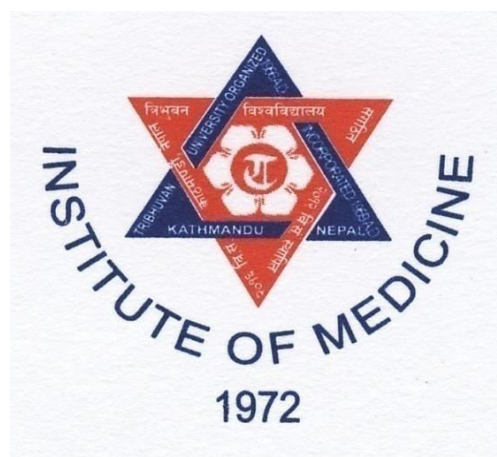


**Curriculum**  
**on**  
**Bachelor in Pharmacy**  
**(B. Pharm)**



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## PHARMACOLOGY II

Subject: Theory	Year: Second	Code: BP 505 A
Full Marks: 100	Total Teaching hours: 90	Credit hour: 6

**Course Description:** This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs used in systemic diseases as well as infectious diseases. In addition, emphasizes on the basic concepts of bioassays and principles of toxicology.

### General objectives:

At the end of the course, the student will be able to

- Discuss the Classification, pharmacological actions of different categories of drugs
- Explain the mechanism of drug action at organ system/sub cellular/ macromolecular levels.
- Discuss indication, contraindication and adverse effects of different categories of drugs
- Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
- Observe the effect of drugs on animals by simulated experiments
- Understand the methods in experimental pharmacology, principles of bioassay and be able to correlate drug effects with the action of drugs at the receptors
- To be able to identify and monitor adverse drug reactions (ADRs) and appreciate the importance of ADR reporting
- Understand pharmacokinetic and pharmacodynamic principles involved in the use of drugs
- Discuss new molecules introduced in drug therapy.

### Specific objectives:

#### Unit 1: Pharmacology of drugs acting on Endocrine System

After the completion of the course, students will be able to

Discuss Classification, Mechanism, Pharmacological action drugs acting on Endocrine System

**a. Thyroid hormones: Thyroxine, Thyroid inhibitors. [2 Hrs]**

**b. Insulin, Oral Anti-diabetic drugs and Glucagon: [4 Hrs]**

Different preparations of insulins, Sulphonylureas (first generation and second generations), Meglitinides (Nateglinide and Repaglinide), Biguanides (Metformin), DPP-4 inhibitors (Sitagliptin, Linagliptin), Thiazolidinediones (Pioglitazone), alpha-glycosidase inhibitors (Acarbose), Glucagon

**c. Corticosteroids: [4 Hrs]**

Hydrocortisone, Prednisolone, Methyl-prednisolone, Triamcinolone, Dexamethasone, Betamethasone, and Fludrocortisone.

**d. Sex hormones: [4 Hrs]**

Estrogens, progestins and contraceptives; androgens

**e. Drugs acting on the uterus: uterine stimulants and uterine relaxants [2 Hrs]**

## **Unit 2: Pharmacology of drugs acting on the Gastrointestinal Tract [7 Hrs]**

After the completion of the course, students will be able to

Discuss Mechanism and Pharmacological action of

- a. Antacids, anti-secretory and anti ulcer drugs.
- b. Laxatives and anti-diarrheal drugs.
- c. Emetics and anti-emetics.

## **Unit 3: Chemotherapy**

After the completion of the course, students will be able to

A. Discuss General Principles of Chemotherapy [2 Hrs]

B. Discuss Classification, Mechanism, Pharmacological action of Chemotherapeutic drugs. [8 Hrs]

- a. Sulphonamides and Cotrimoxazole
- b. Penicillin- [PenicillinG, Ampicillin, Amoxicillin, Flucloxacillin, Ticarcillin, Piperacillin, Carbenicillin and beta lactamase inhibitor)
- c. Cephalosporin- Cephalaxin, Cefaclor, Cefuroxime, Ceftriazone, Cefpodoxime, Cefixime, Cefotaxime, Cefepime
- d. Monobactams- Aztreonam
- e. Carbapenems- Imipenem and Meropenam
- f. Tetracycline – Doxycycline, Minocycline, Tigecycline
- g. Chloramphenicol
- h. Aminoglycosides- Gentamicin, Amikacin. Streptomycin, Framycetin
- i. Macrolides- Azithromycin, Clarithromycin, Roxithromycin,
- j. Fluoroquinolones- Ciprofloxacin, Ofloxacin, Levofloxacin, Moxifloxacin
- k. Miscellaneous: Vancomycin, Clindamicin

