Facility of Pharmacy, Integral University, Lucknow.

B. Pharm. Course (Hours Prescribed)

STUDY AND EVALUATION SCHEME

Effective from Session 2012–13

COURSE: B. Pharm. Year – III, Semester – VI

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course Code</th>
<th>Subject Name</th>
<th>Period (Hours)</th>
<th>Sessional Exam</th>
<th>Exam Subject Total</th>
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<td>Theory</td>
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<td>CT</td>
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<td>Pharmaceutical Chemistry – V (Medicinal Chemistry - I)</td>
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<td>Pharmaceutics – VII (Pharmaceutical Technology – II)</td>
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<td>PHAR – 363</td>
<td>Pharmacology - III</td>
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<td>4.</td>
<td>PHAR – 364</td>
<td>Pharmacognosy – IV</td>
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<td>Practical</td>
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<td>Day to Day Evaluation</td>
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<td>Pharmacognosy – IV</td>
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|              | 15 | 16 | 0  | 0  | 180 | 720 | 900 |

T.A. – Teacher Assessment ESE – End Semester Examination CT – Cumulative Test

NOTE: Duration in Theory & Practical of ESE shall be three (03) hours and four (04) hours respectively.
SEMMESTER – VI

PHAR – 361

PHARMACEUTICAL CHEMISTRY – V

(MEDICINAL CHEMISTRY – I)

THEORY

Unit – I

Basic Principles of Medicinal Chemistry: Physicochemical aspects (Opticals, geometric and bioisosterism) of drug molecules and biological action. Drug receptor interaction including transduction mechanism. [08]

Mode of action, uses, structure activity relationship of the following classes of drugs (Synthetic procedures of individually mentioned drugs only)

Unit – II

A. Drugs Acting at Synaptic and Neuro-Effector Junction Sites:
   ii) Adrenergic Drugs: Ephedrine, Isoproterenol, Amphetamine, Salbutamol, Terbutaline, Adrenaline. [08]

Unit – III

B. Drugs Acting on the Central Nervous System:
   i) General Anaesthetics: Thiopental, Ketamine, Methohexital, Enflurane.
   ii) Local Anesthetics: Lignocaine, Benzocaine, Bupivacaine.
   iii) Hypnotics and Sedatives: Phenobarbitone, Pentobarbitone.
   iv) Opioid Analgesics: Pethidine, Methadone, Pentazocine.
   v) Antitussives: Caramiphen, Dextromethorphan. [08]

Unit – IV

vi) Anticonvulsants: Phenytoin, Carbamazepine, Ethosuximide, Valproic Acid.
   vii) Antiparkinsonism drugs: Carbidopa, Levodopa.
   viii) CNS Stimulants: Caffeine, Nikethamide. [08]

Unit – V

ix) Psychopharmacological Agents:
   a) Neuroleptics: Imipramine, Amitryptyline.
   b) Antidepressants: Doxepin, Phenelzine, Meprobamate, Chlordiazepoxide, Diazepam.
   c) Antispasmodic and anti ulcer drugs: Dicyclomine, Ranitidine, Omeprazole, Pirenzipine.
   d) Neuromuscular Blocking Agents: Gallamine, Triethiodide, Mephenesin, Pancuronium….. [08]
PRACTICAL
1. Synthesis of selected drugs from the course content involving two or more steps.
2. Establishing the pharmacopoeial standards of the drugs synthesized.

SUGGESTED PRACTICALS
1. Synthesis of Methyl salicylate.
2. To establish pharmacopoeial standards of Methyl salicylate.
3. Synthesis of Paracetamol
4. To establish pharmacopoeial standards of paracetamol.
5. To synthesize Benzocaine
6. To establish pharmacopoeial standards of Benzocaine
7. Synthesis of Phenytoin.
8. To establish pharmacopoeial standards of Phenytoin.
10. To establish pharmacopoeial standards of Hydantion.
12. To establish pharmacopoeial standards of Barbituric acid.

BOOKS RECOMMENDED:
3. Pharmacopoeia of India, Ministry of Health, Govt. of India.
Unit – I

1. **Capsules:** Material for production of hard gelatine capsule, methods of capsule filling, soft gelatin capsule shell and capsule content, quality control, stability testing and storage of capsule dosage forms.

2. **Micro Encapsulation:** Types of microcapsule, importance of micro encapsulation in pharmacy, micro encapsulation by phase separation, co-acervation, multi orifice spray drying, spray congealing, polymerization, complex, emulsion, air suspension technique, coating pan and other techniques, evaluation of microcapsules. [10]

Unit – II

3. **Tablets:**
   a. Formulation of different types of tablets, granulation technology on large scale by various techniques, different types of tablet compression machinery and the equipments employed; evaluation of tablets.

Unit – III

Novel Drug Delivery systems:

4. **Control Drug Delivery System:**
   a) Theory, release and diffusion of drugs from C.D.D.S. General methods of design and evaluation of C.D.D.S.
   b) Carriers for drug delivery systems, Products, Physical, Chemical and biomedical engineering approach to achieve controlled drug delivery.

