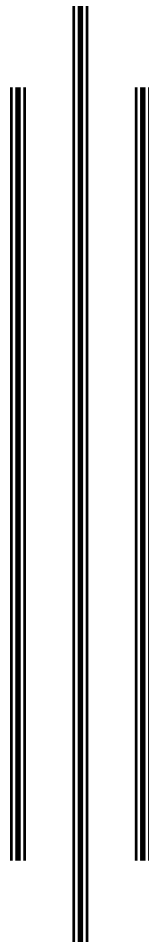


**CURRICULUM**  
for  
**DIPLOMA**  
in  
**PHARMACY**  
**(Second and Third Year)**



COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING  
**Curriculum Development Division**  
2005

# Table of Content

<b>BACKGROUND.....</b>	<b>3</b>
<b>MISSION OF THE CURRICULUM.....</b>	<b>3</b>
<b>STRATEGY.....</b>	<b>3</b>
<b>PHILOSOPHY .....</b>	<b>3</b>
<b>PROGRAM DESCRIPTION .....</b>	<b>3</b>
<b>AIMS AND OBJECTIVES .....</b>	<b>3</b>
<b>CONCEPTUAL FRAMEWORK .....</b>	<b>4</b>
<b>TARGET GROUP.....</b>	<b>4</b>
<b>GROUP SIZE .....</b>	<b>4</b>
<b>ENTRY CRITERIA.....</b>	<b>4</b>
<b>MEDIUM OF INSTRUCTION .....</b>	<b>4</b>
<b>COURSE DURATION .....</b>	<b>4</b>
<b>PATTERN OF ATTENDANCE .....</b>	<b>5</b>
<b>TEACHER AND STUDENT RATIO.....</b>	<b>5</b>
<b>PROGRAM COORDINATOR, TEACHER AND DEMONSTRATOR.....</b>	<b>5</b>
<b>INSTRUCTIONAL MEDIA AND MATERIALS.....</b>	<b>5</b>
<b>COMPREHENSIVE PROFESSIONAL FIELD PRACTICE.....</b>	<b>5</b>
<b>TEACHING LEARNING METHODOLOGIES.....</b>	<b>6</b>
<b>DISCIPLINARY AND ETHICAL REQUIREMENTS.....</b>	<b>6</b>
<b>METHODS OF EVALUATION.....</b>	<b>6</b>
<b>PASS MARKS.....</b>	<b>6</b>
<b>GRADING SYSTEM .....</b>	<b>7</b>
<b>CERTIFICATE AWARD .....</b>	<b>7</b>
<b>CAREER PATH.....</b>	<b>7</b>
<b>COURSE STRUCTURE (DIPLOMA IN PHARMACY).....</b>	<b>8</b>
<b>PHARMACEUTICS I .....</b>	<b>10</b>
<b>PHARMACOLOGY &amp; PHARMACOTHERAPEUTICS – I.....</b>	<b>15</b>
<b>PHARMACEUTICAL CHEMISTRY I.....</b>	<b>19</b>
<b>PHARMACOGNOSY .....</b>	<b>23</b>
<b>BIOCHEMISTRY, PATHOLOGY AND MICROBIOLOGY .....</b>	<b>27</b>
<b>PHARMACEUTICAL MANAGEMENT.....</b>	<b>31</b>
<b>HEALTH EDUCATION, HEALTH CARE SYSTEM &amp; FIRST-AID .....</b>	<b>34</b>
<b>PHARMACEUTICS II.....</b>	<b>42</b>
<b>PHARMACOLOGY &amp; PHARMACOTHERAPEUTICS II .....</b>	<b>48</b>
<b>PHARMACEUTICAL CHEMISTRY II .....</b>	<b>52</b>
<b>HOSPITAL AND CLINICAL PHARMACY .....</b>	<b>57</b>
<b>FORENSIC &amp; COMMUNITY PHARMACY .....</b>	<b>61</b>
<b>PHARMACOEPIDEMIOLOGY AND ENVIRONMENTAL HEALTH .....</b>	<b>65</b>
<b>COMPREHENSIVE PROFESSIONAL FIELD PRACTICE.....</b>	<b>75</b>
<b>OTHER REFERENCE BOOKS .....</b>	<b>77</b>
<b>PERSON INVOLVED IN DIPLOMA IN PHARMACY CURRICULUM DEVELOPMENT .....</b>	<b>80</b>

## **Background**

His Majesty's Government of Nepal has called for the provision of basic health care service for all persons by establishing a network of services in remote and urban areas. The Council for Technical Education and Vocational Training (CTEVT) has been contributing towards the development of different level of health personnel. In this connection, CTEVT has planned to produce Pharmacy Assistant as middle level medicinal service providers. The council for technical education and vocational training will award certificate in "**Diploma in Pharmacy**" to the candidates who successfully complete the requirements as prescribed by the council. The **Diploma in Pharmacy** graduates will be able to work as **Pharmacy Assistant in the Community Pharmacy** (retail pharmacy) and other Pharmaceutical services.

## **Mission of the Curriculum**

To provide the document, which directs CTEVT schools and faculty in the process of educating quality middle level pharmacy personnel to meet the needs of pharmacy service in Nepal.

## **Strategy**

The strategies to achieve our mission of educational excellence will be attained by maintaining expert faculty, implementing the curriculum, and recruiting quality students.

## **Philosophy**

The philosophy of the **Diploma in Pharmacy** curriculum should be based on the development of pharmacy, as a profession for fulfilling the health needs of the people with its socio-cultural impact on health. It should be based on code of conduct of Nepal Pharmacy Council. The approach should focus on pharmaceutical care and services for better health care.

## **Program Description**

This course is based on the job required to perform by a pharmacy assistants at different levels of health institutions in Nepal. The **Diploma in Pharmacy** program extends over three years. The first year focuses on core subjects; the second year focuses on pharmaceutical sciences. Similarly, the third year focuses on the application of acquired knowledge and skills through comprehensive field practices in hospital, industry, retail pharmacies/drug marketing and field settings. The graduates are eligible for registration as pharmacy assistants (Grade-II) in the Nepal Pharmacy Council.

The contents of individual subjects prescribed in the curriculum are incorporated in the light of "must to know and must to do" principle.

## **Aims and Objectives**

The course aims to produce middle level pharmacy personnel with sound academic knowledge equipped with perfect technical skills who can face real life situation at the level they are aimed at. The course enables students:

- To prepare technically competent middle level pharmaceutical human resources who will demonstrate positive attitude and respect for the profession and socio-cultural values.

- To develop middle level pharmaceutical human resources for good pharmacy practice in the hospitals as well as in the community settings.
- To inculcate leadership quality in pharmacy assistants to manage rational supply of pharmaceuticals and to promote rational use of drugs within the health care service or at the private pharmacies.
- To develop middle level pharmaceutical human resources in order to assist in production and quality assurance of pharmaceuticals.

## **Conceptual Framework**

The course should reflect:

- The need of pharmaceutical service in proper care of a patient.
- The need of proper pharmaceutical care for improving the pharmacotherapy.
- The respect gained from the community through professional service.
- The roles and responsibilities of pharmacist to improve the pharmaceutical supply system and to promote rational drug use.
- The development of professionalism in pharmaceutical sector by addressing simple to complex ideas those are associated with epistemology, ontology and methodology in pharmacy.

## **Target Group**

SLC pass candidates.

## **Group Size**

40 (maximum) in a batch

## **Entry Criteria**

The entry criteria are:

- SLC with 45% in aggregate with English, Science and Mathematics as compulsory subjects.
- Passed entrance examination organized by CTEVT.
- Applicant should submit along with the following documents at the time of application:
  - SLC pass certificate
  - Character certificate
  - Citizenship certificate (for the name, parents name, age, date of birth and address verification purpose only).
  - Physical fitness certificate (at the time of admission).
- Student quota for different category of students as per the policy of CTEVT.

## **Medium of Instruction**

English and/or Nepali

## **Course Duration**

The diploma in Pharmacy program extends over three academic years. One academic year consists of maximum of 39 academic weeks and one academic week consists of maximum of 40 hrs.

## Pattern of Attendance

Minimum of 90% attendance is required to appear in final examination.

## Teacher and Student Ratio

The teacher student ratio is:

- Overall ratio of teacher and student must be 1:10 (at the institution level).
- Teacher and student ratio for practical demonstration 1:10
- Teacher and student ratio for bench work 1:5
- 75% of the teachers must be fulltime.

## Program Coordinator, Teacher and Demonstrator

The qualifications of the program coordinator, teacher and demonstration are:

- The program coordinator must be a master degree holder in related field or a bachelor degree holder in related field with minimum 3 years experience in teaching activities.
- The teacher must be a bachelor degree holder with minimum 3 years experience in related field.
- The demonstrator must have an intermediate level degree in related field with 2 years experience in teaching activities.
- For basic science and general subjects the teacher must have a master's degree.

## Instructional Media and Materials

The following instructional media and materials are suggested for the effective instruction and demonstration.

- **Printed Media Materials** (Assignment sheets, Case studies, Handouts, Information sheets, Individual training packets, Procedure sheets, Performance Check lists, Textbooks etc.).
- **Non-projected Media Materials** (Display, Models, Flip chart, Poster, Writing board etc.).
- **Projected Media Materials** (Opaque projections, Overhead transparencies, Slides etc.).
- **Audio-Visual Materials** (Audiotapes, Films, Slide-tape programs, Videodiscs, Videotapes etc.).
- **Computer-Based Instructional Materials** (Computer-based training, Interactive video etc.).

## Comprehensive Professional Field Practice

The details of professional practice and field visit are as follows:

- Consists of 8½ weeks.
- Comprehensive professional practice should be conducted in hospitals, retail pharmacy and manufacturing units recognized by Ministry of Health and Population (MOHP)/ Department of Drug Administration (DDA).
- There should not be more than 10 students in a single hospital, 5-6 students per manufacturing industry and 2 students in a retail pharmacy at a time.
- During field practice there should be at least one teacher (either from health facility or training institution).

## Teaching Learning Methodologies

The methods of teachings for Diploma in Pharmacy program will be a combination of several approaches. Such as Illustrated Lecture, Group Discussion, Demonstration, Simulation, Guided practice, Practical experiences, Fieldwork, Laboratory observation, Hospital visit, Term paper presentation, Case analysis, Tutoring, Role-playing, Heuristic and Other Independent learning.

- Theory: Lecture, Discussion, Assignment, Group work.
- Practical: Demonstration, observation and Self-practice.

## Disciplinary and Ethical Requirements

1. Intoxication, insubordination or rudeness to peers will result in immediate suspension followed by review by the disciplinary review committee of the school.
2. Dishonesty in academic or practice activities will result in immediate suspension followed by administrative review, with possible expulsion.
3. Illicit drug use, bearing arms on campus, threats or assaults to peers, faculty or staff will result in immediate suspension, followed by administrative review with possible expulsion.

## Methods of Evaluation

### a. Internal assessment

- There shall be a transparent evaluation system for each subject both in theory and practical exposure.
- Each subject will have internal evaluation at regular intervals of 4 months and students must get the feedback about it.
- Weightage of theory and practical marks will be according to the course structure.
- Clinical assessment format must be developed and applied by the evaluators for evaluating student's performance in each subject related to the clinical experience.

### b. Final examination

- Weightage of theory and practical marks will be according to the course structure.
- Students must pass in all subjects both in theory and practical to qualify for certification. If a student becomes unable to succeed in any subject s/he shall appear in the re-examination as organized by CTEVT.
- Students shall be allowed to appear in final examination only after completing the internal assessment requirements.

### c. Requirement for final practical examination

- Qualified pharmacist must evaluate final practical examinations.
- One evaluator in one setting can evaluate not more than 20 students in a day.
- Practical examination should be administered in actual situation on relevant subject with the provision of at least one internal evaluator from the concerned or affiliating institute led by external evaluator nominated by CTEVT.
- Provision of re-examination as per CTEVT policy.

## Pass Marks

The pass marks for theory and practical examinations are:

- 40% in theory examination

- 60% in practical examination

## **Grading System**

The following grading system will be adopted:

- Pass division: Pass aggregate below 65%.
- First division: 65% or above.
- Distinction: 80% or above.

## **Certificate Award**

The council for technical education and vocational training will award certificate in "**Diploma in Pharmacy**" to the candidate who successfully completes the requirements as prescribed by the CTEVT.

## **Career path**

The graduates will be eligible for the position equivalent to Non-gazetted 1<sup>st</sup> class (technical) as Pharmacy Assistants or as prescribed by the Public Service Commission. The graduate is eligible for registration with the Nepal Pharmacy Council in the grade as mentioned in the Nepal Pharmacy Council Act.

## Course structure (Diploma in Pharmacy)

### First year

S.N	Subject	Mode		Weekly Hrs	Distribution of Marks						Total Marks
		T	P		Theory			Practical			
					Internal	Final	Time (Hrs)	Internal	Final	Time (Hrs)	
1	English	3	-	3	20	80	3	-	-	-	100
2	Nepali	3	-	3	20	80	3	-	-	-	100
3	Social Studies	2	-	2	10	40	2	-	-	-	50
4	Anatomy & Physiology	3	2	5	16	64	3	8	12	3	100
5	Physics	3	2	5	16	64	3	8	12	3	100
6	Chemistry	3	2	5	16	64	3	8	12	3	100
7	Zoology	3	2	5	16	64	3	8	12	3	100
8	Botany	3	2	5	16	64	3	8	12	3	100
9	Mathematics, Statistics & Computer Application	3	2	5	16	64	3	8	12	3	100
	<b>Total</b>	<b>26</b>	<b>12</b>	<b>38</b>	<b>146</b>	<b>584</b>		<b>48</b>	<b>72</b>		<b>850</b>

### Second year

S.N	Subject	Mode		Weekly Hrs	Distribution of Marks						Total Marks
		T	P		Theory			Practical			
					Internal	Final	Time (Hrs)	Internal	Final	Time (Hrs)	
1.	Pharmaceutics I	3	2	5	20	80	3	20	30	3	150
2.	Pharmacology and therapeutics I	3	2	5	20	80	3	20	30	3	150
3.	Pharmaceutical Chemistry I	4	2	6	20	80	3	20	30	3	150
4.	Pharmacognosy	3	2	5	20	80	3	20	30	3	150
5.	Biochemistry, Microbiology and Pathology	3	2	5	20	80	3	20	30	3	150
6.	Pharmaceutical Management	3	1	4	16	64	3	8	12	3	100
7.	Health Education, Health Care System and First Aid	3	2	5	16	64	3	8	12	3	100
	<b>Total</b>	<b>22</b>	<b>13</b>	<b>35</b>	<b>132</b>	<b>528</b>		<b>116</b>	<b>174</b>		<b>950</b>

### Third year

S.N	Subject	Mode		Weekly Hrs	Distribution of Marks						Total Marks
		T	P		Theory			Practical			
					Internal	Final	Time (Hrs)	Internal	Final	Time (Hrs)	
1	Pharmaceutics II	3	2	5	20	80	3	20	30	3	150
2	Pharmacology and therapeutics II	3	2	5	20	80	3	20	30	3	150
3	Pharmaceutical Chemistry II	4	2	6	20	80	3	20	30	3	150
4	Hospital & Clinical Pharmacy	3	2	5	16	64	3	8	12	3	100
5	Forensic and Community Pharmacy	3	1	5	16	64	3	8	12	3	100
6	Pharmacoepidemiology and Environmental Health	2	1	3	16	64	3	8	12	3	100
7	Comprehensive Professional Field Practice							100	100	4	200*
	<b>Total</b>	<b>18</b>	<b>10</b>		<b>108</b>	<b>432</b>		<b>184</b>	<b>226</b>		<b>950</b>

\*Details on the distribution of marks for field practice evaluation are mentioned in the Field Practice section of the curriculum.



# Second Year

# Pharmaceutics I

Theory total: 117 hrs (3 hrs/week)  
Practical total: 78 hrs (2 hrs/week)

Full marks: 150 (Th. 100+Pr. 50)  
Pass marks: 70 (Th. 40+Pr. 30)

## Course description

This course is designed to equip the students with knowledge and skills on pharmaceutical calculations, pharmaceutical process, and principles of pharmaceutics and basics of biopharmaceutics. It also deals with comminution principal, pharmaceutical application of size separation and mixing, extraction processes method of heat transfer and factors affecting bioavailability.

## Course objective

After completion of course the student will be able to:

1. Classify different pharmaceutical dosage forms and orient with new drug delivery systems.
2. Describe the contents of different pharmacopoeias.
3. Define metrology, do conversion from one system to another and solve the problems related to percentage and ratio strength and dilution and concentration.
4. Define comminution and describe comminution principles with example of each.
5. Describe different grades of powder.
6. Describe the pharmaceutical application of size separation and mixing and working of their respective equipments.
7. Select filters and describe the different filtration equipment.
8. Define extraction and describe various extraction processes and its principles
9. Explain the pharmaceutical application of drying and explain different dryers.
10. Describe the physicochemical principles of pharmaceutics and their applications.
11. Prepare simple Pharmaceutical preparations.