C. Chemotherapy: [8 Hrs]

After the completion of the course, students will be able to

- a. Discuss Classification, Mechanism and Pharmacological action of Antitubercular drugs – First Line, Second Line and Treatment of Tuberculosis.
- b. Discuss Classification, Mechanism and Pharmacological action of Antileprotics drugs- Dapsone, Clofazimine, Rifampin.
- c. Discuss Classification, Mechanism and Pharmacological action of Anti-Fungal drugs - Fluconazole, Itraconazole, Amphotericin B, Griseofulvin, Clotrimazole, Ketoconazole
- d. Discuss Classification, Mechanism and Pharmacological action of Anti- Viral drugs- Acyclovir, Oseltamivir, Lamivudine, Ribavirin
- e. Discuss Classification, Mechanism and Pharmacological action of Anti-malarial drugs - Chloroquine, Primaquine, Mefloquine, Pyrimethamine, Quinine, Artemisinin, Proguanil
- f. Discuss Classification, Mechanism, Pharmacological action of Anti-amoebic drugs – Metronidazole, Secnidazole, Tinidazole, Diloxanide Furoate
- g. Discuss Classification, Mechanism and Pharmacological action of Anthelmintic drugs - Albendazole, Mebendazole, Praziquatel, Niclosamide, Ivermectin, Diethyl Carbamazone (DEC)

#### **Unit 4: Chemotherapy of malignancy[14 Hrs]**

After the completion of the course, students will be able to

- a. Discuss General and specific toxicity of cytotoxic drugs, Cell cycle, obstacles to successful chemotherapy, Principle in chemotherapy of Cancer.
- b. Discuss Mechanism and Pharmacological action of Alkylating agents
  - Nitrogen mustards: Mechlorethamine, cyclophosphamide, melphalan, chlorambucil, ifosfamide,
  - Alkyl sulphate: Busulphan
  - Nitrosoureas: Carmustine, lomustine, streptozocin
- c. Discuss Mechanism and Pharmacological action of Antimetabolites
  - Folate antagonist: Methotrexate
  - Purine antagonist: 6-MP, 6-thioguanine.
  - Pyrimidine antagonist, 5-FU, gemcitabine
- d. Discuss Mechanism and Pharmacological action of Platinum containing compounds: Cisplatin, carboplatin
- e. Natural products: Discuss Mechanism and Pharmacological action of
  - Vinca alkaloids: Vincristine, vinblastine
  - Taxanes: Paclitaxel, docitaxel
  - Podophyllotoxins: Etoposide, teniposide.
  - Camptothecins: Topotecan, irinotecan
- f. Discuss Mechanism and Pharmacological action of Antibiotics: Actinomycin D, mitomycin C, doxorubicin, mithramycin, bleomycin
- g. Discuss Mechanism and Pharmacological action of Enzymes: L-asparaginase
- h. Discuss Mechanism and Pharmacological action of Miscellaneous agents: Hydroxyurea, imatinib
- i. Discuss Mechanism and Pharmacological action of Hormones and antagonists
  - Oestrogens- Ethinyl estradiol, fosfestrol,
  - Antioestrogen (SERM)- Tamoxifen, Raloxifen
  - Progestins- Hydroxyprogesterone, medroxyprogesterone
  - Androgens- Testosterone propionate
  - Antiandrogen- Flutamide
  - 5- $\alpha$ -reductase inhibitor- Finasteride
  - Corticosteroids- Prednisolone
  - Aromatase inhibitors- Letrozole, Anastrozole
  - SER- down regulator- Fulvestrant

**j.** Discuss Mechanism and Pharmacological action of Targeted drugs:

- Tyrosine protein kinase inhibitors: imatinib
- Epidermal growth factor receptor inhibitors: gefitinib, erlotinib
- Angiogenesis inhibitors: sunitinib
- Proteasome inhibitors: bortezomib
- Monoclonal antibodies: rituximab

### **Unit 5: Pharmacology of Autacoids [9 Hrs]**

After the completion of the course, students will be able to

Discuss Mechanism, Pharmacological action and pathophysiological role of Autacoids

**a. Histamine, 5-HT and their antagonist:**

- H1 antihistaminics:
- Serotonin antagonists

**b. Prostaglandins, Thromboxanes, Leukotrienes**

**c. Angiotensin, Bradykinin**

**d. Analgesic, Anti-pyretic and anti-inflammatory drugs:** Aspirin, Paracetamol, Ibuprofen, Nimesulide, Diclofenac, Aceclofenac, Naproxen, Mephenamic acid, Nabumetone, Indomethacin, Coxibs

**e. Anti-gout drugs:** Colchicine, Allopurinol, Probenecid, Sulfinpyrazone

### **Unit 6: Pharmacology of drugs acting on Respiratory System [5 Hrs]**

After the completion of the course, students will be able to

Discuss Mechanism and Pharmacological action of drugs acting on Respiratory System.

**a. Anti-cough agents:** Bromhexine, Ambroxol, Codeine, Dextromethorphan

**b. Anti-Asthmatic agents:** Salbutamol, Terbutaline, Salmeterol, Theophylline, Aminophylline, Ipratropium bromide, Prednisolone, Beclomethasonedipropionate, Budesonide, Omalizumab

### **Unit 7: Immunosuppressants [3 Hrs]**

After the completion of the course, students will be able to

Discuss Mechanism and Pharmacological action of Immunosuppressants: Cyclosporine, Tacrolimus, Sirolimus, Azathioprine, Methotrexate, Cyclophosphamide, Glucocorticoids, Biological agents.

### **Unit 8: Principles of Toxicology [18 Hrs]**

After the completion of the course, students will be able to

Discuss Principles of Toxicology.

- a. Definition for acute, sub acute and chronic toxicity.
- b. Definition of poison, general principles of treatment of poisoning.
- c. Signs, symptoms and management of poisoning with particular reference to Barbiturates, Opioids, Paracetamol, Organophosphorus, Atropine, Ethanol and Heavy metals.

### Unit 9: Principles and methods of bioassay [2 Hrs]

After the completion of the course, students will be able to  
Discuss Principles and methods of bioassay.

#### PHARMACOLOGY II

Subject: Practical	Year: Second	Code: BP 505 B
Full Marks: 50	Total Teaching hours: 90	Credit hour: 2

At the end of the course, students will be able to

1. Identify commonly used Apparatus/instruments in experimental pharmacology.
2. Identify commonly used laboratory animals and their handling
3. Prepare stock solutions of drugs and their dilutions and calculation of dose of a drug to be administered.
4. Perform some common and standard techniques: Exsanguination (blood withdrawal), and intravenous injection, intramuscular injection, intraperitoneal injection, intragastric administration and plasma and serum separation.
5. Discuss ethical guidelines for the care and use of animals in health research in Nepal.
6. Discuss different routes of drugs administration in mice/rats
7. Demonstrate effect of autonomic drugs on rabbit's eye
8. Identify Anesthetics used for animal studies, and procedures for rendering animal unconscious and chemical euthanasia.
9. Demonstrate Diuretic activity of drugs in rats.
10. Perform Case studies on Diseases of respiratory system, cardiovascular system, nervous system and diseases related to blood.
11. Discuss in-vitro pharmacology and physiological salt solutions.
12. Perform experiments on spontaneous motor activity (Using Rota Rod or Actophotometer), antianxiety activity (Using Elevated plus Maze or Swim test apparatus) analgesic activity (Using Eddy's Hot Plate), anticonvulsant activity, anti-inflammatory activity and skeletal muscle relaxant activity of drugs by any model.
13. Discuss the effect of hepatic microsomal enzyme inhibitors and inducers on the Phenobarbitone sleeping time in mice.
14. Demonstrate local anesthetic activity of drugs by suitable animal model.
15. Determine bioavailability parameters viz AUC,  $T_{max}$ ,  $K_{el}$  from blood and urine samples in human volunteers or in laboratory animals.
16. Perform animal experiment on acute toxicity studies.
17. Perform estimation of serum biochemical parameters by using semi- autoanalyzer
18. Perform case studies on Diseases related with endocrine system, GIT and Infectious diseases

**19.** Discuss techniques of administration of special dosage forms of drugs : Discussion and overhead picture presentation on proper techniques of administration of :-

- |                                  |                             |
|----------------------------------|-----------------------------|
| <b>a.</b> Inhaler                | <b>e.</b> Dry syrups        |
| <b>b.</b> Eye drops and ointment | <b>f.</b> Suppositories     |
| <b>c.</b> Ear drops              | <b>g.</b> Vaginal pessaries |
| <b>d.</b> Nose drops             |                             |

(Demonstration of these actual dosage forms and hands on experiments on using them)

**Reference books (Latest Editions)**

1. Goodman G. A, Rall, T.W, Nies A.I.S, Taylor P. Goodman and Gilman's The pharmacological Basis of therapeutics. Mc Graw Hill, Pergamon press.
2. Craig, C.R, Stitzel R.E. Modern Pharmacology. Little Brown Co.
3. Katzung B.G. Basic & Clinical Pharmacology. Churchill Livingstone New York
4. Tripathi K. D. Essentials of medical pharmacology. Jaypee, Delhi.
5. Rang H.P, Dale M.M. Pharmacology. Churchill Living stone.
6. Satoskar R.S, Bhadarkar S.D. Pharmacology and pharmacotherapeutics. Popular, Dubai.
7. Kulkarni S.K. Hand Book of Experimental Pharmacology. Vallabh Prakashan, Delhi.
8. Grover J.K. Experiments in Pharmacy & Pharmacology. CBS Publishers, New Delhi.