmacokinetics of drug absorption - zero order and first order absorption rate constant using Wagner-Nelson and Loo-Reigelman method, volume of distribution and distribution coefficient. **(6Hrs)**
- Compartment Modelling:** One compartment and two compartment models, determination of pharmacokinetic parameters from plasma and urine data after drug administration by intravascular and oral route, curve fitting, method of residuals, regression procedures. **(8 Hrs)**
- Non-Linear Pharmacokinetics:** Causes of non-linearity, Michaelis-Menten equation, determination of V_{max} and T_{max} , detection of non-linearity (saturation mechanism). **(3 Hrs)**

8. **Clinical Pharmacokinetics:** Definition and scope, dose adjustment in patient with and without renal and hepatic failure, Pharmacokinetic drug interaction and their signification in combination therapy. **(4 Hrs)**
9. **Bioavailability and Bioequivalence:** Measures of bioavailability, C_{max} , t_{max} and Area Under Curve (AUC). Design of single dose bioequivalence studies and relevant statistics. **(4 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Rowland M and Tozer TN. Clinical Pharmacokinetics: Concept & Application. New York: Lea & Febiger.
2. Shargel L. Applied Biopharmaceutics & Pharmacokinetics. Singapore: McGraw Hill.
3. Gibaldi M. Biopharmaceutics & Pharmacokinetics. New York: Lea & Febiger.
4. Swarbrick J. Biopharmaceutics. New York: Lea & Febiger.
5. Brahmankar DM, Jaiswal SB. Biopharmaceutics and Pharmacokinetics - A Treatise. New Delhi: Vallbah Prakashan.

BIOPHARMACEUTICS AND PHARMACOKINETICS PRACTICAL (BP-474P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-474P | Weekly Workload: L-0, P-3 | |
| Name of Course | BIOPHARMACEUTICS AND PHARMACOKINETICS PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

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

COMMUNICATION SKILLS (BP-475)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-475 | Weekly Workload: L-3, P-0 | |
| Name of the Course | COMMUNICATION SKILLS | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Reading Skills:** The skill of effective reading-eye movements, fixations, regression, and visual wandering, the right approach to reading, factors, affecting the style of reading – reader related material related and environmental, Memory, retention, association of read material.(4 Hrs)
2. **Kinds of Reading:** Introduction to phonetics- familiarization with speech sounds and their symbols – articulation of speech sounds- stress and intonation.(3 Hrs)
3. **Grammar:** word building use of punctuation marks, articles, tenses, abbreviations, prepositions, idioms, and phrase transformation of sentences, incorrect to correct English, single word for a group of words.(7 Hrs)
4. **Business Letter-Writing:** Principles, structure and style of writing business letters i.e., sales letters, claim and adjustment letters, inviting quotations/tenders, writing a memo, job application letters, preparing personal resume. (4 Hrs)
5. **Effective Meetings:** Qualities i.e. planning, processing the discussion, conducting a meeting , use of different type of questions, summaries, handling problem situations and problem people, writing notices, agenda and minutes of meeting. (3 Hrs)
6. **Report Writing:** Characteristics, types of reports, structure of technical/research reports, preparatory steps to report writing. (2 Hrs)
7. **Elements of Style:** Definition of style, characteristics of good technical style- practical hints to improve the style of writing; precise writing; Comprehension of passages(May be picked up from the books recommended for reading).(5 Hrs)

8. **Listening Skills:** Barriers to listening, effective listening and feedback skills; Telephone techniques- Considerations of listening and voice, developing telephone skills- preparing for the call, follow up action. Handling difficult calls and difficult callers.(5 Hrs)
9. **Skills of Effective Speaking:** Preparation i.e., deciding the objective, preparing the environment, organizing the material, selection of words, voice modulation, speed, expression, body language, dealing with questions, dealing with nervousness, presentation of audio-visual aids.(4 Hrs)
10. **Group Discussion Skills:** The art of participating in group discussion i.e., initiative, cooperation with group members, analysis of the issue, putting one's views effectively, establishing leadership.(3 Hrs)

Books Recommended

Note: Recent editions of the following books to be referred

1. Vikram K Das, Kalyani Samantray. Introduction to Professional English and Soft Skills. New Delhi: Cambridge Press.
2. Technical Report Writing. London: British Association for Commercial and Industrial Education.
3. Wright C. (Ed). Handbook of Practical Communication Skills. New Delhi: JAICO Books.
4. Sinha KK. Business Communication. New Delhi: Galgotia Publishing Company.
5. Common Errors in English. New Delhi: Sudha Publications.
6. Hashem A. Common Errors in English. New Delhi: Ramesh Publishing House.
7. Objective English. New Delhi: Tata McGraw Hill Publishing Co.
8. Bansal RK, Harrison JB. Spoken English for India, Hyderabad: Orient Longman.
9. Kumar V. The Sounds of English. New Delhi: Makaav Education Software.
10. Sharma RC, Krishna Mohan. Business Correspondence and Report Writing. New Delhi: Tata McGraw Hill.
11. Group Discussion. New Delhi: Sudha Publications.