## Theory

### Unit 1. Introduction to pharmaceutical preparation and dosage form

8 hrs

#### 1.1 Different pharmaceutical preparations and dosage forms (6 hrs):

Define and classify Tablet, Capsules, Aromatic Water, Cachets, colloids, Creams, Draughts, Dusting Powders, Dentifrices, Ear Drops, Elixir, Emulsions, Enemas, Eye Drops, Eye Lotions, Gargles, Gels, Glycerines, Granules, Effervescent Granules, Implants, Infusions, Inhalations, Injections, Insufflations, Irrigations, Jellies, Linctuses, Liniments, Lotions, Lozenges, Mixtures, Mouthwashes, Nasal Drops, Ointments, Ophthalmic Ointments, Paints, Paste, Pessaries, Powders, Solutions, Dispersable Tablets, Chewable tablets, Spirits, Sprays, Suppositories, Suspensions, Syrups, Tinctures.

**1.2 New drug delivery system (2 hour):**

Discuss briefly about Nasal, Transdermal, Pulmonary, Ocular, Buccal, Post-oral, Vaginal and Intramuscular drug delivery systems.

**Unit 2. Pharmacopeias and formularies used in Nepal 2 hrs**

2.1 Introduce British Pharmacopoeia, United States Pharmacopoeia, Indian Pharmacopoeia, British Pharmaceutical Codex, Japanese pharmacopoeia, International Pharmacopoeia, European Pharmacopoeia etc.

**Unit 3. Weight and measures 7 hrs**

3.1 Classify weight and measure and convert from one system to another and one unit to another.

3.2 Solve problems related to percentage and ratio strength, allegation method and isotonic solutions.

**Unit 4. Comminution 6 hrs**

4.1 Define comminution and describe objectives of size reduction.

4.2 Describe factors affecting size reduction.

4.3 Describe principles of size reduction with examples of each.

**Unit 5. Size separation 6 hrs**

5.1 Introduce size separation and describe pharmaceutical applications of size separations.

5.2 Classify powders as per official standards.

5.3 Describe size separation by sifting and sedimentation methods.

**Unit 6. Mixing and homogenization 8 hrs**

6.1 Define mixing and mention its pharmaceutical applications.

6.2 Describe liquid-liquid mixing, semisolid – liquid mixing, Semisolid – solid mixing, Solid - liquid mixing and solid - solid mixing.

6.3 Describe the function of the following mixing equipment: Planetary Mixer, Triple Roller Mill, Colloid mill and Double cone mixer.

**Unit 7. Filtration and clarification 8 hrs**

7.1 Define filtration and explain theory and pharmaceutical applications of filtration.

7.2 Discuss filter media and filtration aids in brief.

7.3 Describe factors affecting the selection of filters and describe the application of the following:

- Sintered filters.
- Filters candles.
- Filter press.

<b>Unit 8. Extraction</b>	<b>6 hrs</b>
8.1 Define extraction and provide concept of solid-liquid and liquid-liquid extractions.	
8.2 Describe factors affecting the selection of extraction process.	
<b>Unit 9. Heat process</b>	<b>6 hrs</b>
9.1 Define heat, temperature and heat transfer and describe method of heat transfer.	
9.2 Mention the name of different heat processes.	
9.3 Define evaporation and explain its pharmaceutical application.	
9.4 Describe evaporation still and evaporation pan.	
9.5 Explain factors affecting evaporation.	
<b>Unit 10. Distillation</b>	<b>8 hrs</b>
10.1 Define and differentiate between distillation and evaporation.	
10.2 Mention different types of distillation and explain simple distillation, fractional distillation, steam distillation and vacuum distillation.	
10.3 Explain the preparation of purified water and water for injection.	
<b>Unit 11. Drying process</b>	<b>6 hrs</b>
11.1 Define drying and mention its pharmaceutical applications.	
11.2 Mention different types of dryers and explain tray dryer and fluidized bed dryers.	
<b>Unit 12. Physicochemical principles of pharmaceuticals</b>	<b>32 hrs</b>
12.1 Rheology and flow of fluids:	(7 hrs)
• Define viscosity and rheology and classify fluids based on its flow properties.	
<u>Newtonian fluids</u>	
• Provide concept of laminar, transitional and turbulent flows and explain capillary and falling sphere viscometers.	
<u>Non-newtonian fluids</u>	
• Provide concept of types of Non-newtonian flow.	
• Describe pharmaceutical applications of rheology.	
12.2 Solution and their properties:	(6 hrs)
• Mention types of solution, describe vapour pressures of solid, liquids and solutions and provide concept of ideal and real solution.	
• Provide concept of pH and $P^{K_a}$ , describe working of buffer solutions, provide concept of buffer capacity and describe its pharmaceutical applications.	
12.3 Surface and interfacial phenomena:	(3 hrs)

- Define surface and interfacial tension and mention the different methods of measurement.
  - Describe contact angle and its pharmaceutical applications.
- 12.4 Solubility and dissolution rate: (4 hrs)
- Define solubility and describe expression of solubility.
  - Describe factors affecting the solubility of solids in liquids.
- 12.5 Disperse systems: (6 hrs)
- Define colloids and describe their properties.
  - Describe surface-active agents, their physical properties and their pharmaceutical applications.
  - Describe stability of suspension.
  - Describe the methods of determination different types of emulsion and their stability.
- 12.6 Kinetics and stability testing: (6 hrs)
- Define different orders of reaction.
  - Mention different methods of determination of orders of reaction and describe graphical method of interpretation.
  - Describe the method of accelerated stability testing and prediction of shelf life of the product.

### **Unit 13. Introduction to Biopharmaceutics**

**14 hrs**

- 13.1 Provide the concept of bioavailability and biopharmaceutics.
- 13.2 Describe the basic concept of mechanism of drug transport across gastrointestinal barrier.
- 13.3 Mention different factors influencing bioavailability
- 13.4 Explain plasma concentration – time curves of oral, i. v. bolus and i. v. infusion and cumulative urinary drug excretion curve.
- 13.5 Define absolute and relative bioavailability and bioequivalence.
- 13.6 Describe factors influencing steady state plasma drug concentration in the body.

### **Practical**

#### **Unit 1. Different pharmaceutical preparations and dosage forms**

**54 hrs**

- 1.1 Prepare and supply chloroform water. (4 hrs)
- 1.2 Prepare and supply camphor water. (4 hrs)
- 1.3 Prepare and supply aqueous ammonium acetate solution. (4 hrs)
- 1.4 Prepare and supply aqueous iodine solution. (4 hrs)
- 1.5 Prepare and supply chloroform spirit. (2 hrs)

- |      |   |         |
|------|---|---------|
| 1.6  | Prepare and supply camphor spirit.  | (4 hrs) |
| 1.7  | Prepare and supply strong ginger tincture.                                      | (4 hrs) |
| 1.8  | Prepare and supply orange/iodine tincture.                                      | (4 hrs) |
| 1.9  | Prepare and supply root extract of <i>Rheum emodi</i> (Padamchal).              | (6 hrs) |
| 1.10 | Prepare and supply root extract of <i>Rouvo l fia serpentina</i> (Sarpagandha). | (6 hrs) |
| 1.11 | Prepare and supply thymol / chlorhexidine gargle.                               | (4 hrs) |
| 1.12 | Prepare and supply calamine lotion.   | (4 hrs) |
| 1.13 | Prepare and supply compound sodium chloride mouthwash.                          | (4 hrs) |

**Unit 2. Physicochemical principles of pharmaceuticals** **24 hrs**

- |     |  |          |
|-----|--|----------|
| 2.1 | Prepare phosphate buffers of different pH and measure their pH.                                  | (6 hour) |
| 2.2 | Determine bulk density and void porosity of given powder.  | (6 hrs)  |
| 2.3 | Measure the viscosity of simple syrup using redwood/Ostwald viscometer.                          | (6 hrs)  |
| 2.4 | Perform the mixing of different colored powders and examine their particle size microscopically. | (6hrs)   |

**References**

1. Gaud. *Pharmaceutics*, 2003, India.
2. Gaud and Gupta. *Practical Pharmaceutics*, 2004, India.
3. Gaud and Gupta. *Practical Physical Pharmacy*, 2004, India.
4. Gaud. *Textbook of pharmaceutics*, 2004, India.
5. Gupta, A. K. *Pharmaceutics: Practical manual (Part I & II)*, 2004, India.
6. Gupta, A. K. *Introduction to pharmaceutics-I.* , 2004, CBS publisher and distributors, India.
7. *The extra pharmacopoeia (Martindale)*.
8. *Physical Pharmacy* by Alfred Martin.
9. *Bentley's Text Book of Pharmaceutics* by E. A. Rawlins.
10. *Remington: The Science and Practice of Pharmacy*, 20<sup>th</sup> Edition, Vol I & II.
11. *The Theory and Practice of Industrial Pharmacy*, Leon Lackman, H. A. Lieberman, J. L. Kanig, Third Edition, Varghese Publishing House, Hind Rajasthan Building, Dadar, Bombay – 400 014.
12. *Pharmaceutical Dosage Forms and Drug Delivery Systems*. H. C. Ansel, L. V. Allen and N. G. Popovich, Seventh Edition, Lippincott Williams and Wilkins.
13. *Pharmaceutics: The Science of Dosage Forms*, M. E. Aulton, Churchill Livingstone.
14. *Cooper and Gunn's Tutorial Pharmacy*, Sixth Edition.

# Pharmacology & Pharmacotherapeutics – I

Theory total: 117 hrs (3 hrs/week)

Practical total: 78 hrs (2 hrs/week)

Full marks: 150 (Th. 100+Pr. 50)

Pass marks: 70 (Th. 40+Pr. 30)

## Course Description

This course is designed to help students to acquire the knowledge and skills on drug action, handling by body and therapeutics concerned with the application of pharmacology in prevention and treatment of diseases. This course deals with pharmacotherapeutic agents and their role in different pathophysiological conditions. Additionally, this course focuses on the mode of action, the uses and adverse effects, drug interaction, and precautions to be taken for drugs to be used.

## Course objective

After completion of the course the student will be able to:

- 1 Understand the specific action and use of drugs on different body systems.
- 2 Explain the principles of pharmacotherapeutics and drug safety
- 3 Know the action, use, mechanism of action, interaction, adverse reactions, and market availability mainly with reference to counseling to patients & care taker on rational use of following drugs:
  - Gastro intestinal drugs.
  - Cardiovascular drugs.
  - Drugs for Respiratory diseases.
  - Antimicrobial Drugs.

## Theory

### Unit 1: General Pharmacological Principles

20 hrs

- 1.1 Define the terminologies used in pharmacology
- 1.2 Describe different routes of drug administration
- 1.3 Define pharmacokinetics. Describes the process of absorption, distribution, biotransformation and elimination and factors affecting on these processes.
- 1.4 Define pharmacodynamics. Describe the mechanism and principle of drug action. Describe receptor theory, half-life, plasma concentration of drug, bioavailability.
- 1.5 Describe various types of adverse drug reactions.

### Unit 2: Gastrointestinal drugs

22 hrs

- 2.1 Describe peptic ulcer, H. pylori and the general mechanism of action, use, contraindication, precaution and doses of commonly used:

- Antacids.
  - Ulcer healing drugs.
  - Ulcer protective.
- 2.2 Describe Emesis, vomiting.
- 2.3 Describe the general mechanism of action, use, contraindication, precaution and doses of commonly used drugs for nausea and vomiting.
- 2.4 Describe constipation and diarrhea.
- 2.5 Describe the general mechanism of action, use, contraindication, precaution and doses of drugs used for constipation and diarrhea.
- 2.6 Describe liver diseases and their management.

### **Unit 3: Cardiovascular drugs**

**25 hrs**

- 3.1 Overview the physiology of cardiovascular system.
- 3.2 Describe Hypertension, angina, congestive heart failure, arrhythmias, coagulation and hyperlipidemia.
- 3.3 Explain the general mechanism of action, use, contraindication, precaution and doses of:
- Diuretics and Anti diuretics.
  - Beta-blockers.
  - Calcium channel blockers.
  - ACE inhibitors.
  - ACE-II inhibitors.
  - Cardiac glycosides.
  - Lipid lowering.
  - Anti platelet.
  - Anti coagulants.

### **Unit 4: Respiratory system drugs**

**10 hrs**

- 4.1 Overview the physiology of respiratory system.
- 4.2 Describe the pathophysiology of cough, asthma and COPD.
- 4.3 Explain the action, use, contraindication, precaution and doses of bronchodilators.
- 4.4 Describe the commonly used drugs for cough.

### **Unit 5: Antimicrobial drugs**

**40 hrs**

- 5.1 Describe infection and various diseases from infective organisms (bacteria, virus, fungus, protozoa, parasite).



- 5.2 Classify antimicrobials according to their chemical structure, spectrum of activity, type of action and the type of organism against which the antibiotics are active.
- 5.3 Describe microbial resistance, mechanism and its types.
- 5.4 Explain the general mechanism of action, use, contraindication, precaution and doses of the following groups of commonly used antimicrobials:
- Sulphonamides.
  - Penicillin (including its sources and types).
  - Cephalosporinas (from generation I to IV).
  - Tetracyclines and Chloramphenicol.
  - Aminoglycosides.
  - Macrolides.
  - Quinolines.
  - Antitubercular drugs.
  - Antileprotic drugs.
  - Antifungal.
  - Antiviral.
  - Antimalarial.
  - Antiprotozoal
  - Antianthelmentics.

## Practical

- Unit 1: Pharmacology laboratory set up** **15 hrs.**
- 1.1 Familiarize with the different instruments/equipment of pharmacology laboratory in specimen / slide show /Photograph.
- Unit 2: Clinical measurements** **15 hrs.**
- 2.2 Measure the temperature/pulse rate/respiration/blood pressure of human volunteers.
- Unit 3: Interpretation of pharmacological data** **15 hrs.**
- 3.1 Study and interpreted tracings of animal experiments (smooth muscles, skeleton muscles, heart etc.)
- Unit 4: Drug effect** **15 hrs**
- 4.1 Perform different stages of anesthesia in laboratory animals / simulated model / data interpretation
- Unit 5: Societal application of pharmacology.** **18 hrs**
- 5.1 Carry out the case studies:
- Alcohol addiction
  - Drug addiction

## References

- 1 Pharmacology by Satoskar and Bhandarar.
- 2 Martindale: The extra pharmacopoeia. 29<sup>th</sup> Ed.
- 3 British pharmacopoea.
- 4 Indian pharmacopoea.
- 5 CIMS published by Bio – gard medical service (Bangalore).
- 6 MIMS published by mims India, New Delhi.
- 7 Gadam's Pharmacology.
- 8 Essentials of Pharmacology by V.D. Tripathi

# Pharmaceutical Chemistry I

Theory total: 156 hrs (3 hrs/week)

Practical total: 78 hrs (2 hrs/week)

Full marks: 150 (Th. 100+Pr. 50)

Pass marks: 70 (Th. 40+Pr. 30)

## Course description

This course is designed to acquaint students with the knowledge and skills on inorganic part of pharmaceutical and medicinal chemistry. This course focuses on the official literatures recommended by the Drug Control Authority, physico-chemical properties of inorganic pharmaceutical ingredients and biological action in relation to their chemical structure and different methods of their quality control.

## Course objective

After completion of this course the student will able to:

1. Interpret the inorganic pharmaceutical ingredients, official monographs and articles.
2. Describe the physico-chemical properties, method(s) of quality control, storage, stability, incompatibilities and medicinal and pharmaceutical use of various ingredients.

## Theory

### Unit 1: Introduction

4 hrs

- 1.1 Describe the importance of inorganic drug molecules as a whole and focus to pharmacy.
- 1.2 Explain pharmacopoeia, official monograph and their importance.
- 1.3 Interpret one pharmacopoeial monograph as an example.
- 1.4 Describe the physico-chemical properties, method(s) of quality control, storage, stability, and incompatibilities and medicinal and pharmaceutical use of all ingredients mentioned below (Unit-II to VIII).

### Unit 2: Acids, Bases, Buffers, Antioxidants and Preservatives

12 hrs

- 2.1 Boric acid, Hydrochloric acid,
- 2.2 Strong ammonia solution, Calcium hydroxide, sodium hydroxide, Potassium hydroxide,
- 2.3 Citric acid, Sodium citrate, Sodium phosphate,
- 2.4 Sodium benzoate, and Parabens,
- 2.5 Sodium metabisulphide, Thiourea, BHA and BHT.

### Unit 3: Gastrointestinal agents

12 hrs

- 3.1 Acidifying agent Hydrochloric acid.

- 3.2 Antacids: Sodium bicarbonate, Aluminum hydroxide gel, Magnesium carbonate, Magnesium aluminum silicate, Magaldrate, Magnesium Trisilicate, combination of antacids.
- 3.3 Protective, adsorbents, and Laxative: Charcol, Bismuth, Kaolin, Magnesium Sulphate and zinc Sulphate.

**Unit 4: Topical agents** **10 hrs**

- 4.1 Protective: Talc, Zinc Oxide, calamine, Titanium dioxide.
- 4.2 Anti-microbial and astringents: H<sub>2</sub>O<sub>2</sub>, KMNO<sub>4</sub>, chlorinate lime, Iodine, povidone iodine, boric acid, silver nitrate, mercury compounds sulphur compound, Selenium sulphide.
- 5.2 Astringents: Alum, Zinc sulphate.

**Unit 5: Inorganic compounds used in dentistry** **4 hrs**

- 5.1 Sodium fluoride, Stannous fluoride, Calcium salts, Strontium chloride and Zinc sulphate lotion.