5. **Transdermal Drug Delivery System:**
   b. Implants and inserts: Types, design and evaluation methods, Osmotic pumps.

6. **Targeted Drug Delivery systems:**
   Concept, importance and methods of drug targeting. Drug immobilization techniques-nanoparticles, liposomes, neosomes, pharmacosomes and erythrocytes.

7. **Sustained Release Drug Delivery System:**
   Advance concepts in the design, development and production of sustained release products.[10]

Unit – IV

8. **Parenteral Products:**
   a) Water for injection, pyrogenicity, nonaqueous vehicles. Formulation details, containers and closures and their selection.
   Pre-filling treatment, washing of containers and closures, preparation of solution and suspensions, filling and sealing of ampoules, vials, infusion fluids, lyophilization & preparation of sterile powders, equipment for large scale manufacture and evaluation of parental products.
   b) Ophthalmic, Nasal and Ear Products. [05]

9. **Surgical Products:**
   Definition, primary wound dressing absorbents, surgical cotton, surgical gauzes etc. bandages, adhesive type, protective cellulosic hemostasis, official dressing, absorbable and non absorbable sutures, ligatures and catguts.
Unit – V

10. Packaging of Pharmaceutical Product:
   a) Packaging materials with special reference to polymers, metals glass and plastics, control of packaging materials.
   b) Blister and strip packaging.
   c) Testing of containers and closures. Pharmacopoeial tests and specifications, defects in packages.
   d) Stability of package and packaging material.
   e) Ancillary materials used in packaging.
   f) Sterilization of packaging materials.
   g) Packaging of parenterals, Ophthalmic and aerosols.

PHAR – 362 P
PHARMACEUTICAL TECHNOLOGY – II

PRACTICAL
1. Experiments to illustrate preparation, stabilization & physical evaluation of pharmaceutical products like powders, capsules, tablets, parenterals & microcapsules.
2. Evaluation of Materials used in pharmaceutical packaging.

SUGGESTED PRACTICALS
1. Preparation, Evaluation Packing of the following dosage forms:
   a. Capsules : Chloramphenicol Capsules IP
   b. Microcapsules : Co – acervation (Temperature Change)
   c. Tablets : Uncoated – Paracetamol Tablets IP
   d. Tablets : Film Coated – Ibuprofen Tablets IP
   e. Tablets : Enteric Coated – Aspirin Tablets
   f. Parenteral : Disodium EDTA Injection IP (vials)
   g. Parenteral : Dextrose NaCl IV Infusion IP(Infusion boilers)
   h. Parenteral : Water for injection, IP (Ampoule)
   i. Eye Drops : Zinc Sulphate IP
   j. Eye Ointment : Sulphacetamide Sodium IP
2. Formulation and evaluation of sustained releases dosage forms – Aspirin Extended release (Matrix embedding method, granules (USP/NF coating of granules)
BOOK RECOMMENDED
5. Libermann HA, Lachman L, Theory & Practice of Industrial Pharmacy, Lea & Febiger, Philadelphia, U.S.A.
6. Robinson and Vincent, “Controlled Drug Delivery”.
9. Lisbeth, Illume & Davis “Polymers in Controlled Drug Delivery”.

PHAR – 363
PHARMACOLOGY – III

THEORY
Unit – I
1. Drugs Acting on CNS – I: Narcotic and non-narcotic analgesic, Drugs in convulsive disorders, Drugs in Parkinson’s disease, Sedatives, Hypnotics and Anxiolytics. [09]

Unit – II
2. Drugs Acting on CNS – II: Antidepressant, antimaniacs and anti-psychotic, General anesthetics, Local anesthetics. [08]

Unit – III
3. Drugs acting on endocrine system – I: Diabetes mellitus, Insulins, Oral hypoglycemics, Corticosteroids, Thyroid and Antithyroid drugs. [09]

Unit – IV
4. Drugs acting on endocrine system – II: Male sex hormones and Anabolics, Female sex hormones and Oral contraceptives, Fertility drugs, Hormones controlling calcium metabolism, Oxytocics and Tocolytics. [09]

Unit – V
5. Bioassays: Definition and terminology, Condition under which bioassay should be done, Principles of bioassay, Types of bioassay, Important Pharmacopoeal bioassays. [05]
PHAR – 363 P
PHARMACOLOGY – III

PRACTICAL
Use of software alternative to animals for practical where possible.
1. To study the analgesic effect of drug on experimental animal.
2. To record the locomotion activity of a given drug on experimental animal by using actophotometer.
3. To record the muscle grip of animal by using rota rod.
4. To study the hypnotic effect of Diazepam on mice.
5. To study the anticonvulsant activity of phenytoin sodium by using MES method.
6. To study the local anesthetic activity of lignocaine hydrochloride on rabbit eye.
7. Bioassay of insulin
8. Bioassay of oxytocin
9. To study the effect of insulin
10. Clinical cases-I
11. Clinical cases-II