COMMUNICATION SKILLS PRACTICAL (BP-475P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-475P | Weekly Workload: L-0, P-3 | |
| Name of Course | COMMUNICATION SKILLS PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Word processing of documents. **(1 Expt)**
2. Report writing. **(1 Expt)**
3. Preparing agenda for meeting. **(1 Expt)**
4. Preparing minutes of the meetings/seminars. **(1 Expt)**
5. Preparing press releases / advertisements. **(1 Expt)**
6. Preparing a brochure. **(1 Expt)**
7. Preparing a power point slide show on a PC. **(1 Expt)**
8. Group discussion tasks / Seminars. **(3 Expts)**

HIMACHAL PRADESH TECHNICAL UNIVERSITY, HAMIRPUR

COURSE: B. PHARMACY

DETAILED SYLLABUS

SEMESTER-VIII

INSTRUMENTAL METHODS OF ANALYSIS (BP-481)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-481 | Weekly Workload: L-3, P-0 | |
| Name of the Course | INSTRUMENTAL METHODS OF ANALYSIS | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- UV-Visible Spectroscopy:** Brief review of electromagnetic spectrum, UV-Visual range, Interaction of electro-magnetic radiation (UV-Vis) and matter and its effects, Instrumentation, Pharmaceutical applications. **(6 Hrs)**
- Infra-Red Spectroscopy:** Nature of Infra-red radiation, Interaction of IR radiation with organic molecules and effects on bonds, principle, brief outline of classical IR instrumentation, applications. **(6 Hrs)**
- Nuclear Magnetic Resonance Spectroscopy (NMR):** Principles of NMR, Instrumentation, Applications. **(6 Hrs)**
- Mass Spectrometry:** Principle, instrumentation, mass spectrum, types of peaks and its characteristics, applications of mass spectrometry. **(6 Hrs)**
- Emission Spectroscopy:** Principle, basic instrumentation, interpretation of spectra and pharmaceutical applications of fluorimetry and flame photometry. **(4 Hrs)**

6. **Atomic Absorption Spectroscopy:** The theoretical aspects, instrumentation, interpretation of spectra, and applications of atomic absorption spectroscopy. **(2 Hrs)**
7. **X-Ray Diffraction:** The theoretical aspects, instrumentation, interpretation of spectra, and applications of X-ray diffraction in pharmacy. **(3 Hrs)**
8. **Radio Immuno Assay (RIA):** The theoretical aspects, instrumentation, and diagnostic, medical and pharmaceutical applications of RIA. **(3 Hrs)**
9. **Analytical Validation and Quality Management:** Interpretation of analytical data, validation of analytical procedures, TQM, quality review, regulatory control. **(4 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Lee, DC. Pharmaceutical Analysis. London: Blackwell.
2. Indian Pharmacopoeia. New Delhi: Ministry of Health and Family Welfare.
3. Willard HH, Merritt LL, Dean JA. Instrumental Methods of Analysis. New Delhi: CBS Publishers.
4. Ewing GW. Instrumental Methods of Chemical Analysis. Singapore: McGraw Hill.
5. Schirmer RE. Modern Methods of Pharmaceutical Analysis. Vol 1 & 2. Pennsylvania: Franklin Book Co.
6. Kemp W. Organic Spectroscopy: London: ELBS / WH Freeman & Co.
7. Munson JW. Pharmaceutical Analysis: Modern Methods. Part A & B. New York: Marcel Dekker.

INSTRUMENTAL METHODS OF ANALYSIS PRACTICAL (BP-481P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-481P | Weekly Workload: L-0, P-3 | |
| Name of Course | INSTRUMENTAL METHODS OF ANALYSIS PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Quantitative estimation of formulations containing single / multiple drugs by UV Visible spectrophotometry. **(4 Expts)**
2. Estimation of Na⁺, K⁺, Ca⁺ ions by flame photometry. **(2 Expts)**
3. Interpretation of IR spectra of compounds with different functional groups such as -COOH, -COOR, -CONHR, -NH₂, -OH. **(2 Expts)**
4. Interpretation of structure of 3-4 simple organic compounds using UV, IR, NMR and MS. **(2 Expts)**