**Unit 6: Inhalants and stimulants, expectorants, emetics and antidote** **8 hrs**

- 6.1 Oxygen, Carbon dioxide and Nitrous oxide,
- 6.2 Ammonium carbonate, ammonium chloride, potassium iodide and sodium nitrate.

**Unit 7: Major intra and extra cellular electrolytes** **12 hrs**

- 7.1 Acid-base balance and replacement Therapy,
- 7.2 NaCl, KCl, NaHCO<sub>3</sub>, Ringer lactate and other electrolyte for the correction of salt and electrolyte balance special focus to diarrhea, dietary deficiency and Cholera.

**Unit 8: Radiopharmaceuticals** **4 hrs**

- 8.1 Describe Radiopharmaceuticals with special reference to official preparations

**Unit 9: Quality Control of Inorganic active pharmaceutical ingredients.** **90 hrs**

- 9.1 Describe sources of impurities in pharmaceutical ingredients.
- 9.2 Explain identification tests and limit tests of cations and anions as per BP/IP/USP.
- 9.3 Explain melting, point, boiling point, specific gravity and other physico-chemical parameters of inorganic ingredients.
- 9.4 Describe the chromatographic techniques with special focus to TLC.

## Practical

**Unit 1: Arrangement of the basic preparation for the quality control experiments of inorganic pharmaceutical ingredient** **4 hrs**

- 1.1 Perform the Monograph/protocol interpretation of given experiment.
- 1.2 Prepare necessary glasswares.

- 1.3 Prepare necessary reagents- acid/ alkali solution and their standardization.
- 1.4 Handle instrument/apparatus for the given experiment/s and perform their operation.

**Unit 2: Experiments on pharmacopeial identification tests of cations and anions 20 hrs**

- 2.1 Carry out identification tests of the following Cations: Al, Ba, Bi, Ca, Mg, Mn, Cu, Zn, Fe, Ni, Ag, Na, K, Mg.
- 2.2 Carry out identification tests of the following Anions: halides, Thiocyanate, phosphate, Sulphate, borate, Bromate and bromide, carbonate, nitrate.

**Unit 3: Experiments on qualitative inorganic analysis of ions and radicals from unknown compounds 10 hrs**

- 3.1 Perform the analysis of mixture containing cations.
- 3.2 Perform analysis of mixture containing anions.

**Unit 4: Experiments on limit tests 10 hrs**

- 4.1 Carry out the test for heavy metals - Iron and Mercury (two experiments only).
- 4.2 Carry out the test for Chloride, Sulphate.

**Unit 5: Experiments on volumetric analysis representing all methods of titrations 34 hrs**

- 5.1 Perform the titration of strong acid and strong base.
- 5.2 Carry out the titration of weak acid and weak base.
- 5.3 Perform the titration of weak acid and strong base.
- 5.4 Carry out the titration of strong acid and weak base.
- 5.5 Perform the titration of polyprotic acid and strong base.
- 5.6 Analyse iron preparation by complexometric titration method.
- 5.7 Evaluate calcium preparation by complexometric titration method.
- 5.8 Determine content of chloride by argentometric titration method.
- 5.9 Determine content of hydrogen peroxide.
- 5.10 Determine copper in copper sulphate.

**Refernces**

(Latest edition to be referred of all the Books):

0. Mahadik KR and Kucher BS- Concise inorganic Pharmaceutical chemistry, Nirali Prakashan, 2004.
1. Mahadik KR and Kucher BS- Concise organic Pharmaceutical chemistry, Nirali Prakashan, 2004.
2. Kasture AV and Wadker- Pharmaceutical chemistry I & II Nirali Prakashan.
3. Bekeet AH and Stenlk- Practical Pharmaceutical Chemistry 4th edition Part I & II.

4. Kasture AV and Wadker- Practical Pharmaceutical chemistry I & II, Nirali Prakashan.
5. Anthon LM-Bentley's & Drivers text book of Pharmaceutical chemistry, Oxford University Press London.
6. Kadam et.al – Principles of Medicinal Chemistry Vol. I & II.
7. Kasture AV et.al – Pharmaceutical analysis Vol I & II, Nirali Prakashan.
8. Daniel C Harris- Quantitative Chemical Analysis, W H Freeman and Company.
9. Jeffrey GH et.al-Vogel's Textbook of Quantitative Chemical Analysis 5th Edition.
10. Tipins HP Dhake AS- Inorganic Pharmaceutical chemistry, Career publication, Dec 2002.
11. Belsare P and Dhake AS- Inorganic Chemistry (Practical), Career publication.
12. Indian Pharmacopoeia latest edition.
13. British Pharmacopoeia latest edition.

# Pharmacognosy

**Theory total: 117 hrs (3 hrs/week)**

**Full marks: 150 (Th. 100+Pr. 50)**

**Practical total: 78 hrs (2 hrs/week)**

**Pass marks: 70 (Th. 40+Pr. 30)**

## Course Description

This course is designed to provide students the skill and knowledge about pharmacognosy. It deals with the basic concepts of medicinal plants used in complementary and traditional system of medicine. Especially, this course focuses on phytochemistry, analytical process and microscopy of medicinal plants and their uses.

## Course Objectives

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

1. Explain the history and scope of pharmacognosy.
2. Classify the drugs of natural origin.
3. Explain method of cultivation, collection, standardization, drying and storage of medicinal plants.
4. Explain Glycoside, Alkaloids, Phenolic compounds, Tannins, Volatile oils and derivatives of Isoprenes / Terpenes.
5. Explain the source, characteristics and uses of the following pharmaceutical aids of natural origin: Starch, gum acacia, Tragacanth, agar and cellulose.
6. Describe source, geographical distribution, microscopic and macroscopic features, active constituents and uses of the plant drugs.
7. Explain and carry out microscopical and thin layer chromatography method of analysis.
8. Explain surgical cotton and gauze.
9. Explain various aspects of medicinal plants of Nepal having economic importance.

## Theory

### Unit 1: Introduction

**6 hrs.**

- 1.1 Define Pharmacognosy and explain origin and importance of Pharmacognosy.

Explain history and scope of Pharmacognosy including complementary and traditional system of medicine.

Classify and elaborate the Drugs of natural origin.

- Unit 2: Medicinal plants** **9 hrs.**
- 2.1 Describe different methods of cultivation of medicinal plants.
  - 2.2 Explain the process of collection, drying & storage of medicinal plants.
  - 2.3 Describe the Pharmacopoeial standards with respect to quality and detection of adulterants.
- Unit 3: Phytochemistry.** **30 hrs.**
- 3.1 Explain the process of plant analysis.
  - 3.2 List types of plant constituents and explain their therapeutic importance.
  - 3.3 Define and explain Glycosides.
  - 3.4 Define and explain Alkaloids.
  - 3.5 Define and explain Phenolic compounds.
  - 3.6 Define and explain Tannins.
  - 3.7 Define and explain Volatile oil.
  - 3.8 Define and explain Isoprenes / Terpenes.
- Unit 4: Pharmaceutical aids of natural origin.** **5 hrs.**
- 4.1 Define and explain source, characteristics and uses of the following pharmaceutical aids of natural origin: Starch, Gum, Acacia, Tragacanth and Agar.
- Unit 5: Vegetable drugs** **45 hrs.**
- 5.1 Describe source, geographical distribution, microscopical & macroscopical features and therapeutic use of the following drugs:  
Digitalis, Senna, Rhubarb, Glycyrrhiza, Discorea, Picrorrhiza, Podophyllum, Cannabis, Stramonium, Belladonna, Cocain, Rauwolfia, Vinca, Ergot, Ipecacuanha, Ephedra, Fennel, Coriander, Lemon grass, Clove, Cinnamon, Eucalyptus, Mentha, Cardamom, Nardostacys, Gultheria, Ginger, Vasaka, Chiraita, Yarsagumbha, Berberis, Acorus, Neem and Valeriana.
- Unit 6: Analytical procedure** **10 hrs.**
- 6.1 Define and explain microscopical technique of analysis.
  - 6.2 Define and explain Thin Layer Chromatographic (TLC) method of analysis.
- Unit 7: Surgical dressing** **4 hrs.**
- 7.1 Describe surgical cotton and its use.
  - 7.2 Describe surgical Gauze and its use.
- Unit 8: Status of medicinal plants of Nepal** **8 hrs**
- 8.1 State vernacular name, English name, botanical name, family, distribution, habitat, parts used and morphological characteristics of following ten medicinal plants of economic important found in Nepal:



*Dactylorhiza hatagirea* (Panch Aunle); *Cinnamomum glaucescens* (Sugandha kokila); *Cordycep sinensis* (Yarshagumba); *Terminalia chebula* (Harro); *Piper longum* (Pipla); *Terminalia balerica* (Barro); *Asparagus racemosus* (Satawari); *Zantoxylum armatum* (Timur); *Tinospora sinensis* (Gurjo); *Emblica officinalis* (Amala)

## Practical

- Unit 1: Pharmacognostical studies** **20 hrs.**
- 1.1 Perform organoleptic test, physical and chemical tests and microscopical examination of medicinally useful parts of the following drugs:
  - 1.2 Digitalis, Rhubarb, Stramonium, Vinca, Fennel, Berberis, Clove, Cinnamon, Ginger, Vasaka and Acorus.
- Unit 2: Extraction procedures** **6 hrs.**
- 2.1 Carry out the extraction the following medicinal and aromatic plants applying hydro-distillation technique: Vasaka, Rauwolfia, Fennel and Clove.
- Unit 3: Thin layer chromatography** **8 hrs.**
- 3.1 Carry out Thin Layer Chromatographic (TLC) method of analysis of plant extracts.
- Unit 4: Chemical test for active ingredients** **10 hrs.**
- 4.1 Carry out chemical test for alkaloids, glycosides, tannins and flavonides.
- Unit 5: Macroscopical and Microscopical studies** **10 hrs.**
- 5.1 Carry out test for identification of fibers and evaluation of surgical dressings and gauze.
- Unit 6: Field trip** **24 hrs.**
- 6.1 Perform field trip of minimum of four days visiting Herbarium and herbal farm and collect specimens of locally available drugs and write report on it.

### Text Books

1. W. C. Evans : Trease & Evans Pharmacognosy 15 Edition. W. B. Saunders. Edinburg 2002.
2. Wallis T. E. – Practical Pharmacognosy.
3. Shah C. S. & Quadry – A text Book of Pharmacognosy.

### Reference Books

1. Medicinal plants of Nepal – Bulletin of Department of Medicinal plants. No. 3. His majesty's Government of Nepal, Ministry of Forest and Soil conservation. Department of Plant Resources, Kathmandu, 1997.
2. Standards of Medicinal Plants for Ayurvedic Drugs : A publication of Department of Medicinal Plants.
3. Gokhale. Pharmacognosy (Diploma), 2004, India.

4. Gokhale and Kokate. Practical Pharmacognosy, 2002, India.
5. Kokate. Pharmacognosy, 2004, India.
6. Quality control of Medicinal plants: A publication of WHO, 1998.
7. Identification Manual for some Non Timber Forestry Products of Nepal: Dr. SB Malla et al.- Forest Resource information system project HMG/FINIDA

# Biochemistry, Pathology and Microbiology

Theory total: 117 hrs (3 hrs/week)

Full marks: 150 (Th. 100+Pr. 50)

Practical total: 78 hrs (2 hrs/week)

Pass marks: 70 (Th. 40+Pr. 30)

## Course description

This course on biochemistry, pathology and microbiology is designed to provide students the knowledge and skills on metabolism, pathology of blood and urine, immunology, nucleic acid and recombinant DNA technology and microbiology. This course also deals with the microorganisms and related pathological conditions.

## Course objective

After completion of this course the student will be able to:

1. Understand the metabolism of carbohydrate, protein, fat minerals and vitamins in the body.
2. Explain the pathology of blood and urine.
3. Explain immunity and basic concept on immunology.
4. Know the hormones and their role in the body.
5. Describe different pathological conditions in the human body.

## Theory

### Unit 1: Introduction

2 hrs

- 1.1 Introduce biochemistry focusing to pharmacy.

### Unit 2: Cell

6 hrs

- 2.1 Explain structure, composition, classification and multiplication of cell.

### Unit 3: Metabolism, related pathology, and qualitative and quantitative tests of the followings:

19 hrs

- 3.1 Explain Carbohydrates including Hyaluronic acid and Heparin.
- 3.2 Describe Amino acids, Peptides and Proteins.
- 3.3 Explain Lipids and fatty acids.
- 3.4 Interpret the relation of Carbohydrate, Fat and protein metabolism.
- 3.5 Describe Vitamins and enzymes.
- 3.6 Explain Minerals, ions and water

### Unit 4: Pathology of blood and urine

17 hrs

- 4.1 Explain blood cells- function, composition and their characteristics.

- 4.2 Introduce pathology related to blood cells.
- 4.3 Explain normal and abnormal constituents of urine.
- 4.4 Describe qualitative and quantitative tests of urinary constituents.

**Unit 5: Immunology** **4 hrs**

- 5.1 Explain Immune system and Immunity.
- 5.2 Describe Sources and properties of antigens.
- 5.3 Describe Anti-bodies, T and B-lymphocytes, T-cell

**Unit 6: Basic concepts of nucleic acid and recombinant DNA technology** **4 hrs**

- 6.1 Describe about DNA, RNA.
- 6.2 Introduce DNA replication.
- 6.3 Describe biochemical regulation of gene expression in brief.

**Unit 7: Basic concepts of hormones** **15 hrs**

- 7.1 Explain General considerations and mode of action.
- 7.2 Describe the release and related pathology of hormones.

**Unit 8: Microbiology** **30 hrs**

- 8.1 Introduction to Pharmaceutical Microbiology.
  - Define Microbiology.
  - Describe the historical development.
  - Explain the importance of microbiology for pharmacy students and profession.
  - Describe Bacteria, Fungus, Protozoa, virus and other microbes.
  - Explain Culture media and handling of microorganisms, Isolation and Identification, Physical and Chemical effects on microbial growth. aseptic techniques.
  - Describe the sterilization and disinfections- methods, microbial contamination control and sterility Testing, sterilization of pharmaceutical ingredients and dosage forms. Vaccine and sera.
  - Explain microbial assay of antibiotics and vitamins-method, procedure and evaluation.

**Unit-9: Introduction to pathology** **20 hrs**

General explanation of Common pathological conditions with emphasis on the following systems:

- 9.1 Describe gastric/peptic ulcer, hepatitis, diarrhea, vomiting, constipation and Typhoid fever.
- 9.2 Explain Hypertension, Angina Pectoris, Congestive heart failure and rheumatic heart disease.
- 9.3 Describe UTI, Nephritis and Renal failure.

- 9.4 Describe Epilepsy, Depression, Psychosis, conjunctivitis and otitis media.
- 9.5 Explain Pneumonia, Asthma and COPD.
- 9.6 Describe Meningitis, Myasthenia gravis, Spondylitis.
- 9.7 Explain Syphilis, Gonorrhoea and HIV-AIDS.
- 9.8 Describe Goiter and Thyrotoxicosis, Diabetes.

## Practical

- Unit 1: Identification and detection of the following: 16 hrs**
- 1.1 Perform the following tests for Carbohydrate: Molisch Test/Barfoed's test and Iodine test for amylase. (4 hrs)
  - 1.2 Perform the following tests for Proteins: (4 hrs)
    - 1.3 Total protein/Albumin in blood.
    - In Urine: Heat + Acetic acid, Sulphosalicylic acid, Strip method.
  - 1.3 Perform the following tests for Amino acids: Ninhydrin Test/Xanthoproteic test (2 hrs)
  - 1.4 Perform the following tests for Lipid: Cholesterol (Lieberman Burchard test). (2 hrs)
- Unit 2. Analysis of normal and abnormal constituents of blood and urine with relevant experiments 20 hrs**
- 2.1 Perform the following tests of dextrose as blood sugar (O- Toluidine + Enzymatic test).
  - 2.2 Perform the following tests of urine ( Benedict's Method and strip method).
  - 2.3 Perform the following tests for:
    - Urea (DAM Method) and Creatinine (Jafrie reaction method).
    - Alkaline phosphate (KA Method) and Bilirubin (Vandenberg reaction).
    - SGPT & SGOT (Enzymatic reaction) and Calcium (OCP Method).
  - 2.4 Perform the following tests for:
    - Diastase and Lipase (Enzymatic reaction).
- Unit 3: Staining and microscopic examination 6 hrs**
- 3.1 Perform staining and microscopic examination of Sputum and Faces. (3+3 hrs)
- Unit 4: Practice in injecting drugs by IM/SC/IV/ withdrawal of blood samples. 4 hrs**
- 4.1 Practice in injecting drugs by IM/SC/IV/ withdrawal of blood samples.
- Unit 5: Identification of microorganism by gram stain and acid-fast stain. 6 hrs**
- 5.1 Identify microorganism by gram stain and acid-fast stain.

**Unit 6. Preparation and aseptic transfer of at least one culture media** **8 hrs**

6.1 Perform the identification and count of bacterial colonies practically.

**Unit 7. Demonstration of sterilization and disinfections of the following:** **4 hrs**

7.1 Sterilize Powder/glassware/and vials by dry heat.

7.2 Sterilize Rubber gloves/Surgical cotton/ligature and suture.

7.3 Sterilize Thermolabile substances by filtration.

**Unit 8: Phenol coefficient test and related experiment** **2 hrs**

8.1 Carry out Phenol coefficient test and related experiment

**Unit 9: Sterility testing** **6 hrs**

9.1 Carry out sterility test.

**Unit 10: Demonstration of microbial assay of antibiotics** **6 hrs**

10.1 Demonstrate microbial assay of antibiotics.

**References**

1. Kulkarni MV et.al- Biochemistry, Nirali Prakashan.
2. Chaudari MA and Gokhale S B- Biochemistry and Clinical Pathology, Nirali Prakashan.
3. Mc Murry J and Castellion E Mary- Fundamentals of Organic and Biological Chemistry. 2<sup>nd</sup> edition Prentic Hall.
4. Kale- Practical Biochemistry and Clinical Pathology. Book Syndicate Mumbai.
5. Robins et.al.- Pathological basis of Disease. 7 th edition, Churchil Levingtion 2002.
6. Furest R – Microbiology in Health and Disease, W B Saunder & Co, 1995.
7. Bialley and Scott – Dignonostic Microbiology.
8. Lenniger AC – Principles of Biochemistry, CBS Publication.
9. Cheesebrough M – Medical Laboratory Manual for Tropical Countries Vol I & II. ELBS.
10. Rawling’s EA –Bently’s text book of Pharmaceutics. All India Traveller Book Sellers.
11. Patology for Medical students.
12. Pharmaceutical Microbiology.
13. Mukarjee K C- Handbook of Medical Laboratory Technology.
14. Handbook of Medical Laboratory Technology CMC Vellore.
15. Herold Varley – Practical Clinical Biochemistry.
16. I D P Watton Microanalysis in Medicinal Chemistry.
17. Manual Methods in Clinical Chemistry- WHO publication.

# Pharmaceutical Management

Theory total: 117 hrs (3 hrs/week)  
Practical total: 39 hrs (1 hr/week)

Full marks: 100 (Th. 80+Pr. 20)  
Pass marks: 44 (Th. 32+Pr. 12)

## Course Description

This course is designed to equip students with the knowledge and skills on business organization and management, economic theory and financial management. The course is also focused on management of a community pharmacy, management of government drug supply and the pharmaceutical marketing.

## Course Objectives

After completing the course the student will be able to:

1. Develop general concept of business organization and management.
2. Conceptualize economic theory applicable to pharmaceuticals.
3. Develop basic managerial skills and financial management skills applicable in pharmaceutical sectors.
4. Develop concept of marketing skills and apply them in the pharmaceutical sector.
5. Manage community pharmacy.

## Theory

### Unit 1: General concept of business organization & management

30 hrs

- 1.1 Describe the concept of management: process, discipline and characteristics.
- 1.2 Explain in brief about management and administration.
- 1.3 Illustrate in brief about major management functions.
- 1.4 Describe management skills and abilities.
- 1.5 Explain in brief about general principles of management, Taylor's scientific management theory, planning and organizing.
- 1.6 Describe nature and process of controlling.
- 1.7 Explain decision-making.
- 1.8 Describe direction and motivation.
- 1.9 Explain leadership and supervision.
- 1.10 Describe business communication.
- 1.11 Explain human resource management.
- 1.12 Describe entrepreneurship.
- 1.13 Explain business organization in pharmaceutical enterprises (industry, trade, hospital and community).

**Unit 2: General concept on economic theory with focus to pharmaceuticals** **10 hrs**

- 2.1 Explain market economy.
- 2.2 Describe theory of demand.
- 2.3 Illustrate consumer behavior.
- 2.4 Describe revenue and cost curves.
- 2.5 Describe theory of price and output determination.
- 2.6 Explain public finance and taxation.

**Unit 3: Financial management in general and financial management in pharmaceutical sectors** **20 hrs**

- 3.1 Describe general concept of cost and cost accounting.
- 3.2 Describe concept of capital and capital management.
- 3.3 Explain calculation of turn over, working capital, profit loss account, break-even analysis and investment return ratios.

**Unit 4: Marketing in general and pharmaceutical marketing** **30 hrs**

- 4.1 Illustrate general concept of marketing.
- 4.2 Explain general concept on elements of marketing.
- 4.3 Describe general concept on customers and their types.
- 4.4 Elaborate demand and creation of demand.
- 4.5 Explain marketing process in general.
- 4.6 Depict marketing Functions.
- 4.7 Describe general concept of promotion.
- 4.8 Explain general concept of sales.
- 4.9 Explain general concept on sales promotion.
- 4.10 Elaborate the pharmaceutical marketing with emphasis on:
  - Nature of pharmaceutical market.
  - Structure of pharmaceutical market.
  - Promotional strategy in pharmaceutical products.
  - Tactics in detailing pharmaceutical products.
  - Designing of promotional material in pharmaceutical marketing.

**Unit 5: Management of a community pharmacy** **18 hrs**

- 5.1 Explain location analysis.
- 5.2 Describe establishing and financing a community pharmacy.
- 5.3 Illustrate the development of the business plan.
- 5.4 Describe pharmacy layout design.
- 5.5 Describe legal structure of ownership.
- 5.6 Explain business law for community pharmacy.
- 5.7 Explain risk management and insurance.
- 5.8 Describe pricing decision for products and services.



- 5.9 Elaborate on purchasing and inventory control.
- 5.10 Describe human resources management.
- 5.11 Explain the development and innovative services.
- 5.12 Describe credit management efficiency.
- 5.13 Explain about computerization of pharmacy.

**Unit 6: Management of government drug supply**

**9 hrs**

- 6.1 Describe selection and indenting of drugs, importance of EDL and STS in selection/ indenting and quantification techniques.
- 6.2 Describe purchasing including tender procedures.
- 6.3 Explain storage of medicines including vaccines.
- 6.4 Depict the distribution system.
- 6.5 Describe monitoring mechanism.
- 6.6 Elaborate on importance of training and the concept of rational drug use.

## **Practical**

**Unit 1: Pharmaceutical marketing**

**10 hrs.**

- 1.1 Prepare a marketing plan for the given product of pharmaceutical products.

**Unit 2: Financial management in pharmaceutical sectors**

**10 hrs.**

- 2.1 Discuss and give presentation on the given problem on the followings.
  - Calculate the profit and loss account.
  - Calculate the working capital requirement.
  - Calculate the rate of return.
  - Propose alternate marketing plan.

**Unit 3: Management of a community pharmacy**

**19 hrs.**

- 3.1 Conduct a survey on the market of the given pharmaceutical product.
- 3.2 Prepare a proposal to establish a community pharmacy in the given location.

**References**

1. Managing Drug Supply, Published by HMG, DHS/MoH.

# Health Education, Health Care System & First-Aid

Theory total: 117 hrs (3 hrs/week)  
Practical total: 78 hrs (2 hrs/week)

Full marks: 100 (Th. 80+Pr. 20)  
Pass marks: 44 (Th. 32+Pr. 12)

## Course Description

This course is designed to acquaint students with knowledge and skills on health education and health care delivery system of Nepal as well as first-aid treatment.

## Course objectives

After completion of course the student will be able to:

1. Find out health education needs related to pharmacy and deliberate both planned and incidental health education to individual, family and the community.
2. Apply different health education methods and media to increase adherence to drug therapy.
3. Change the pharmaceuticals behavior of individual, family and the community.
4. Understand health care delivery system in Nepal.
5. Provide contribution in PHC activities as a pharmacy assistant.
6. Provide the first aid treatment.

## Theory

### Unit 1: Health education

57 hrs

#### 1.1 Concept of health:

4 hrs

- Define health.
- Differentiate promotive, preventive, curative and rehabilitative.
- Describe concept of disease.
- Explain concept of causation.
- Explain concept of prevention.
- Describe level of prevention.
- List factors that influence health.

#### 1.2 Principles and scope of health education:

8 hrs

- Describe scope of health education.
- Explain principles of health education.

- State importance of health education in pharmacy.
  - List person responsible for health education.
  - Identify health education needs related to pharmacy conducting educational diagnosis survey.
  - Define pharmaceuticals behavior of health workers, individual, family and community and explain how health education process helps change unfavorable behavior related to pharmacy.
- 1.3 Health education methods: 12 hrs
- Explain role of different methods for providing health education.
  - Classify different methods.
    - Individual method: Interview and Counseling.
    - Group method: Group discussion, Role-play, Brain storming, Work-shop etc.
    - Mass Method: Lecture, exhibition etc.
  - List advantages and disadvantages of each method.
- 1.4 Health education media: 12 hrs
- Define audio-visual aids.
  - Classify different health education media.
  - List advantages and disadvantages of each media.
  - Describe criteria for the selection of media.
- 1.5 Planning of health education: 6 hrs
- Describe concept and importance of planning.
  - Describe steps of planning.
  - Describe health education program planning process.
  - Explain health education program implementation.
  - Define health education program evaluation and differentiate formative and summative evaluation.
  - Describe health education program evaluation process.
- 1.6 Factors affecting health education: 3 hrs
- Explain factor-affecting learning.
    - Biological factors such as condition of sensory organs.
    - Physical factors.
    - Socio-culture factors.
    - Physiological factors.

1.7 Learning: 6 hrs

- Define learning.
- Describe different way of learning such as; by hearing, by seeing, by doing, by repetition, and by immitation.
- Describe different learning theories.

1.8 Communication: 6 hrs

- Define communication and describe different types of communication.
- Describe communication process and barriers.
- Describe different communication models.

**Unit 2: Health care system 25 hrs**

2.1 History of health care delivery system in Nepal: 11 hrs

- Describe the health care delivery system in Nepal.
  - Traditional health care -
    - Without system: Dhami, Jhankri, Lama, Guvaju etc.
    - With system: Ayurvedic, Homeopathy, Unani.
  - Modern health care -
    - Health Policy.
    - Second Long Term Health Plan.
    - Millenium development goal.
- Describe recent organogram of Ministry of Health (MoH).
- Explain healthcare management models.
- Describe process of patient care in community.

2.2 Primary Health Care: 14 hrs

- Describe concept of Primary Health Care.
- Define Primary Health Care.
- Explain principles of Primary Health Care.
- List and explain elements of Primary Health Care.
- Describe implementation of PHC (in terms of WHO and government of Nepal).
- Describe role of pharmacist in PHC.
- List and describe priority national programs (EPI, FP, TB/Leprosy, STI, Malaria/Kala-azar, etc.).

### Unit 3 First-aid

35 hrs

#### 3.1 Diagnosis and treatment.

12 hrs

Identify and manage the following:

- Emergency / General treatment of poisoning.
- Emergency / general treatment of shock.
- Emergency/general treatment of snakebites.
- Emergency/general treatment of burns.
- Emergency/general treatment of fractures.
- Emergency/general treatment of drowning.

#### 3.2 Abdominal Pain

2 hrs

Identify the following:

- Generalized abdominal pain.
- Upper abdominal pain.
- Pain in kidney.
- Blood in vomit and stool.

#### 3.3 Cough and breathing problems

3 hrs

Identify the following:

- Chest pain.
- Cough in children under five.
- Cough in adult.
- Difficulty in breathing.

#### 3.4 Diarrhea and vomiting (rehydration and fluid therapy)

4 hrs

Identify and manage the following:

- Diarrhea.
- Vomiting.

#### 3.5 Fever

2 hrs

Identify and manage the following:

- Acute fever.
- Chronic fever.

#### 3.6 Minor skin problems

2 hrs

Identify and manage the following:

- General illness, fever and rashes.

- Itching.
  - Ulcers.
  - Red, scaly, flaking rash.
- 3.7 Musculo-skeletal problem 2 hrs
- Identify and manage the following:
- Backache.
  - Pain in joints.
  - Weakness in arm, legs, difficulty in walking.
- 3.8 Nutritional deficiency 4 hrs
- Identify and manage the following:
- Failure to weight gain in child.
  - Weight loss in adult.
  - Weakness with anaemia.
- 3.9 Minor eye, ear, nose problems 4 hrs
- Identify and manage the following:
- Red eye with pain.
  - Red eye without pain.
  - Ear pain.
  - Ear discharge.
  - Blocked nose.
  - Foreign body.

## Practical

### Unit 1: Health education

**42 hrs**

- 1.1 Educational diagnosis survey (in hospital or health post or community): 12 hrs
- Select topic of interest.
  - Prepare Knowledge, Attitude and Practice (KAP) questionnaire.
  - Collect data from patients (1 day field).
  - Analyze and interpret data.
  - Find out problem.
  - Prioritize problems.

1.2	Preparation of a plan: Prepare a plan for the development of a health education action project based on results of the health education survey.	6 hrs
1.3	Organization and assessment: Organize and conduct a health education action project and assess the effectiveness of it (1 day field).	6 hrs
1.4	Demonstration of different methods of presentation: <ul style="list-style-type: none"> <li>• Prepare subject or text.</li> <li>• Present those texts by using different health education methods.</li> </ul>	12 hrs
1.5	Demonstration of operating process of Overhead Projector (OHP): <ul style="list-style-type: none"> <li>• Prepare appropriate text in transparencies.</li> <li>• Operate overhead projector.</li> <li>• Deliver that text using mini-lecture method.</li> </ul>	6 hrs
<b>Unit 2: Health care system</b>		<b>12 hrs</b>
2.1	Visit of health facility (PHCC/HP/SHP): <ul style="list-style-type: none"> <li>• Make an organogram of health facility.</li> <li>• Observe activities delivered to the patient and community.</li> <li>• Identify eight elements of PHC focusing on most frequently and rarely performed elements.</li> <li>• Make a field visit report.</li> </ul>	12 hrs
<b>Unit 3: First-aid</b>		<b>24 hrs</b>
3.1	Demonstration of different types of splint: <ul style="list-style-type: none"> <li>• Demonstrate the process of immobilization using splint.</li> </ul>	3 hrs
3.2	Demonstration of tourniquet: <ul style="list-style-type: none"> <li>• Locate suitable place for tourniquet.</li> <li>• Use tourniquet appropriately.</li> </ul>	3 hrs
3.3	Demonstration of ORS: <ul style="list-style-type: none"> <li>• Demonstrate the process of making ORS.</li> </ul>	2 hrs
3.4	Visit of health facility (Hospital/PHCC/HP/SHP): <ul style="list-style-type: none"> <li>• Observe signs and symptoms of common emergency problems.</li> <li>• Observe management procedure of common emergency problems.</li> <li>• Diagnose common emergency problems.</li> <li>• Manage common emergency problems.</li> </ul>	16 hrs

## References

1. Park, J.E. and park, K, textbook of social and preventive medicine (recent edition).
2. Pradhan, H.B., A textbook of Health Education. Educational Resources for Health, 1995.
3. Community Health Nursing
4. Macmohan, R. et al.. WHO current edition *A guide to management in primary health care*
5. Kamala, T. & Bishnu, R. Health learning materials centre, Tribhhuwan University, Kathmandu. 1990. *Leadership and management for nurses*.
6. Warner, D. “Helping Health workers Learn”
7. “Primary Health Care in Nepalese context”, Journal of Institute of Medicine, Vol. 1, No. 1, Feb 1979, pp 27 – 49.



# Third Year

# Pharmaceutics II

**Theory total: 117 hrs (3 hrs/week)**

**Full marks: 150 (Th. 100+Pr. 50)**

**Practical total: 78 hrs (2 hrs/week)**

**Pass marks: 70 (Th. 40+Pr. 30)**

## Course description

This course is designed to provide students the knowledge and skills about pharmaceutics. This course deals with different dosage forms, biphasic pharmaceutical products, aerosol, parental preparation biological products, powders, suppositories and ophthalmic products. Additionally, it deals with packaging materials, quality control, method of dispensing and surgical devices and medical appliances.

## Course objective

After completion of course the student will be able to:

1. Explain manufacturing process of different dosage forms.
2. Describe the packaging materials and merits and demerits of each.
3. Explain different types of biological products and their production.
4. Explain and understand prescription components.
5. Prepare simple solid dosage forms and biphasic preparations including intravenous solutions.

## Theory

### Unit 1: Oral administration of solid dosage

**10 hrs**

#### 1.1 Tablets:

- Define tablet and describe its merits and demerits.
- Mention different types of compressed tablets and their uses.
- Mention formulation of tablets with examples.
- Mention processes involved in the production of tablets.
- Describe the defects in tablets.
- Describe the reasons for tablets coating and types of tablet coating and their merits and demerits.
- Describe the packaging and storage of Tablets.

## 1.2 Capsule:

- Define capsule and mention its types and advantages and disadvantages.
- Mention different sizes of Hard gelatin capsule and describe method for calculation of filling weight.
- Describe different parts and working of hard gelatin capsule filling machine; describe the points that make difficulties in filling the capsules.
- Mention the difference between hard and soft gelatin capsules.
- Describe the Packaging and storage of capsule.

### **Unit 2: Monophasic liquid dosage forms**

**8 hrs**

- 2.1 Define monophasic liquid dosage form and mention its advantages and disadvantages.
- 2.2 Describe factors affecting solubility.
- 2.3 Mention the components of formulation with examples.
- 2.4 Describe the preparation of mixtures, Syrup, Elixirs, Linctuses, Drops, Draughts, Gargles, Mouth Washes, Throat paints, Sprays, Enemas, Douches, Ear drops, Nasal drops and sprays, Liniments and Lotions.

### **Unit 3: Biphasic pharmaceutical products**

**30 hrs**

#### 3.1 Emulsion:

(7 hrs)

- Define emulsion and mention its types.
- Define and classify emulsifying agents.
- Mention important points to be considered for selection of emulsifying agents.
- Mention the components of formulation with examples and describe the method of preparation in brief.
- Describe the storage condition for emulsion.

#### 3.2 Suspension:

(7 hrs)

- Define suspension and mention the characteristics of an ideal suspension.
- Mention the formulation components with examples.
- Describe preparation in brief.
- Mention the difference between flocculated and deflocculated system.
- Describe the packaging and storage condition.

#### 3.3 Semi solid dosage form

- Ointment: (10 hrs)
  - Define ointment and mention the characteristics of an ideal ointment.
  - Classify ointments.

- Classify ointment bases.
- Describe preparation of ointment and its stability aspects in brief.
- Describe packaging and storage condition.
- Cream, Paste and Jellies: (6 hrs)
  - Define cream, paste and jellies.
  - Mention formulation components with examples.
  - Describe preparation, packaging and storage of each in brief.

**Unit 4: Packing of pharmaceutical dosage form** **5 hrs**

- 4.1 Mention the ideal characteristics of containers and closures.
- 4.2 Classify containers on the basis of (a) method of closure and use (b) shapes.
- 4.3 Mention types and merits and demerits of glass, plastics, metals and papers.
- 4.4 Describe the packaging guidelines for pharmaceuticals implemented in Nepal.

**Unit 5: Aerosol** **4 hrs**

- 5.1 Define aerosol and mention its merits and demerits.
- 5.2 Describe aerosol principle.
- 5.3 Illustrate components of aerosol.
- 5.4 Describe aerosol system operation.
- 5.5 Explain proper administration and use of pharmaceutical aerosol.
- 5.6 Mention the advantages of Aerosol over other dosage forms.

**Unit 6: Parental preparation** **14 hrs**

- 6.1 Introduce parenteral preparations and mention its different routes of administration.
- 6.2 Mention its advantages and disadvantages.
- 6.3 Mention types and formulation components with examples.
- 6.4 Describe aseptic condition and its need in manufacturing of parenteral preparation.
- 6.5 Describe the steps involved in manufacturing of parenteral preparation in brief.

**Unit 7: Biological products** **7 hrs**

- 7.1 Define immunity and describe its types.
- 7.2 Define immunological terminologies.
- 7.3 Classifications of immunological preparations.
- 7.4 Describe the preparation of vaccines, sera and toxoids in brief.
- 7.5 Describe cold chain equipment and maintenance of cold chain for different vaccines.

- Unit 8: Dispensing pharmacy** **9 hrs**
- 8.1 Prescriptions:
- Describe the parts of prescription and its handling steps, orient with Latin terms commonly used, describe modern methods of prescribing and solve numerical involved in dispensing.
- 8.2 Pharmaceutical Incompatibilities in prescriptions:  
Describe physical, chemical and therapeutic incompatibilities.
- 8.3 Posology:  
Define dose and dosage form, describe the factors influencing dose, and calculate doses on the basis of age, sex and surface area.
- Unit 9: Powders** **3 hrs**
- 9.1 Define and classify powders, mention its advantages and disadvantages.
- 9.2 Describe preparation of different types of powders encountered in prescriptions.
- 9.3 Describe its packaging and storage.
- Unit 10: Suppositories** **6 hrs**
- 10.1 Define suppositories and mention its types.
- 10.2 Mention the formulation components and describe the preparation in brief.
- 10.3 Describe the packaging and storage.
- Unit 11: Ophthalmic products** **6 hrs**
- 11.1 Introduce and classify ophthalmic products.
- 11.2 Describe the pharmaceutical requirements of ophthalmic products.
- 11.3 Describe the preparation in brief.
- 11.4 Describe packaging and storage conditions.
- Unit 12: Quality assurance** **7 hrs**
- 12.1 Define quality control and quality assurance.
- 12.2 Describe the meaning of quality of drugs.
- 12.3 Orient with GMP and GLP.
- 12.4 Provide concept of total quality management.
- 12.5 Describe documentation in quality assurance.
- Unit 13: Surgical devices and medical appliances** **8 hrs**
- 13.1 Explain suture and ligature.
- 13.2 Classify suture and ligature with examples.
- 13.3 Orient with other medical appliances such as contact lens, urinary catheters, medical and surgical gloves, cottons, syringes, nebulizers etc.

# Practical

## **Unit 1: Oral administration of solid dosage** **24 hrs**

### 1.1 Tablets:

- Prepare aspirin tablets. (4 hrs)
- Prepare paracetamol tablets. (4 hrs)
- Determine physical parameter of paracetamol tablet. (4 hrs)

### 1.2 Capsule:

- Prepare hard gelatin capsule of aspirin. (4 hrs)
- Prepare hard gelatin capsule of aspirin/ferrous gluconate. (4 hrs)
- Determine physical parameter of amoxicillin capsules. [4 hrs]

## **Unit 2: Biphasic pharmaceutical products** **20 hrs**

### 2.1 Emulsion:

- Prepare turpentine liniment (w/o emulsion). [2 hrs]
- Prepare white liniment (o/w emulsion). [2 hrs]

### 2.2 Suspension:

- Prepare and supply antacid suspension. (4 hrs)
- Prepare and supply calamine/kaolin suspension. (4 hrs)

### 2.3 Semi solid dosage form.

#### Ointment:

- Prepare and supply sulphur ointment. (4 hrs)
- Prepare and supply methyl salicylate ointment. (4 hrs)

## **Unit 3: Parenteral preparation** **8 hrs**

3.1 Prepare and supply 5% (v/v) dextrose solution. (4 hrs)

3.2 Prepare and supply 0.9% sodium chloride solution. (4 hrs)

## **Unit 4: Dispensing pharmacy** **4 hrs**

### 4.1 Chemical incompatibility:

- Prepare and supply strychnine hydrochloride mixture in aromatic spirit of ammonia. (2 hrs)

### 4.2 Physical incompatibility:

- Prepare and supply menthol insufflations containing camphor, Ammonium chloride and Light magnesium carbonate. (2 hrs)

**Unit 5: Powders** **4 hrs**

5.1 Prepare and supply compound magnesium trisilicate oral powder. (2 hrs)

5.2 Prepare and supply compound calcium carbonate powder. (2 hrs)

**Unit 6: Suppositories** **8 hrs**

6.1 Prepare paracetamol suppository. (4 hrs)

6.2 Prepare boric acid suppository. (4 hrs)

**Unit 7: Ophthalmic products** **10 hrs**

7.1 Prepare and supply sulphacetamide eye drops. (4 hrs)

7.2 Prepare and supply sodium bicarbonate eye lotion or chloramphenicol eye ointment. (4 hrs)

7.3 Transfer sterile product under aseptic condition. (Laminar airflow). [2 hrs]

**References**

1. Gaud. *Pharmaceutics*, 2003, India.
2. Gaud and Gupta. *Practical Pharmaceutics*, 2004, India.
3. Gaud and Gupta. *Practical Physical Pharmacy*, 2004, India.
4. Gaud. *Text book of pharmaceutics*, 2004, India.
5. Gupta, A. K. *Pharmaceutics: Practical manual (Part I & II)*, 2004, India.
6. Gupta, A. K. *Introduction to pharmaceutics-II*, 2004, CBS publisher and distributors, India.
7. E. A. Rowlinson (ED): *Bentley's The Text book of pharmaceutics latest edition*, Bailliere Tindall, London.
8. *The extra pharmacopoeia (Martindale)*.
9. Remington: *The Science and Practice of Pharmacy*, 20th Edition, Vol I & II.
10. *The Theory and Practice of Industrial Pharmacy*, Leon Lackman, H. A. Lieberman, J. L. Kanig, Third Edition, Varghese Publishing House, Hind Rajasthan Building, Dadar, Bombay – 400 014.
11. *Pharmaceutical Dosage Forms and Drug Delivery Systems*. H. C. Ansel, L. V. Allen and N. G. Popovich, Seventh Edition, Lippincott Williams and Wilkins.
12. *Pharmaceutics: The Science of Dosage Forms*, M. E. Aulton, Churchill Livingstone.
13. *Indian pharmacopoeias*.
14. *British pharmacopoeias*.
15. K. Kafle, R. G. Pinniger, *Diagnostic & treatment Manual for primary health care in the district*, Current edition.
16. Cooper and Gunn's *Tutorial Pharmacy*, Sixth Edition.

# Pharmacology & Pharmacotherapeutics II

Theory total: 117 hrs (3 hrs/week)

Full marks: 150 (Th. 100+Pr. 50)

Practical total: 78 hrs (2 hrs/week)

Pass marks: 70 (Th. 40+Pr. 30)

## Course description

This course is designed to provide students the knowledge and skills about pharmacology and pharmacotherapeutics. It deals with pharmacotherapeutic agents and their role in different pathophysiological conditions. Additionally, this course focuses on the mode of action, the uses and adverse effects, drug interaction, and precautions to be taken for drugs to be used.

## Course objective

After completion of course the student will be able to understand the action, use, and mechanism of action, side effects, contraindication of the following drugs:

1. NSAIDs and antipyretic analgesics.
2. Drugs acting on autonomic nervous system.
3. Histamine & antihistamines.
4. Drugs used in renal system.
5. Hormones and related drugs.
6. Drugs acting on peripheral nervous system.
7. Drugs acting on central nervous system.
8. Chemotherapy and neoplastic disease.
9. Drugs acting on skin and mucous membrane.
10. Nutritional Supplements.
11. Drugs used in ENT and eye.

## Theory

### Unit 1 NSAIDs and antipyretic analgesics

10 hrs

- 1.1 Explain the physiology of inflammation.
- 1.2 Illustrate pain, pyrexia and inflammation.
- 1.3 Describe the mechanism of action, use, contraindication, precaution and doses of commonly used analgesics antipyretics and anti-inflammatory drugs.
- 1.4 Illustrate drug for rheumatoid arthritis and gout.
- 1.5 Describe the action, use, contraindication, precaution and doses of drugs for rheumatoid arthritis and drugs for gout.



- Unit 2: Drugs acting on autonomic nervous system** **10 hrs**
- 2.1 Draw an overview on the physiology of ANS about cholinergic, anti cholinergic, adrenergic and antiadrenergic system.
  - 2.2 Describe the general mechanism, side effects, contraindication and precaution of cholinergic, anti cholinergic, adrenergic and antiadrenergic drugs with examples of commonly used drugs.
- Unit 3: Histamine & antihistamines** **4 hrs**
- 3.1 Describe general mechanism, action, use, contraindication, precaution and dose of commonly used antihistamines and decongestants.
- Unit 4: Drugs used in renal system** **4 hrs**
- 4.1 Explain about acute and chronic renal failure and its management.
- Unit 5: Hormones and related drugs** **20 hrs**
- 5.1 Describe the physiology of endocrine system.
  - 5.2 Describe hyperthyroidism and hypothyroidism.
  - 5.3 Explain the mechanism of action, use, contraindication, precaution and doses for commonly used drugs on hyperthyroidism and hypothyroidism.
  - 5.4 Describe diabetes mellitus.
  - 5.5 Explain role and the mechanism of action, use, contraindication, precaution and doses of insulin and oral hypoglycemic drugs and glucagons.
  - 5.6 Describe the general mechanism of action, use, contraindication, precaution and doses of commonly used corticosteroids.
  - 5.7 Mention the general mechanism of action, use, contraindication, precaution and doses of the commonly used gonadal hormones and their antagonist.
  - 5.8 Describe the general mechanism of action, use, contraindication, precaution and doses of oxytocin and drugs used in uterus.
- Unit 6: Drugs acting on peripheral nervous system** **6 hrs**
- 6.1 List the drugs used as skeletal muscle relaxants and their mechanism of action.
  - 6.2 Describe the general mechanism of action, use, contraindication, precaution and doses of commonly used local anesthetics.
- Unit 7: Drugs acting on central nervous system** **24 hrs**
- 7.1 Explain the general mechanism of action, use, contraindication, precaution and doses of commonly used general anaesthetics.
  - 7.2 Describe the effect of ethyl and methyl alcohols in the body, guidelines for safe drinking.
  - 7.3 Elaborate the general mechanism of action, use, contraindication, precaution and doses of commonly used sedative and hypnotics.

- 7.4 Describe the general mechanism of action, use, contraindication, precaution and doses of commonly used antiepileptic drugs.
- 7.5 Mention the general mechanism of action, use, contraindication, precaution and doses of commonly used antiparkinsonian drugs.
- 7.6 Explain different types of mental illnesses and the general mechanism of action, use, contraindication, precaution and doses of commonly used anti psychotic, anti anxiety drugs, anti depressant and antimanic drugs.
- 7.7 Describe pain and its physiology.
- 7.8 Explain the general mechanism of action, use, contraindication, precaution and doses of commonly used opioid analgesics and antagonists.
- 7.9 Give a brief introduction of CNS stimulants and cognition enhancers.

### **Unit 8: Chemotherapy and neoplastic disease**

**6 hrs**

- 8.1 Describe the general mechanism, contraindication, precaution and handling of commonly used anticancer drugs.

### **Unit 9: Miscellaneous drugs**

**5 hrs**

- 9.1 Describe the general mechanism, contraindication, precaution and handling of immunosuppressant and gene therapy.

### **Unit 10: Drugs acting on skin and mucous membrane**

**10 hrs**

- 10.1 Describe the use and preparations of the following:

- Demulcents.
- Emollients.
- Adsorbents and protectives.
- Astringents.
- irritants and counter irritants.
- Kerolytics.
- Antiseborrheics.
- antipsoriasis.
- Drugs for acne and vulgaris.
- Steroids preparation.
- Antiseptic and disinfectants with their classifications and spectrum of activity.
- Scabies, and drugs used in scabies and pediculosis.
- Single versus combination therapy for management of skin diseases.

### **Unit 11: Nutritional supplements**

**12 hrs**

- 11.1 Classify vitamins and describe their role in the body.

11.2 Explain the sources of vitamins and mineral, Anemia, Iron therapy and role of minerals in the body.

11.3 Describe enzyme preparations and their role.

### **Unit 12: Eye, ear and nasal preparation**

**6 hrs**

12.1 Describe the mechanism, precaution, and contraindication of commonly used eye, ear and nasal preparation.

## **Practical**

### **Unit 1: Drug effects**

1.1 Carry out the study on the effect of local anaesthetics on rabbit cornea / simulated model / data interpretation. 15 hrs.

1.2 Carry out the study on the effect of mydriatics and miotics on rabbit's eye / simulated model/ data interpretation. 15hrs.

1.3 Carry out study of effect of convulsions and anticonsulvals in mice or rat / simulated model / data interpretation 15hrs.

Conduct a study of general behavior of some drugs on mice / simulated model / data interpretation. 15hrs.

### **Unit 2: Case studies**

2.1 Conduct the simulated case studies on the followings: 18 hrs.

- Drug crossing Blood Brain Barrier.
- Drugs not crossing Blood Brain Barrier.
- Dose adjustments in Hepatic diseases, Kidney diseases, elderly patients, Pregnancy, and during lactation.

### **References**

1. Pharmacology by Satoskar and Bhandarar.
2. Martindale: The extra pharmacopoeia. 29<sup>th</sup> Ed.
3. British pharmacopoea.
4. Indian pharmacopoea.
5. CIMS published by Bio – gard medical service (Bangalore)
6. MIMS published by mims India, New Delhi.
7. Gadam's Pharmacology.
8. Essentials of Pharmacology by V.D. Tripathi

# Pharmaceutical Chemistry II

Theory total: 156 hrs (4 hrs/week)  
Practical total: 78 hrs (2 hrs/week)

Full marks: 150 (Th. 100+Pr. 50)  
Pass marks: 70 (Th. 40+Pr. 30)

## Course description

This course is designed to acquaint students with the knowledge and skills on physico-chemical properties of organic pharmaceutical ingredients and biological action in relation to their chemical structure and recommended method/s of their quality control.

## Course objective

After completion of this course student will able to:

1. Understand the organic pharmaceutical ingredients, their official monographs and articles.
2. Explain nomenclature of organic compounds with special reference to heterocyclic system.
3. Explain structure, storage, handling and quality assurance of the organic drug molecules.

## Theory

### Unit 1: Introduction

4 hrs

- 1.1 Describe the importance of organic drug molecules as a whole and also focus to pharmacy.
- 1.2 Explain the brief history of the development of pharmaceutical chemistry.

### Unit 2: Nomenclature of organic compounds with special reference to heterocyclic system.

8 hrs

- 2.1 Explain the Nomenclature of Organic Compounds, IUPAC rule special reference to heterocyclic system.
- 2.2 Explain the numbering system different position of benzene ring.

### Unit 3: Structure, storage, handling and quality assurance of the molecules of following organic drugs (from section 3.1 to 3.17)

144 hrs

- 3.1 Antiseptic and disinfectants: (20 hrs)
  - Explain Formaldehyde.
  - Introduce Acriflavine, Proflavine, Benzylkonium chloride, Cetrimide, phenol and cresol.
  - Explain Sulfonamide and Anti-leprotics.
  - Explain Suphanilamide, Co-trimoxazole.

- Introduce Silver Sulfadiazine, Sulphadimethoxin, Sulphaguanidine, Thalazole, Dapsone, Clofazemin.
- 3.2. Penicillins and Cephalosporins: (6 hrs)
- Explain Amoxicillin.
  - Explain Benzylpenicillin, Ampicillin, Cephalexin, Cefaclor, Cefotaxime, Cefixime, cefadroxil.
- 3.4 Chloramphenicol and Tetracycline: (2 hrs)
- Explain Chloramphenicol, Tetracycline HCl, Doxycycline.
- 3.5 Aminoglycosides and Macrolides: (2 hrs)
- Explain Erythromycin, Gentamicin, Azithromycin, Kanamycin..
- 3.6 Quinolones and Fluoroquinolones. (4 hrs)
- Describe Nitrofurantoin, Nalidixic acid, Norfloxacin, Ciprofloxacin, Ofloxacin.
- 3.7 Antitubercular medicines: (6 hrs)
- Explain INH, PAS, Rifampicin, E-butol, Pyrizinamide, Streptomycin and Thiacetazone. Anti-leprotic: Dapsone and clofazemine.
- 3.8. Anti-amoebic and Anthelmentics: (12 hrs)
- Explain Metronidazole, albendazole and chloroquin.
  - Explain Tinidazole, Secnidazole, Diloxanide fuorate, Mebendazole, Paryntel pamoate, DEC. Anti-malarials: Quinine group (Chloroquine and others) TMP and pyremethamine, Artemisenine derivatives.
- 3.9 Scabicides and pediculocides (2 hour)
- Explain GBHC, Benzyl benzoate.
- 3.10 Psychotropic agents: (14 hrs)
- Define Antipsycotics and introduce Chlorpromazine, Trifluoperazine, Haloperidol, Dizepam, Lorazepam.
  - Define Hypnotics and introduce Barbiturates, Nitrazepam.
  - Define Anti-depressants and introduce Amitryptilline, Imipramine, Alprazolam.
  - Define Antiepileptics, Anticonvulsants and antirigidity. Introduce Carbamazepine, Phenytoin, sodium Valproate, Trihexyphenydl.
- 3.11 Drugs Acting on CNS and ANS.: (26 hrs)
- Define General anaesthetic, Halothane, Methohexital, Trichloroethylene, Ketamine.
  - Define Local Anaesthetic, Lignocaine, Benzocaine, Ethyl Chloride.
  - Define Adrenergic Drugs, Adrenaline, Noradrenaline, Salbutamol, Ephedrine, Pseudoephedrine.
  - Define Adrenergic antagonist, Atenolol group.
  - Define Cholinergics: Neostigmine, Pyridostigmine, Pilocarpine
  - Define Cholinergic Antagonist: Atropine sulphate group including Tropicamide.

- Describe muscle relaxant and introduce Chlorzoxazone and Tizanidine.
- 3.12 Cardiovascular Drugs: (12 hrs)
- Explain Frusomide, Amlodipine, Atenolol , Enalapril and Aspirin.
  - Explain Thiazides, Urea, Mannitol, Nitrate anti-anginals, Quinidine, Procainamide, Heparin, Warferin, Dypyridamol, Ticlopidine, Aspirin, Ethamsylate, Cumarins, Digitalis, Simvastatin.
- 3.13 Hormones and Related drugs: (12 hrs)
- Explain Insulin, Chlorpropamide, and dexamethasone.
  - Explain Glibenklamide, Metformin, Phenformin, Rosiglitazone, Thyroxine, Carbimazole, Methylthiouracil, Steroids (Dexamethasone, Prednisolone, Betamethasone), Testosterone, estrogens and Progesterone.
- 3.14 Histamines and Antihistamines: (4 hrs)
- Explain chlorpheniramine and cetirizine
  - Explain Pheniramine, , Diphenhydramine, Promethazine, Cyproheptadine.
- 3.15 Analgesic, Anti-pyretic and NSAID: (6 hrs)
- Explain Codeine, Paracetamol and Ibuprofen.
  - Explain Pethidine, Tramadol, Petazocin, Diclofenac, Mefenamic acid, Nimesulide and Glucosamine.
- 3.16 Anti-neoplastic: (4 hrs)
- Explain Cisplatin, Mercaptopurine, Fluorouracil, Tamoxifen, Vincristine, Taxol, Doxorubicin and mitomycin.
- 3.17 Vitamins, Minerals and Enzymes: (12 hrs)
- Explain Vitamin A, Vitamin B group, Vit. C, Vitamin D, Niacinamide, D-panthenol, Iron salts and iron soluble polymers, Folic acid.
  - Explain Vitamin E, Vitamin K, Calcium, Zn, Cu, Mn., Diastase, Pepsine, Pancreatin, Serratiopeptdase, Chemotrypsine.
- 3.18 Diagnostics: (2 hour)
- Define BaSO<sub>4</sub>, Iopanoic acid, Propylidone and Meglumine.

# Practical

## Unit 1: Experiments for simple laboratory procedures

30 hrs

- 1.1 Crystallize sugar from its saturated solution.
- 1.2 Carry out sublimation of iodine.
- 1.3 Perform filtration and drying of talc suspension and aqueous solution of Aspirin. Extract Ibuprofen from its tablet.
- 1.4 Perform distillation of 60% acetic acid in water and determine the percentage of acetic acid in distillate.
- 1.5 Determine melting point of Paracetamol, Metronidazole, Ibuprofen, Aspirin and amoxicillin.
- 1.6 Determine viscosity of Sodium CMC and starch slurry.
- 1.7 Determine optical rotation of aqueous solution of dextrose.

## Unit 2: Experiments for Systemic qualitative test of Organic pharmaceutical Ingredients

28 hrs

- 2.1 Determine solubility and melting point of Paracetamol, Metranidazole, Amoxicillin, Tetracycline and Citric acid.
- 2.2 Determine Boiling point of alcohol and Glycerin.
- 2.3 Detect functional group of Penicillins, Cephalosporin, Phenolic hydroxyl, Aromatic Amine and sulphanomides.
- 2.4 Carry out Identification test of at least five common active pharmaceutical ingredients and excipients (Starch, lactose, Chlorpheniramine maleate, Tetracycline, Iodine).

## Unit 3: Identification of unknown organic compounds.

20 hrs

- 3.1 Identify at least two unknown organic compounds.

### Referneces

(Latest edition to be referred of all the Books):

14. Mahadik KR and Kucher BS- Concise inorganic Pharmaceutical chemistry, Nirali Prakashan, 2004.
15. Mahadik KR and Kucher BS- Concise organic Pharmaceutical chemistry, Nirali Prakashan, 2004.
16. Kasture AV and Wadker- Pharmaceutical chemistry I & II Nirali Prakashan.

17. Bekeet AH and Stenlk- Practical Pharmaceutical Chemistry 4th edition Part I & II.
18. Kasture AV and Wadker- Practical Pharmaceutical chemistry I & II, Nirali Prakashan.
19. Antheron LM-Bently's & Drivers text book of Pharmaceutical chemistry, Oxford University Press London.
20. Kadam et.al – Principles of Medicinal Chemistry Vol. I & II.
21. Kasture AV et.al – Pharmaceutical analysis Vol I & II, Nirali Prakashan.
22. Daniel C Harris- Quantitive Chemical Analysis, W H Freeman and Company.
23. Jeffrey GH et.al-Vogel's Textbook of Quantitative Chemical Analysis 5th Edition.
24. Tipins HP Dhake AS- Inorganic Pharmaceutical chemistry, Career publication, Dec 2002.
25. Belsare P and Dhake AS- Inorganic Chemistry (Practical), Career publication.
26. Indian Pharmacopoeia latest edition.
27. British Pharmacopoeia latest edition.



# Hospital and Clinical Pharmacy

Theory total: 117 hrs (3 hrs/week)  
Practical total: 78 hrs (2 hrs/week)

Full marks: 100 (Th. 80+Pr. 20)  
Pass marks: 44 (Th. 32+Pr. 12)

## Course description

This course enriches the students with the knowledge and skills for managing the pharmacy department of hospital and community pharmacy. Hospital pharmacy focuses on drug distribution system in hospital, sterile manufacture, non-sterile manufactures, nomenclature and uses of surgical instruments and hospital equipment. Similarly, clinical pharmacy focuses drug Interactions, adverse drug reaction, therapeutic drug monitoring, concept of patient counseling, store handling and rational dispensing.

## Course Objectives

After completion of this course students will be able to:

1. Handle pharmacy department of hospital for providing the services to out patient department and in-patient department.
2. Provide the patient counseling services for rational drug use.
3. Familiarize with clinical trial programme and project.
4. Organize drug-monitoring programme.
5. Explain rational management of drug store department.

## Theory

### Part A: Hospital Pharmacy

#### Unit 1: Hospitals

8 hrs

- 1.1 Define with function; classify hospitals based on various criteria, organization, management and delivery system in Nepal.

#### Unit 2: Hospital pharmacy

10 hrs

- 2.1 Define hospital pharmacy.
- 2.2 Explain functions and objectives of hospital pharmacy services.
- 2.3 Describe the importance of location, layout, flow chart of materials and men.
- 2.4 Explain personnel and facilities requirements including equipments based on individual and basic needs.
- 2.5 Explain requirements and abilities required for hospital pharmacists.

#### Unit 3: Drug distribution system in hospital

10 hrs

- 3.1 Explain drug distribution system in hospitals with emphasis on:

- Out patient services.
- In-patient services.
- Types of services.
- Detailed discussion of unit dose system.
- Floor ward stock system.
- Satellite pharmacy system.
- Central sterile services.
- Bedside pharmacy.

**Unit 4: Manufacturing** **10 hrs**

- 4.1 Explain economical considerations, estimation of demand.
- 4.2 Explain sterile manufacture- large and small volume parenterals, facilities, requirements, layout, production planning, and manpower requirements.
- 4.3 Explain Non-sterile manufacture - Liquid orals, externals, and Bulk concentrates.
- 4.4 Explain procurement, stores and testing of raw materials.

**Unit 5: Surgical and accessories** **5 hrs**

- 5.1 Define and explain nomenclature and uses of surgical instruments and hospital equipments and health accessories.

**Unit 6: Drugs and therapeutic committee** **4 hrs**

- 6.1 Explain D.T.C. (Drugs and Therapeutic Committee), Hospital formulary system and their organization, functioning, composition.

**Unit 7: Drug information** **2 hrs**

- 7.1 Elaborate drug information service and drug information bulletin.

**Unit 8: Quality Assurances for surgical and others** **3 hrs**

- 8.1 Familiarize with surgical dressing like cotton, gauze, bandages and adhesive tapes including their pharmacopoeial tests for quality as well as other hospital supply e.g. I.V. sets, Ryals tubes, Catheters, Syringes.

**Unit 9: Store management** **3 hrs**

- 9.1 Explain rational store management for general drugs, corrosive, toxic, narcotic drugs, inflammable drugs and other chemicals.

**Unit 10: Data, information management** **3 hrs**

- 10.1 Explain application of computers in maintenance of records, inventory control, medication monitoring, drug information and data storage and retrieval in hospital and retail pharmacy establishments.

**Part B: Clinical Pharmacy**

**Unit 1: Introduction** **5 hrs**

- 1.1 Introduction to clinical pharmacy practice.
- 1.2 Define and elaborate clinical pharmacy scope.

- Unit 2: Dispensing** **5 hrs**
- 2.1 Modern dispensing aspects:
- Explain patient counseling guidance for the use of common drugs and medication history.
- Unit 3: General symptoms** **15 hrs**
- 3.1 List and explain common daily terminology used in the practice of medicine.
- 3.2 Disease, manifestations and pathophysiology including salient symptoms to understand the disease like Tuberculosis, Hepatitis, Rheumatoid Arthritis, Cardio-vascular diseases, Epilepsy, Diabetes, Peptic Ulcer, Hypertension.
- Unit 4: Drug interactions** **8 hrs**
- 4.1 Drug interactions:
- Define
  - Explain Mechanism of drug interaction
  - Elaborate drug-drug interaction with reference to analgesics, diuretics, cardio vascular drugs, Gastro-intestinal agent, vitamins and hypoglycemic agents.
  - Elaborate drug-food interaction
- Unit 5: Adverse drug reaction** **5 hrs**
- 5.1 Adverse drug reactions.
- 5.2 Define and explain significance.
- 5.3 Explain drug-induced diseases and teratogenicity.
- Unit 6 Patient compliance** **8 hrs**
- 6.1 Handle patient compliance.
- 6.2 Define, state, factors affecting patient compliance, methods of improving patient compliance.
- Unit 7: Therapeutic drug monitoring** **5 hrs**
- 7.1 Define Drug Monitoring.
- 7.2 Explain Importance of monitoring.
- 7.3 State the Techniques of monitoring.
- Unit 8: OTC products and self-medication** **4 hrs**
- 8.1 State advantages and disadvantages self-medication.
- 8.2 Explain role of advertisement.
- 8.3 Explain concept of e-medication.
- Unit 9: Clinical pharmacy services in specific conditions** **4 hrs**
- 9.1 Explain the role of clinical pharmacy services in specific conditions like:
- Pregnancy.
  - Lactation.

- Elderly, children, neonate.
- Liver, kidney diseases.

## **Practical**

<b>Unit 1: Hospital management</b>	<b>13 hrs</b>
1.1 Prepare transfusion fluids, and other pharmaceutical preparations.	
<b>Unit 2: Quality control</b>	<b>20 hrs</b>
2.1 Conduct sterility test of the product prepared in unit 1.	
2.2 Evaluate surgical dressings.	
<b>Unit 3: Sterilization</b>	<b>15 hrs</b>
3.1 Sterilize surgical instruments, glassware and other hospital supplies.	
<b>Unit 4: Information management:</b>	<b>15 hrs</b>
4.1 Handle and use data processing software and equipments.	
<b>Unit 5: Patient safety</b>	<b>15 hrs</b>
5.1 Assess clinical data.	

### **References**

1. Remington's Pharmaceutical Sciences.
2. Martindale's Extra Pharmacopoeis.
3. Textbook of Hospital and clinical pharmacy, Dandiya, P. C., Mathur, Mukul, Vallabhai Prakashan.
4. WHO publication on Hospital and clinical Pharmacy.

# Forensic & Community Pharmacy

**Theory total: 117 hrs (3 hrs/week)**

**Full marks: 100 (Th. 80+Pr. 20)**

**Practical total: 78 hrs (1 hr/week)**

**Pass marks: 44 (Th. 32+Pr. 12)**

## Course Description

This course is designed to help students to acquaint with the knowledge and skills on different regulatory provision in the drug administration as well as related regulations of Nepal and basic differences on the regulatory provisions of India. This course also focuses on the different ethical aspects of pharmacy and different components of the community pharmacy.

## Course objectives

After completion of this course the students will be able to:

1. Understand the provision of drug laws and their regulations.
2. Explain drug policy.
3. Discuss the banned drugs and pharmaceutical ethics.
4. Describe different aspects of community pharmacy and community pharmacy management.
5. Develop communication skill and dispensing technique.

## Theory

### Unit 1: Pharmaceutical legislation of Nepal

**30 hrs**

- 1.1 Explain the provisions of Drugs Act, 1978.
- 1.2 Explain the provisions of Drug Registration Regulation.
- 1.3 Explain the provisions of Drug Consultative Council and Drug Advisory Committee Regulations.
- 1.4 Explain the provisions of Drug Standard Regulation.
- 1.5 Explain the provisions of Drug Inspection Regulation.
- 1.6 Explain the provisions of Drug Manufacturing Codes.
- 1.7 Explain the provisions of Good Manufacturing Practices.
- 1.8 Explain the provisions of Drugs Sale and Distribution Codes.
- 1.9 Explain the provisions of Regulation for veterinary, ayurvedic and other system of medicines.
- 1.10 Explain the provisions of National Drug Policy.

**Unit 2: Act and regulations related to pharmaceutical products** **22 hrs**

- 2.1 Explain the provisions of consumer protection act.
- 2.2 Explain the provisions of narcotic drugs control act relating to pharmaceutical product and the relation of act with Drugs Act, 1978.
- 2.3 Explain the concept of control of poisonous & hazardous chemical substances and their control mechanism.
- 2.4 Describe the various pharmacy institutions and organizations of Nepal and their functions.
- 2.5 Explain the drugs banned drugs in Nepal and the reason of drug banning.

**Unit 3: Ethical aspects of pharmacy** **3 hrs**

- 3.1 Describe rules of moral conduct in pharmacy.
- 3.2 Describe how pharmacy profession is different than other profession with suitable examples.
- 3.3 Describe importance of ethics in pharmacy.

**Unit 4: Community pharmacy** **40 hrs**

- 4.1 Describe profession & professionalism.
- 4.2 Explain pharmacy as profession.
- 4.3 Describe the role of community pharmacy in the society, Primary Health Care, public health and role of community pharmacist.
- 4.4 Explain the different component of prescription.
- 4.5 Explain different steps of dispensing of prescription and dispensing techniques.
- 4.6 Explain the pharmaceutical abbreviations and calculations.
- 4.7 Explain extemporaneous dispensing.
- 4.8 Explain labeling of dispensed products.
- 4.9 Explain patient counseling.
- 4.10 Explain patient compliance.