BOOKS RECOMMENDED:
6. Tripathi, K.D. Essentials of Medical Pharmacology, Jay Pee Publishers, New Delhi
THEORY

Unit – I

1. Systematic study of source, cultivation, collection, processing, commercial varieties, chemical constituents, substitutes, adulterants, uses, diagnostic, macroscopic & microscopic features, specific chemical tests of the following alkaloids containing drugs:
   a. **Pyridine – piperidine**: Tobacco, Areca & Lobelia.
   b. **Tropane**: Belladonna, Hyoscyamus, Datura, Coca, Duboisia and Withania.
   c. **Quinoline & Isoquinoline**: Cinchona, Ipecac, Opium.
   d. **Indole**: Ergot, Rauwolfia, Catharanthus, Nux Vomica and Physostigmine. [08]

Unit – II

e. **Imidazole**: Pilocarpus.
f. **Steroidal**: Veratrum & Kurchi.
g. **Alkaloidal Amines**: Ephedra & Colchicum.
h. **Glucoalkalid**: Solanum.
i. **Purines**: Coffee, Tea & Cola.
j. **Quinazoline**: Vasaka. [07]

Unit – III

2. Utilization, production & world wide trade of phytocostituents such as Tropane Alkaloids, Isoquinoline (ipecac) & Quinoline Alkaloids (cinchona). [04]
3. World wide trade in Medicinal plants & derived products namely, Rauwolfia, Taxol, Diosgenin, Digitalis, Liquorice, Papain, Ginseng, Aloe, Valerian & Plant laxatives. [08]

Unit – IV

4. **Biological sources, preparation, Identification tests and uses of following enzymes**: Diastase, papain, pepsin, trypsin & Pancreatin.
5. Plant bitters & Sweeteners. [04]
6. Chemistry & therapeutic activity of penicillin, Streptomycin & tetracycline. [02]
7. Natural Allergens and Photosensitizing agents and fungal toxins. [02]

Unit – V

8. Historical development of plant tissue culture, type of cultures, nutritional requirement, growth & their maintenance. Application of plant tissue culture in Pharmacognosy. [06]
i. Plant hormones and their applications.
ii. Polyploidy, Mutation & hybridization with reference to medicinal plants. [01]
PHAR – 364 P
PHARMACOGNOSY – IV

PRACTICAL
1. Identification of crude drugs listed above.
2. Microscopic study of characters of any 8 selected drugs given in theory in entire and powder form.
3. Chemical evaluation of powdered drugs & enzymes.
4. Chromatographic studies of some herbal constituents.
5. Some experiments in plant tissue culture.

SUGGESTED PRACTICES:
1. To study the morphology and microscopy of Datura and Withania.
2. To study the morphology and microscopy of Ipecac and Rauwolfia.
3. To study the morphology and microscopy of Catharanthus and Nux Vomica.
4. To study the morphology and microscopy of Ephedra and Kurchi.
5. To study the morphology and microscopy of Solanum and Vasaka.
6. To study the
   b. Transverse section of Catharanthus leaf and Kurchi bark.
7. To study the TLC profile of Catharanthus leaf.
8. To study the TLC profile of Withania root.
9. Chemical test of Tea, Tobacco, Datura and Withania.
11. Introduction of plant tissue culture techniques on laboratory scale.
12. Preparation of agar slants.
13. To grow callus culture in any defined media.

PROJECT:
World wide trade of medicinal plants (Monograph).

BOOKS RECOMMENDED:
12. Vapoorte, Swedson, “Chromatography of Alkaloids”.
13. Dixit VK, Vyas SP, Pharmaceutical Biotechnology, CBS Publication, ND.
16. “British Herbal Pharmacopoeia”.
17. “Indian Herbal Pharmacopoeia”.
19. Peach K. & Tracey MV, “Modern Methods of Plant Analysis”.
PHAR – 365
PROFESSIONAL COMMUNICATION – II

Unit – I
1. Written Skills:
   - Proposals writing formats.
   - Report writings.
   - Business letters.
   - Applications.
   - Covering letters.
   - Curriculum Vitae designing [10]

Unit – II
2. Productivity, time management simulation exercise.
3. Leadership skills.
4. Team Work “BSC”, Boss, Subordinate & Colleagues. [06]

Unit – III
5. Group Discussions (GD)
   - Tips
   - GD [08]

Unit – IV
6. Corporate behaviour, corporate expectations, office etiquettes.
7. Extempore. [06]

Unit – V
8. Interview Tips:
   - What a student is supposed to do before the interview, during the interview, after the interview and on the day of interview.
   - Various questions that may be asked in an interview.
   - Model interview (video shooting & displaying optional)
9. Exit Interview [10]

BOOKS RECOMMENDED: