## Scheme of Studies

### Course Codes and Course titles

<table>
<thead>
<tr>
<th>Year - I</th>
<th>Semester I</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
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<tr>
<td></td>
<td></td>
<td>PHM-CHEM-7104</td>
<td>Pharmaceutical Analysis</td>
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<td>PHM-CHEM-7104P</td>
<td>Pharmaceutical Analysis Practical</td>
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<td>PHM-CHEM-7105</td>
<td>Pharmaceutical Properties and Environmental Monitoring</td>
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<td>PHM-CHEM-7105P</td>
<td>Pharmaceutical Properties and Environmental Monitoring Practical</td>
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<td>PHM-CHEM-7106</td>
<td>Pharmaceutical Biostatistics</td>
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<td>PHM-CHEM-7107</td>
<td>General safety</td>
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|                   | Semester II | PHM-CHEM-7204 | Current Medicinal Chemistry                              | 3            |
|                   |            | PHM-CHEM-7204P | Current Medicinal Chemistry Practical                    | 1            |
|                   |            | PHM-CHEM-7205 | Pharmacognosy                                            | 3            |
|                   |            | PHM-CHEM-7205P | Pharmacognosy Practical                                  | 1            |
|                   |            | PHM-CHEM-7206 | Drug Design                                               | 2            |
|                   |            | PHM-CHEM-7207 | Combinatorial Chemistry                                  | 2            |

**Optional Courses**

| PHM-CHEM-7108 | Industrial Management | 2 |
| PHM-CHEM-7208 | Research Methodology  | 2 |

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<tr>
<th>Year – II</th>
<th>Semester – III &amp; IV</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
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<td>PHM-CHEM-7301</td>
<td>Internship</td>
<td>Nil</td>
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<td>PHM-CHEM-7499</td>
<td>Thesis and Viva Voce</td>
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COURSE CONTENTS
Year-I, Semester-I

TITLE: PHARMACEUTICAL ANALYSIS
COURSE NO: PHM-CHEM-7104 (Credit hrs. 3)


Nuclear magnetic resonance spectroscopy: Magnetic properties of nuclei, field and precession, chemical shift concept, isotopic nuclei, reference standards and solvents. \(^1\)H-NMR spectra, multiplicity, coupling constants, integration of signals, interpretation of spectra, decoupling-double resonance and shift reagent methods, application of \(^1\)H-NMR spectroscopy in pharmaceutical analysis.

Mass spectrometry: Basic principles and brief outline of instrumentation. Ion formation, molecular ion, metastable ion, fragmentation process in relation to molecular structure and functional groups. Relative abundance of isotopes, chemical ionization, FAB, ESI, MALDY, GC-MS and other recent advances in mass spectrometry.


Recommended Books


TITLE: PHARMACEUTICAL ANALYSIS PRACTICAL
COURSE NO: PHM-CHEM-7104P (Credit hrs. 1)

- Assay of commercial drugs having following active molecules on UV-Visible spectrophotometer.
  - Esomeprazole magnesium
  - Pantoprazole sodium
  - Ciprofloxacin.HCl
  - Ofloxacin
  - Enrofloxacin
  - Cetirizine dihydrochloride
  - Levocetirizine dihydrochloride
- Assay of analgesics by HPLC
- Assay of acetylsalicylic acid and salicylic acid by UV method
- Assay of acetylsalicylic acid and salicylic acid by titration
- Analysis of mixtures by GCMS

Recommended Books


Validation: Process validation, analytical validation, equipment validation, regulatory perspective of validation.


**Recommended Books**

TITLE: PHARMACEUTICAL PROPERTIES & ENVIRONMENTAL MONITORING PRACTICAL COURSE NO: PHM-CHEM-7105P (Credit hrs. 1)

- Manufacture of the following pharmaceutical ingredients:
  - Pyrazinamide
  - Benzylbenzoate
  - Parabens
  - Aspirin
  - Paracetamol
  - Derivitization of benzene
  - Sulphonamide preparations
  - Practical based on theory syllabus
- Limit test
- Ash content (sulphated ash)
- Karl-Fisher titration
- LOD

Recommended Books


Sampling, sample size and power. Statistical inference and hypothesis. Tests for statistical significance: student t-test, Chi-square test, confidence level, Null hypothesis.

Linear regression and correlation. Analysis of Variance (one way and two way). Factorial designs (including fraction factorial design). Theory of probability, Permutation and Combination. Ratios, Percentage and Proportion. Two-way ANOVA and Multiple comparison procedures.

**Recommended Books**

General Safety Rules, Safety Equipment and First-aid:
General Safety Rules for preventing laboratory accidents. Safety equipment: shields for eye and face protection, proper clothing for protection in laboratory accident, fire equipment and fire safety. First-aid: Treatment of minor-cuts and severe bleeding, Treatment of burns caused by fire, chemical burns and medication for emergency treatment, artificial respiration, electric shock, damage to clothes.