**Unit 5: Communication skills** **10 hrs**

- 5.1 Explain nonverbal communication.
- 5.2 Explain patterns of behavior in communication.
- 5.3 Explain questioning and listening skill.
- 5.4 Explain barriers of communication.
- 5.5 Explain confidentially.

**Unit 6: Good community pharmacy practice** **12 hrs**

- 6.1 Describe the requirements of premises/layout.

- 6.2 Describe the requirements of equipments.
- 6.3 Describe the requirements of manpower.
- 6.4 Describe the requirements of material.
- 6.5 Describe the requirements of storage and inventory control.
- 6.6 Describe the requirements of services.
- 6.7 Describe the requirements of documentation.

## **Practical**

- Unit 1: Documents for obtaining license** **10 hrs**
- 1.1 Prepare a list of documents required for obtaining the following licenses for Department of Drug Administration (DDA) Nepal and present why those provisions are made.
    - For establishment of pharmaceutical industry.
    - For obtaining Manufacturing license.
    - For market permission.
    - For retail/wholesale shop registration.
    - For obtaining import license.
- Unit 2: Case report** **8 hrs**
- 2.1 Make a complete case report to file a case to the court/chief drug administrator.
    - Unregistered shops.
    - Banned drugs available in the shop.
    - Substandard quality medicines available in the shop.
    - Illegal Import of medicines.
- Unit 3: Prepare a layout design of a retail shop.** **2 hrs**
- Unit 4: Role play** **12 hrs**
- Conduct a Role-play on dummy prescriptions.
- Conduct a Role-play on non – verbal communication.
- Unit 5: Drug management** **5 hrs**
- 5.1 Allocate the drugs into the different locations.
- Unit 6: Development of chart** **2 hrs**
- 6.1 Prepare a chart of pharmaceutical organization and their objectives.

## References

1. Drugs Act and Regulations of Nepal published by Kanoon Kitab Byabastha Samitte.
2. Publications of Department of Drug Administration (DDA).
3. Alfonso R. Gennaro: Remington the Science and Practice of Pharmacy, Volume II (20th Edition) 2002, Lippincott Williams & Wilkins, Philadelphia.
4. J. Winfield and R. M. E. Richards: Pharmaceutical Practice (2nd Ed.) 1998, Churchill Livingstone, Edinburg.
5. The Drug & Cosmetic Act of India.



# Pharmacoepidemiology and Environmental Health

Theory total: 78 hrs (2 hrs/week)

Full marks: 100 (Th. 80+Pr. 20)

Practical total: 39 hrs (1 hr/week)

Pass marks: 44 (Th. 32+Pr. 12)

## Course Description

This course is designed to equip the students with the knowledge and skills on pharmacoepidemiology in addressing drug related questions in a large population and environmental impact to the health.

## Course Objectives

After completion of this course students will be able to:

1. Explain epidemiology and epidemiological concepts.
2. Describe different epidemiologic study designs pertaining to adverse drug effects, drug efficacy or patterns of drug use in a large population.
3. Explain different types of biases and confounding that may be specific to pharmacoepidemiologic study.
4. Describe environment, environmental health, and environmental pollution.
5. Explain the impact of environmental impact to the health.
6. Explain the national and global issues of environment pollution.
7. Describe water, air and noise pollution and its impact to the health.
8. Explain the water purification techniques.

## Theory

### Unit 1: Pharmacoepidemiology

28 hrs

#### 1.1 Introduction and concept of epidemiology:

10 hrs

- Describe epidemiological concept.
- Define epidemiology.
- Describe use of epidemiology.
- Describe historical development of epidemiology and its practice.
- Explain infectious diseases epidemiology -
  - Diseases transmission (Chain of Infection), prevention and control.
  - Principle of disease control and prevention, hospital acquired infection.

- Overview of common infectious diseases.
  - Describe defense mechanism of the body.
  - Describe Immunization and immunity.
- 1.2 Overview of pharmacoepidemiologic concepts: 8 hrs
- Describe pharmacoepidemiological concept.
  - Discuss different types of pharmacoepidemiological studies.
    - Descriptive, analytical and experimental study.
  - Calculate different rates, ratios, and odds ratios.
- 1.3 Methods of quantifying drug interactions and adherence to drug therapy in pharmacoepidemiology: 2 hrs
- Discuss methods of quantifying drug interaction using principles of epidemiology, more specifically the Rothman principle of causation and the Rothman Synergy index.
  - Discuss different methods of quantifying adherence to drug therapy.
- 1.4 Confounding and Bias: 2 hr
- Define confounding and bias.
  - Classify different types of bias.
- 1.5 Drug Utilization Stud: 6 hr
- Define drug utilization.
  - Calculate different drug use indicators.
  - Describe prescribing pattern of health facilities.
  - Assess advice given by pharmacists and shop attendants in response to common health problems.

## **Unit 2: Environmental health**

**50 hrs**

- 2.1 Introduction: 2 hrs
- Define Environment, Environmental Health, Sanitation and Hygiene and Environmental Pollution.
  - Enumerate examples of sanitation, environmental pollution and health impacts due to environment.
  - Describe international, regional and national concepts of health and environment.
  - Relate environment and health.
  - Describe epidemiological triads i.e. inter-relationship between agent, host and environment.

- 2.2 Water: 6 hrs
- Define safe and wholesome water.
  - Describe criteria and standards of water quality.
  - Explain water quality standards with respect to Physical, chemical and biological quality.
  - List different sources of water and describe their merits and demerits.
    - Rain, surface and ground water.
  - Differentiate hard and soft water.
  - Describe process of removing hardness of water.
  - Describe uses of water: Domestic purpose, Public purpose, Industrial purpose and Agricultural purpose.
- 2.3 Water pollution and contamination: 2 hrs
- Differentiate water contamination and pollution.
  - Describe major water pollutants - organic pollutants and inorganic pollutants.
  - Name different types of diseases arise due to water:
    - Water borne, water based and water related.
- 2.4 Water purification: 4 hrs
- Describe large scale and small scale water purification methods, including:
    - Household water purification: Boiling, filtration, and chemical treatment.
    - Disinfections of well.
    - Large-scale purification: slow sand filtration and rapid sand filtration.
    - Describe purified water, distilled water & water for injection and explain their usage.
  - Describe features of a sanitary well.
- 2.5 Introduction to air pollution: 2 hrs
- Describe air and its composition.
  - Define air pollution.
  - List sources of air pollution:
    - Automobiles, industries, domestic sources, tobacco smoking, other sources.
  - List indicators of air pollution.
  - Describe health effects of air pollution.
  - Describe air pollution prevention and control measures.

- Discuss state of air pollution in Nepal.
- 2.6 Noise pollution: 1 hr
- Define noise pollution.
  - Describe health effects of chronic noise exposure.
  - State safe noise level and measure to control noise pollution.
- 2.7 Introduction to waste: 2 hrs
- Define waste.
  - Classify waste.
    - Solid, liquid and hazardous waste.
- 2.8 Solid waste management: 3 hrs
- Differentiate biodegradable and non-bio-degradable solid waste.
  - Explain minimizing waste- the 3R concept:
    - Reduce, reuse and recycle.
  - State process of waste disposal.
  - State collection, storage, transportation and ultimate disposal: sanitary land filling, dumping, composting and incineration.
  - Describe disposal of waste in rural areas.
  - Describe burial and manure pit.
- 2.9 Excreta disposal in the community: 2 hr
- Describe current situation and practices of human waste.
  - Describe health hazards due to improper excreta disposal.
  - Describe methods of human excreta disposal.
- 2.10 Hospital waste management: 2 hrs
- Define hospital waste and describe its problem in Nepal.
  - Describe health hazards due to hospital waste.
  - Explain hospital waste management: separation of waste and process of incineration.
- 2.11 Safe disposal of unwanted pharmaceuticals: 2 hrs
- Define unwanted pharmaceuticals.
  - Classify unwanted pharmaceuticals.
    - Solids, semi-solids, powders, liquid, ampoules, anti-infection drugs, anti-neoplastics, controlled drugs, aerosol canisters, disinfectants, PVC plastic, glass, paper and cardboards.

- Identify appropriate method of unwanted pharmaceuticals disposal.
    - Return to donor or manufacturer, incineration, immobilization, waste encapsulation, inertization, landfill, sewer, fast-flowing watercourse, burning in open containers and chemical decomposition.
  - Describe steps of unwanted pharmaceuticals disposal.
    - Decision, approval, planning, forming work teams, health and safety of work teams, sorting, disposal and security.
- 2.12 Liquid waste: 2 hrs
- Define liquid waste and describe sources of liquid waste.
    - Domestic, agricultural, industrial and institutional.
  - Describe components of liquid waste.
  - Identify different methods of liquid waste management.
    - At household/institutional levels.
      - Soakage pit, soak well, seepage pit, dispersion trench, septic tanks
    - At urban area.
      - Waste water treatment plant reed bed.
- 2.13 Personal hygiene: 1 hr
- Define personal hygiene.
  - Explain importance of personal hygiene.
  - Describe hand-washing process.
- 2.14 Concept of food hygiene: 2 hrs
- Define food hygiene.
  - Explain importance of food hygiene and its relation to good health.
  - Describe components food hygiene.
    - General food hygiene, milk hygiene and meat hygiene.
  - State management of food hygiene at differeels.
    - Domestic, commercial and institutional.
- 2.15 Food borne diseases: 2 hrs
- Describe concept of food borne diseases.
  - Define and state examples of food intoxication and food infection.
  - Describe food intoxication (poisoning):
    - Bacterial, plant and chemical food poisoning.
  - Describe sources of food contamination.

- Human and environmental factors.
- 2.16 Food preservation: 2 hrs
- Define food preservation and describe importance of food preservation.
  - List methods of food preservation.
    - Drying, smoking, cooking, pickling, fermentation, pasteurization, parboiling, refrigeration/freezing and canning/bottling.
- 2.17 Food additives, food fortification and food adulteration: 1 hr
- Define and differentiate food fortification, food additives and food adulteration.
    - List importance of food fortification.
    - List hazards due to food additives and food adulteration.
- 2.18 Concepts of housing: 2 hrs
- Define and differentiate housing, human settlement, residential environment and slum.
  - State principles of housing.
    - Physiological, psychological, healthful and free from accidents.
  - Identify criteria for healthful housing.
  - Identify basic housing standards including site, materials, space, light, ventilation, waster disposal facilities etc.
  - Define overcrowding.
  - Describe effects of overcrowding.
  - State accepted standards in overcrowding.
    - Persons per room, floor space and ventilation.
  - Explain health issues in housing and their effects.
- 2.19 Protection from noise:
- Explain importance of protection from noise pollution.
  - Mention acceptable decibel limits.
  - Illustrate ways to control noise pollution in a housing setting.
- 2.20 Protection from radiation:
- Mention sources of radiation exposure.
  - List effects of radiation.
  - Mention ways of providing protection from radiation.
- 2.21 Ventilation:
- Define ventilation.

- Explain importance of proper ventilation.
- Mention standards of ventilation.
- List types of ventilation.

2.22 Rodents and Insects:

4 hrs

- Define rodentology and Entomology.
- List rodent borne diseases: bacterial, viral and rickettsial.
- Explain economic burden due to rodents.
- State rodent Control Measures.
- Describe Rodents survey technique, environmental sanitation, trapping, rodenticides, fumigation, hemosterilants, biological control.
- Explain economic loss due to arthropods/insects List arthropod and insect borne diseases, including the diseases transmitted by- mosquitoes, house flies, bed bugs, reduvid bugs, hard ticks, soft ticks, trombiculid mites, itch mites, cyclops, cockroaches, lice and fleas.
- Describe principles of arthropod control.
  - Environmental, chemical, biological and genetic control.
- Describe action of different types of insecticides and insect-repellents.
- Explain insecticide resistance.

2.23 Occupational diseases:

6 hrs

- Define occupational health and safety, occupational hazard and occupational disease.
- Differentiate toxicity, hazard and risk.
- List occupational diseases:
  - Due to physical, chemical, biological agents.
  - Occupational dermatitis.
  - Diseases of psychological origin .
- Prevention:
  - Medical measures.
  - Engineering interventions.
  - Legislation.

# Practical (Field work)

## Unit 1 Pharmacoepidmiology 12 hrs

- Conduct drug utilization study: 12 hrs
  - Visit health facility
  - Collect prescription from patient and fill format
  - Visit retailer shop and observe dispensing procedure
  - Write observational findings in a format
  - Analyze prescribed drugs and correct advice given by shop attendants as per indicators
  - Interpret findings

## Unit 2: Environmental health 27 hrs

- Calculate water requirement for daily domestic purpose. 1 hr
- Calculate the amount of bleaching powder necessary for well disinfections. 2 hrs
  
- Visit water treatment plant. 6 hrs
  - Observe water treatment process.
  - Make a field visit report.
- Visit pasteurization plant. 6 hrs
  - Observe pasteurization process.
  - Identify pasteurization type.
  - Make a field visit report.
- Visit solid waste management project. 6 hrs
  - Observe solid waste management process.
  - Make a field visit report.
- Visit municipality. 6 hrs
  - Observe municipality's activities related with environmental health and sanitation.
  - Make a field visit report.



## References:

1. Miller, Tyler (1988), Environmental Science, USA: Wadsworth Inc.
2. Ojha, S. (BS 2046), Watawarniya swasthya ra sarsaphai, Kathmandu, Health Learning Materials Center.
3. Park, J. E. and Park, K. (2000), Textbook of Preventive and Social Medicine, India: Banarasidas Bhanot.
4. Nathanson, Jerry A. (2003), Basic Environmental Technology- Water Supply, Waste Management & Pollution Control,
5. Beacon Press, MOPE (2000), State of the Environment of Nepal, Kathmandu: Ministry of Population and Environment, Nepal.
6. MOPE/ICIMOD/UNEP (2001), Nepal: State of the Environment Report 2001: Kathmandu: UNEP/ICIMOD.
7. WHO (1996), Guideline for Drinking Water Quality: Health Criteria and other Supporting Information, WHO.
8. WHO (1999), Guidelines for safe disposal of unwanted pharmaceuticals in and after emergencies, WHO/EDM/PAR/99.2
9. Etminan M, Samii A. Review of pharmacoepidemiologic study designs I. Pharmacotherapy 2004;24:964-9.
10. Rahme E, Pilote L, LeLorier J. Association between naproxen use and protection against acute myocardial infarction. Arch Intern Med 2002;162:1111-5.
11. Ray WA, Stein CM, Hall K, Daugherty JR, Griffin MR. Non-steroidal anti-inflammatory drugs and risk of serious coronary heart disease: an observational cohort study. Lancet 2002;359:118-23.
12. Juurlink DN, Mamdani M, Kopp A, Laupacis A, Redelmeier DA. Drug-drug Interactions among elderly patients hospitalized for drug toxicity. JAMA 2003;289:1652-8.
13. Ray WA, Murray KT, Meredith S, Narasimhulu SS, Hall K, Stein CM. Oral erythromycin and the risk of sudden death from cardiac causes. N Engl J Med 2004;351:1089-96.
14. Bourgault C, Rainville B, Suissa S. Antihypertensive drug therapy in Saskatchewan: patterns of use and determinants in hypertension. Arch Intern Med 2001;161:1873-9.
15. Jackevicius CA, Mamdani M, Tu JV. Adherence with statin therapy in elderly adherence with statin therapy in elderly patients with and without acute coronary syndromes. JAMA 2002;288:462-7.
16. Etminan M, Hemmelgarn B, Delaney JAC, Suissa S. Lithium use and the risk of injurious motor vehicle crashes in older adults: A case-control study. BMJ 2004;328:558-559.
17. Approaches to combat with confounding by indication in observational studies of intended drug effects. Pharmacoepidemiol and Drug Safety 2003;12:551.

18. Horwitz RI, Feinstein AR. The problem of "protopathic bias" in case-control studies. *Am J Med* 1980;68:255-8.
19. Suissa S. Inhaled steroids and mortality in COPD: bias from unaccounted immortal time. *Eur Respir J* 2004;23:391-5.
20. Barbone F, McMahon AD, Davey PG, Morris AD, Reid IC, McDevitt DG, MacDonald TM. Association of road-traffic accidents with benzodiazepine use. *Lancet*. 1998; 352:1331-6.

# Comprehensive Professional Field Practice

**Nature: Practical**

**Full marks: 200**

**Total: 340 hrs (40 hrs/week)**

**Pass marks: 120**

## Course description

This course is designed to help students to apply the knowledge and skills in the actual professional practice.

## Course objective

After completion of this course the students will be able to:

1. Read and interpret prescription, interpret dose, dispense and council the patients in community and hospital setting.
2. Perform the manufacturing, quality assurance drugs and regulatory related functions as a pharmacy assistant.

## Placement schedule

Students will be deputed to industries, labs, regulatory bodies, and health facilities/hospital and community and retail pharmacies for the period of 8½ weeks (40 hrs per week that means  $40 \times 8.5 = 340$  hrs).