NOVEL DRUG DELIVERY SYSTEMS (BP-482)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-482 | Weekly Workload: L-3, P-0 | |
| Name of the Course | NOVEL DRUG DELIVERY SYSTEMS | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Introduction:** Fundamental concepts of controlled release. **(3 Hrs)**
- Modified Release Oral Drug Delivery Systems:** Principle, formulation, evaluation of osmotic pumps, pH controlled, ion exchange controlled and diffusion controlled systems. **(7 Hrs)**
- Ocular Drug Delivery:** Factors affecting ocular drug absorption, development of ocular drug delivery systems and evaluation with special reference to ocular inserts. **(6 Hrs)**
- Buccal Drug Delivery:** Mechanism of mucoadhesion, Bioadhesive polymers, Development of buccal drug delivery systems, Evaluation techniques. **(7 Hrs)**
- Transdermal Drug Delivery:** Permeation through skin, physicochemical factors in drug permeation, permeation enhancers, approaches and technologies for developing transdermal drug delivery systems and their evaluation, Iontophoresis. **(6 Hrs)**
- Particulate Drug Delivery Systems:** Formulation, evaluation and pharmaceutical applications of Liposomes, Niosomes, Resealed Erythrocytes, Microspheres and Nanoparticles. **(11 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

- Osborne DW, Amann AH. Topical Drug Delivery Formulations. New York: Marcel Dekker.
- Tyle P. Drug Delivery Devices: Fundamental Applications, New York: Marcel Dekker.
- Robinson R, Lee VHL. Novel Drug Delivery Systems. New York: Marcel Dekker.
- Jain NK. Novel and Drug Delivery Systems, New Delhi: CBS Publishers.
- Bean HS, Becket AH, Carless JE. Advances in Pharmaceutical Sciences. Vol. 5. London: Academic Press.
- Roseman TJ, Mansdorf SZ. Controlled Release Delivery Systems. New York: Marcel Dekker.

NOVEL DRUG DELIVERY SYSTEMS PRACTICAL (BP-482P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-482P | Weekly Workload: L-0, P-3 | |
| Name of Course | NOVEL DRUG DELIVERY SYSTEMS PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Dissolution studies of marketed SR product. **(1 Expt)**
2. Preparation and evaluation of microspheres using egg albumin as polymer. **(1 Expt)**
3. Preparation and evaluation of matrix tablets using different polymers. **(2 Expts)**
4. Preparation and evaluation of buccal mucoadhesive tablets. **(1 Expt)**
5. Preparation and evaluation of transdermal films with different polymers. **(2 Expts)**
6. Preparation and evaluation of pH controlled release system using different grades of Eudragits. **(2 Expts)**
7. Preparation of niosomes and evaluation. **(1 Expt)**

QUALITY CONTROL AND QUALITY ASSURANCE (BP-483)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-483 | Weekly Workload: L-3, P-0 | |
| Name of the Course | QUALITY CONTROL AND QUALITY ASSURANCE | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs /Week)

- Introduction:** An understanding of the concepts of quality assurance, good manufacturing practice and quality control as applied to the pharmaceutical Industry. **(2 Hrs)**
- Raw Materials Control:** Raw material, purchase specifications, vendor selection criteria, controls on raw materials. **(3Hrs)**
- Manufacturing Quality Control:** Manufacturing controls on dosage forms, manufacturing documents, master formula record, batch formula records, batch packaging records, quality audits of manufacturing processes and facilities. **(6 Hrs)**
- In-process Quality Control:** In-process quality controls on various sterile and non-sterile dosage forms, standard operating procedures (SOP) for various operations like cleaning, filling, drying, compression, disinfection, fumigation, sterilisation, etc. **(6 Hrs)**
- Packaging and Labelling Control:** Packaging and labelling controls, line clearance, reconciliation of labels, cartons and other packaging material. **(3Hrs)**
- Validation:** Introduction to validation – concurrent validation, prospective validation and retrospective validation, design, development and process validation methods for pharmaceutical operations involved in production with special reference to tablets, cleaning validation, validation of production equipment and analytical instruments. **(4 Hrs)**
- Quality Audit:** Quality control documentation, retention of samples and records, quality audits and quality review. **(2Hrs)**

8. **Drug Regulatory Affairs:** Regulation on manufacture of drugs in India, drug regulatory controls and authorities, requirements of GMP, cGMP, GLP, ISO 9000 series, submission of marketing application for India, US and European markets. **(8 Hrs)**
9. **Performance Evaluation of Pharmaceutical Products:** Biopharmaceutical classification scheme (BCS), federal perspectives on *in vitro* dissolution of immediate release and extended release products, federal perspectives on bioavailability and bioequivalence, *in vitro* – *in vivo* correlations and bio-waiver. **(6 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Weinberg S. Good Laboratory Practice Regulations. New York: Marcel and Dekker.
2. SwarbrickJ. Encyclopedia of Pharmaceutical Technology. New York: Marcel Dekker.
3. Berry JR, Nash RA. Pharmaceutical Process Validation. New York: Marcel Dekker.
4. Will SH, Stoker JR. Good Manufacturing Practices for Pharmaceuticals. New York: Marcel Dekker.
5. Brewer RF. Design of Experiments for Process Improvement and Quality Assurance. New Delhi: Narosa.

Regulatory Guidelines

1. FDA Guidelines. Website: www.fda.gov/cder/guidance/index.htm.
2. Orange Book. Website: www.fda.gov/cder/ob/default.htm.

QUALITY CONTROL AND QUALITY ASSURANCE PRACTICAL (BP-483P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-483P | Weekly Workload: L-0, P-3 | |
| Name of Course | QUALITY CONTROL AND QUALITY ASSURANCE PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Quality control tests for tablets, capsules, liquid orals, semi-solids (6 Expts)
2. Validation of various instruments used in manufacturing (4 Expts)

INDUSTRIAL PHARMACOGNOSY (BP-484)

| | | | |
|---------------------------------|---|----------------------------------|-----------------------|
| Course Code | BP-484 | Weekly Workload: L-3, P-0 | |
| Name of the Course | INDUSTRIAL PHARMACOGNOSY | | |
| Lectures to be delivered | 40 (1 hr each for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs. | Max. Marks: 70 | Min. Marks: 35 |
| Continuous Assessment | Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10% | | Max. Marks: 30 |

INSTRUCTIONS

- For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
- For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

- Chemotaxonomy:** Chemotaxonomy of medicinal plants. (5 Hrs)
- Aromatic Plants:** Utilization of aromatic plant and derived products with special reference to sandalwood oil, mentha oil, lemongrass oil, vetiver oil, geranium oil and eucalyptus oil. (4Hrs)
- Herbal Cosmetics:** Raw materials used in herbal cosmetic with reference to Shampoos, conditioners, hair darkeners, skin care. (5 Hrs)
- Plant Biotechnology:** Historical development of plant tissue culture, types of cultures, nutritional requirements, growth and their maintenance, production of secondary metabolites like shikonin and taxol, biotransformation, immobilization of cells and enzymes, applications of plant tissue culture in pharmacognosy. (6Hrs)
- Allergens:** Natural allergens, photosensitizing agents and fungal toxins. (3Hrs)
- Neutraceuticals:** Herbs as health foods. (4Hrs)
- Herbal Industries:** A Brief account of plant based industries involved in work on Medicinal and Aromatic Plants in India. Utilization and production of phytoconstituents such as quinine, calcium sennosides, podophyllotoxin, diosgenin, solasodine, and tropane alkaloids. (4Hrs)
- Worldwide Trade of Medicinal Plants:** World-wide trade in medicinal plants and derived products with special reference to diosgenin (disocorea), taxol (taxussps) digitalis, tropane alkaloid containing plants, papain, cinchona, ipecac, liquorice, ginseng, aloe, valerian, rauwolfia and plants containing laxatives. (6Hrs)
- Intellectual Property Rights:** Plant breeder's rights with special reference to phytoconstituents. (3 Hrs)

Books Recommended

Note: Recent editions of the following books to be referred

- Kalia AN. Textbook of Industrial Pharmacognosy. New Delhi: CBS Publishers.
- Wealth of India - Raw Materials. New Delhi: NISCAIR.
- Namdeo A. Medicinal Plant Biotechnology, New Delhi: Career Publications.
- Veersham C. Medicinal Plant Biotechnology. New Delhi: CBS Publishers.
- Vyas SP, Dixit VK. Pharmaceutical Biotechnology. New Delhi: CBS Publishers.
- Ramawat KG. Plant Tissue Culture. New Delhi: S Chand & Co.

INDUSTRIAL PHARMACOGNOSY PRACTICAL (BP-484P)

| | | | |
|-----------------------------------|--|----------------------------------|-----------------------|
| Course Code | BP-484P | Weekly Workload: L-0, P-3 | |
| Name of Course | INDUSTRIAL PHARMACOGNOSY PRACTICAL | | |
| Practicals to be Conducted | 13 (not less than 10 for each semester) | | |
| Semester End Examination | Max. Time: 3 hrs | Max. Marks: 50 | Min. Marks: 25 |
| Continuous Assessment | Lab work 30%, Lab record 25%, Viva 25%, Attendance 20% | | Max. Marks: 50 |

INSTRUCTIONS

Laboratory examination will consist of three parts:

- a. Performing a practical exercises assigned by the examiner
- b. Viva-voce examination
- c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Isolation of some selected phytoconstituents studied in theory. **(4 Expts)**
2. Extraction of volatile oils and their chromatographic profiles. **(3 Expts)**
3. Some experiments in plant tissue culture (Demonstration). **(1 Expt)**
4. Preparation of Herbal Cosmetics. **(2 Expts)**