Safe Disposal of Reagents and Derivatives:

Recommended Books

Classification, mechanism of action, SAR, synthetic approach and recent advances of fourth
generation cephalosporins and fluoroquinolone antibacterials.

Classification, mechanism of action, SAR, synthetic approach and recent advances of CNS
depressant agents.

Classification, mechanism of action, SAR, synthetic approach and recent advances of:
a. Sex Hormones and corticosteroids.
b. Adrenergic agents.

classification, mechanism of action, synthetic approach & recent advances of:
a. Anti- HIV agents.
b. AChE inhibitors and statins

Classification, mechanism of action and recent advances of:
a. Drugs used in peptic ulcer.
b. COX-2 inhibitors
c. Artemisin derivatives
d. Macrolide and anti-cancer antibiotics.

Recommended Books

3. Alex Gringauz-“Introduction to Medicinal Chemistry” Wiley-VCH, Inc. New York
   (1997).
TITLE: CURRENT MEDICINAL CHEMISTRY PRACTICAL
COURSE NO: PHM-CHEM-7204P

(Credit hrs. 1)

➢ Preparation of the following pharmaceutical ingredients:
  • Magnesium stearate
  • Magnesium trisilicate
  • Sodium phosphates
  • Aluminum hydroxide
  • Ferrous sulphate
  • Calcium gluconate
  • Zinc gluconate
  • Potassium iodide

➢ Formulation of
  • Tablets
  • Syrups
  • Ophthalmics

Recommended Books

4. Abraham DJ, “Burger’s Medicinal Chemistry & Drug Discovery”, Vol-VIII,
Role of Natural Products in new Drug Development, plant derived drugs, novel drug templates.

Bioactive compounds from micro-organism with reference to antibiotics, anti-protozoals and marine natural products.

Structural elucidation insights for natural products by combination of classical, synthetic, degradative and spectral methods with reference to quercetin, tropanes and morphinan type alkaloids, quinine, digitoxigenin, camphor and caffeine.

Pharmacological Screening of Herbal Drugs- Introduction and evaluation of herbal drugs for antidiabetic, hepatoprotective, diuretic, anti-diarrhocal, antiulcer, wound healing, cardiovascular, anti-inflammatory, analgesic, antipyretic, antifertility, anti-oxidant, anti-viral & cyto-toxic properties.

**Recommended Books**

Isolation of Natural Products from the following:

- Red Pepper
- Turmeric
- Piperine from Black Pepper
- Caffeine from tea
- Separation of plant pigments by TLC
- Separation of plant pigments by paper chromatography
- Cholesterol from gall stone, brain and egg
- Lactose from milk
- Oil from orange peels

Recommended Books

TITLE: DRUG DESIGN  
COURSE NO: PHM-CHEM-7206  

Introduction to Drug Design Concept, Lead Discovery Interactions (Forces) Involved in Drug Receptor Complex, Physicochemical Properties in Relation to Biological Action, Stereochemical Aspects in Drug Design.


Recommended Books


Recommended Books

6. Arno. F. Spatola, “Combinatorial Chemistry and Molecular Diversity Course at the University of Louisville: A Description” Department of Chemistry, University of Louisville. (1996).
OPTIONAL COURSES

TITLE: INDUSTRIAL MANAGEMENT
COURSE NO: PHM-CHEM-7108

Introduction of Management
- Meaning of management
- Characteristics of management
- Importance of management
- Levels of management
- Functions of management

Principles of Management
- Scientific Management
- Henry Fayol’s principles
- Functions of management

Administrative Management
- Elements of management
- Planning
- Organizing
- Staffing
- Directing
- Supervising
- Controlling

Managerial Control
- Techniques of control
- Budget
- Budgetary control
- Statistical data and report

Planning and Forecasting
- Characteristics of planning
- Benefits of planning
- Limitations of planning
- Classification of plans

Personnel Management
- Objectives of personnel management
- Functional areas of personnel management
- Organizational structure of the personnel department
- Recruitment and selection process

Production Management
- Historical evolution
- Concept of production
- Production system
- Production methods
• Production planning
• Classification of the production systems

**Material Management**
• Objectives of material management
• Organization of a materials management department
• Importance of materials management
• Purchasing
• Storekeeping

**Channels of distribution**
• Advantages of distribution channels
• Factors to be considered in the selection of distribution channels
• Different channels of distribution
• Types of middlemen

**Recommended Books**

Research Methodology in Chemistry:

Recommended Books


Year-II, Semester-III & IV

TITLE: INTERNSHIP
COURSE NO: PHM-CHEM-7301 (Credit hrs. Nil)

TITLE: THESIS AND VIVA VOCE
COURSE NO: PHM-CHEM-7499 (Credit hrs. 12)