S. No.	Subjects/Area	Duration	Paper
1.	Industry/QA-QC lab	4 weeks (160 hours)	<b>I=100</b>
2.	Drug Regulatory bodies		
3.	Health facility/Hospital		
4.	Community practice	4½ weeks (180 hours)	<b>II = 100</b>
<b>Total</b>		8½ weeks (340 hours)	

## Skills to be performed

### 1 After completion of the training of Paper –I the students will be able to:

- 1.1 Carry out the study of manufacturing process of pharmaceutical dosage forms.
- 1.2 Carry out the study of quality assurance of pharmaceutical dosage forms and devices.
- 1.3 Orient with Drug Regulatory Functions of pharmaceutical dosage forms and devices.
- 1.4 Perform dispensing and distribution of pharmaceutical dosage forms and devices in health facility and/or hospital settings.
- 1.5 Observe, realized and report the proper use of medicine in the visited institutions.
- 1.6 Observe and assist ADR monitoring.

2. After completion of the training of **Paper – II** the students will be able to:

- 2.1 Read, interpret and dispense correctly a prescription.
- 2.2 Conduct the two-way communication with patient.
- 2.3 Counsel the patient on drugs and therapy related issues.

### **Evaluation**

1. For both paper (Paper I&II) 50 % of each paper is allotted for internal assessment that will be given by the supervisor teacher from the college on the basis of practical site supervision plus report submitted by the student.
2. Final viva voce marks will be 50 of each subject. Out of which 25 marks in each paper will be given by the examiner (Pharmacist expert) nominated by CTEVT and a rest of 25 marks of each subject will be given by the examiner (relevant subject teacher) of the institute.
3. The students must to pass the paper I and II separately.
4. The students must obtain minimum of 60 % marks in each paper both in internal assessment and final viva voce separately.

## Other Reference Books

- 1 Alfonso R. Gennaro: Remington the Science and Practice of Pharmacy, Volume II (20th Edition) 2002, Lippincott Williams & Wilkins, Philadelphia.
- 2 Antheron LM-Bentley's & Drivers text book of Pharmaceutical chemistry, Oxford University Press London. Eighth Edition
- 3 Approaches to combat with confounding by indication in observational studies of intended drug effects. *Pharmacoepidemiol and Drug Safety* 2003; 12:551.
- 4 Barbone F, McMahon AD, Davey PG, Morris AD, Reid IC, McDevitt DG, MacDonald TM. Association of road-traffic accidents with benzodiazepine use. *Lancet*. 1998; 352:1331-6.
- 5 Beacon Press, MOPE (2000), State of the Environment of Nepal, Kathmandu: Ministry of Population and Environment, Nepal.
- 6 Bekeet AH and Stenlk- Practical Pharmaceutical Chemistry 4th edition Part I & II.
- 7 Belsare P and Dhake AS- Inorganic Chemistry (Practical), Career publication.
- 8 Bentley's Text Book of Pharmaceutics by E. A. Rawlins. 8th edition
- 9 Bialley and Scott – Digonostic Microbiology.
- 10 Bourgault C, Rainville B, Suissa S. Antihypertensive drug therapy in Saskatchewan: patterns of use and determinants in hypertension. *Arch Intern Med* 2001; 161:1873-9.
- 11 British Pharmacopoeia 1995 or latter edition.
- 12 Chaudari MA and Gokhale S B- Biochemistry and Clinical Pathology, Nirali Prakashan.
- 13 Cheesebrough M – Medical Laboratory Manual for Tropical Countries Vol I & II. ELBS.
- 14 CIMS published by Biogard medical service (Bangalore), Current Edition
- 15 Community Health Nursing
- 16 Cooper and Gunn's Tutorial Pharmacy, Sixth Edition.
- 17 Daniel C Harris- Quantitive Chemical Analysis, W H Freeman and Company.
- 18 Drugs Act and Regulations of Nepal published by Kanoon Kitab Byabastha Samitte (updated version)
- 19 E. A. Rowlins (ED):Bentley's The Text book of pharmaceutics 8th edition, Bailliere Tindall,London.
- 20 Essentials of Pharmacology by K.D. Tripathi 5th edition
- 21 Etminan M, Hemmelgarn B, Delaney JAC, Suissa S. Lithium use and the risk of injurious motor vehicle crashes in older adults: A case-control study. *BMJ* 2004; 328:558-559.
- 22 Etminan M, Samii A. Review of pharmacoepidemiologic study designs I. *Pharmacotherapy* 2004; 24:964-9.
- 23 Furest R – Microbiology in Health and Disease, W B Saunder & Co, 1995.
- 24 Gadam's Pharmacology, Latest Edition
- 25 Gaud and Gupta. Practical Pharmaceutics, 2004, India.
- 26 Gaud. Pharmaceutics, 2003, India.
- 27 Gaud. Textbook of pharmaceutics, 2004, India.
- 28 Gokhale and Kokate. Practical Pharmacognosy, 2002, India.
- 29 Gokhale. Pharmacognosy (Diploma), 2004, India.
- 30 Gupta, A. K. Introduction to pharmaceutics-I. , 2004, CBS publisher and distributors, India.
- 31 Gupta, A. K. Pharmaceutics: Practical manual (Part I & II), 2004, India.
- 32 Handbook of Medical Laboratory Technology CMC Vellore.
- 33 Herold Varley – Practical Clinical Biochemistry.

- 34 Horwitz RI, Feinstein AR. The problem of "protopathic bias" in case-control studies. *Am J Med* 1980;68:255-8.
- 35 I D P Watton *Microanalysis in Medicinal Chemistry*.
- 36 Identification Manual for some Non Timber Forestry Products of Nepal: Dr. SB Malla et al.- Forest Resource information system project HMG/N/FINIDA
- 37 Indian Pharmacopoeia, 2000
- 38 J. Winfield and R. M. E. Richards: *Pharmaceutical Practice* (2nd Ed.) 1998, Churchill Livingstone, Edinburg.
- 39 Jackevicius CA, Mamdani M, TU JV. Adherence with statin therapy in elderly adherence with statin therapy in elderly patients with and without acute coronary syndromes. *JAMA* 2002;288:462-7.
- 40 Jeffrey GH et.al-Vogel's *Textbook of Quantitative Chemical Analysis* 5th Edition.
- 41 Juurlink DN, Mamdani M, Kopp A, Laupacis A, Redelmeier DA. Drug-drug Interactions among elderly patients hospitalized for drug toxicity. *JAMA* 2003; 289:1652-8.
- 42 K. Kafle, R. G. Pinniger, *Diagnostic & treatment Manual for primary health care in the district*.
- 43 Kadam et.al – *Principles of Medicinal Chemistry* Vol. I & II.
- 44 Kale- *Practical Biochemistry and Clinical Pathology*. Book Syndicate Mumbai.
- 45 Kamala, T. & Bishnu, R. Health learning materials centre, Tribhuvan University, Kathmandu. 1990. *Leadership and management for nurses*.
- 46 Kasture AV and Wadker- *Pharmaceutical chemistry I & II* Nirali Prakashan.
- 47 Kasture AV and Wadker- *Practical Pharmaceutical chemistry I & II*, Nirali Prakashan.
- 48 Kasture AV et.al – *Pharmaceutical analysis* Vol I & II, Nirali Prakashan.
- 49 Kokate. *Pharmacognosy*, 2004, India.
- 50 Kulkarni MV et.al- *Biochemistry*, Nirali Prakashan.
- 51 Lenniger AC – *Principles of Biochemistry*, CBS Publication, Latest Edition
- 52 Macmohan, R. et al.. WHO current edition *A guide to management in primary health care*
- 53 Mahadik KR and Kucher BS- *Concise inorganic Pharmaceutical chemistry*, Nirali Prakashan, 2004.
- 54 *Managing Drug Supply*, Published by HMG, DHS/MoH.
- 55 *Manual Methods in Clinical Chemistry*- WHO publication.
- 56 Mc Murry J and Castellion E Mary- *Fundamentals of Organic and Biological Chemistry*. 2nd edition Prentic Hall.
- 57 *Medicinal plants of Nepal – Bulletin of Department of Medicinal plants*. No. 3. His majesty's Government of Nepal, Ministry of Forest and Soil conservation. Department of Plant Resources, Kathmandu, 1997.
- 58 Miller, Tyler (1988), *Environmental Science*, USA: Wadsworth Inc.
- 59 MIMS published by mims India, New Delhi, current edition
- 60 MOPE/ICIMOD/UNEP (2001), Nepal: *State of the Environment Report 2001*: Kathmandu: UNEP/ICIMOD.
- 61 Mukarjee K C- *Handbook of Medical Laboratory Technology*.
- 62 Nathanson, Jerry A. (2003), *Basic Environmental Technology- Water Supply, Waste Management & Pollution Control*,
- 63 Ojha, S. (BS 2046), *Watawarniya swasthya ra sarsaphai*, Kathmandu, Health Learning Materials Center.
- 64 Park, J. E. and Park, K. (2000), *Textbook of Preventive and Social Medicine*, India: Banarasidas Bhanot.
- 65 Park, J.E. and park, K, *textbook of social and preventive medicine* (recent edition).

- 66 Pathology for Medical students.
- 67 Pharmaceutical Dosage Forms and Drug Delivery Systems. H. C. Ansel, L. V. Allen and N. G. Popovich, Seventh Edition, Lippincott Williams and Wilkins.
- 68 Pharmaceutical Dosage Forms and Drug Delivery Systems. H. C. Ansel, L. V. Allen and N. G. Popovich, Seventh Edition, Lippincott Williams and Wilkins.
- 69 Pharmaceutics: The Science of Dosage Forms, M. E. Aulton, Churchill Livingstone. 2nd edition
- 70 Pharmacology by Satoskar and Bhandarar.
- 71 Physical Pharmacy by Alfred Martin, 4<sup>th</sup> Edition
- 72 Pradhan, H.B., A textbook of Health Education. Educational Resources for Health, 1995.
- 73 Publications of Department of Drug Administration (DDA).
- 74 Quality control of Medicinal plants: A publication of WHO, 1998.
- 75 Rahme E, Pilote L, LeLorier J. Association between naproxen use and protection against acute myocardial infarction. Arch Intern Med 2002;162:1111-5.
- 76 Rawling's EA –Bently's text book of Pharmaceutics. All India Traveller Book Sellers.
- 77 Ray WA, Murray KT, Meredith S, Narasimhulu SS, Hall K, Stein CM. Oral erythromycin and the risk of sudden death from cardiac causes. N Engl J Med 2004; 351:1089-96.
- 78 Ray WA, Stein CM, Hall K, Daugherty JR, Griffin MR. Non-steroidal anti-inflammatory drugs and risk of serious coronary heart disease: an observational cohort study. Lancet 2002;359:118-23.
- 79 Remington: The Science and Practice of Pharmacy, 20<sup>th</sup> Edition, Vol I & II.
- 80 Robins et.al.- Pathological basis of Disease. 7 th edition, Churchil Levington 2002.
- 81 Standards of Medicinal Plants for Ayurvedic Drugs: A publication of Department of Medicinal Plants.
- 82 Suissa S.Inhaled steroids and mortality in COPD: bias from unaccounted immortal time. Eur Respir J 2004; 23:391-5.
- 83 Textbook of Hospital and clinical pharmacy, Dandiya, P. C., Mathur, Mukul, Vallabhai Prakashan.
- 84 The Drug & Cosmetic Act of India with latest ammendments
- 85 The extra pharmacopoeia (Martindale)., 32<sup>nd</sup> Edition
- 86 The Theory and Practice of Industrial Pharmacy, Leon Lackman, H. A. Lieberman, J. L. Kanig, Third Edition, Varghese Publishing House, Hind Rajasthan Building, Dadar, Bombay – 400 014.
- 87 Tipins HP Dhake AS- Inorganic Pharmaceutical chemistry, Career publication, Dec 2002.
- 88 Warner, D. "Helping Health workers Learn"
- 89 WHO (1996), Guideline for Drinking Water Quality: Health Criteria and other Supporting Information, WHO.
- 90 WHO (1999), Guidelines for safe disposal of unwanted pharmaceuticals in and after emergencies, WHO/EDM/PAR/99.2
- 91 WHO publication on Hospital and clinical Pharmacy.

## **Person involved in Diploma in Pharmacy curriculum development**

The Council for Technical Education and Vocational Training gratefully acknowledges the expertise and efforts of the following persons who have contributed for the development of the Diploma in Pharmacy curriculum.

### **Policy Level Committee**

Mr. Tulsi Narayan Shrestha	Vice Chairman, CTEVT
Dr. Agni Prasad Kafle,	Member– Secretary, CTEVT
Pro. Bharat Jha,	Asst. Dean, IOM
Dr. Hari Nath Acharya	Director, Planning Division, MOHP
Mr. Bhupendra Bahadur Thapa	Director, DDA
Mr. Radha Raman Prasad	Dy. Director, DDA
Mr. Bishnu Koirala	Director, Curriculum Development Division, CTEVT
Mr. Shiva Shankar Ghimire,	Project Manager, School of Health Science, Bharatpur
Ms. Sita Joshi	Senior Supervision Officer, Technical Division, CTEVT
Mr. Babu Ram Humagain,	President, Nepal Pharmaceutical Association
Mr. Yam Prasad Adhikari,	President, Forum for Health Science
Mr. Sagar Mani Lamsal	Curriculum Officer, Curriculum Development Division CTEVT
Mr. Mister Kant Mainali	Curriculum Officer, Curriculum Development Division CTEVT



## Preliminary Draft Committee

Dr. Shyam Prasad Lohani	Coordinator
Mrs. Chanda Chapagain	Member
Mrs. Lapita Shrestha	Member
Mrs. Rina Raj Bhandari	Member
Mr. M.K.Minali	Member
Mr. Sagar Mani Lamsal	Member Secretary

## Subject Committee

S.No	Subjects	Writing Committee	
		Coordinator	Members
1	<ul style="list-style-type: none"> <li>▪ Pharmaceutics I &amp; II</li> </ul>	<ul style="list-style-type: none"> <li>▪ Ms. Bhawa Rajbhandari</li> </ul>	<ul style="list-style-type: none"> <li>▪ Ms. Chanda Chapagain</li> <li>▪ Mr. Uttam Budhathoki</li> <li>▪ Ms. Shobha Basnet</li> <li>▪ Ms. Reena Rajbhandari</li> </ul>
2	<ul style="list-style-type: none"> <li>▪ Pharmacology and therapeutics I &amp; II</li> <li>▪ Clinical &amp; Hospital Pharmacy</li> </ul>	<ul style="list-style-type: none"> <li>▪ Mr. Tirtha Ratna Shakya</li> </ul>	<ul style="list-style-type: none"> <li>▪ Mr. BalKrishna Khakurel</li> <li>▪ Dr. Shyam Lohani</li> <li>▪ Mr. Mohan Prasad Amatya</li> </ul>
3	<ul style="list-style-type: none"> <li>▪ Pharmaceutical Chemistry I &amp; II</li> <li>▪ Biochemistry, Microbiology and Pathology</li> </ul>	<ul style="list-style-type: none"> <li>▪ Dr. Dharma Prasad Khanal</li> </ul>	<ul style="list-style-type: none"> <li>▪ Ms. Shobha Basnet</li> <li>▪ Mr. Narayan Prasad Dhakal</li> </ul>
4	<ul style="list-style-type: none"> <li>▪ Pharmacognosy</li> </ul>	<ul style="list-style-type: none"> <li>▪ Mr. Keshab Dhoj Joshi</li> </ul>	<ul style="list-style-type: none"> <li>▪ Mr. Tirtha Ratna Shakya</li> <li>▪ Mr. Radha Raman Shah</li> </ul>
5	<ul style="list-style-type: none"> <li>▪ Pharmaceutical Management</li> <li>▪ Forensic and Community Pharmacy</li> </ul>	<ul style="list-style-type: none"> <li>▪ Mr. Babu Ram Humagain</li> </ul>	<ul style="list-style-type: none"> <li>▪ Mr. Kedarji Kandel</li> <li>▪ Mr. Gajendra Bahadur Bhuju</li> </ul>
6	<ul style="list-style-type: none"> <li>▪ HE and Health Care System</li> <li>▪ Environmental Health</li> </ul>	<ul style="list-style-type: none"> <li>▪ Mr. Nabin Shrestha</li> </ul>	<ul style="list-style-type: none"> <li>▪ Mr. Babu Ram Humagain</li> <li>▪ Ms. Lupita Shrestha</li> </ul>
	<ul style="list-style-type: none"> <li>▪ Comprehensive Professional Field Practice</li> </ul>	<ul style="list-style-type: none"> <li>Dr. Dharma Prasad Khanal</li> </ul>	<ul style="list-style-type: none"> <li>Ms. Shobha Basnet</li> </ul>

## Joint Subject Committee

Mr. Babu Ram Humagain,	Nepal Pharmaceutical Association
Mr. Bal Krishna Khakurel,	Ministry of Health and Population
Ms. Bhawa Rajbhandari,	Bir Hospital
Mr. Bhupendra Bahadur Thapa,	DDA
Ms. Chanda Chapagain,	Forum of Health Science
Dr. Dharma Prasad Khanal,	Nepal Pharmacy Council
Mr. Gajendra Bahadur Bhujju,	Nepal Pharmacy Council
Mr. Jeeban Chandra Dahal	CTEVT
Mr. Kedarji Kandel,	Forum for Health Science
Mr. Keshab Dhoj Joshi,	Nepal Pharmacy Council
Ms. Lupita Shrestha,	NIMS
Mr. Mister Kant Mainali	CTEVT
Mr. Mohan Prasad Amatya,	Nepal Pharmacy Council
Mr. Nabin Shrestha,	IOM
Mr. Narayan Prasad Dhakal,	Nepal Pharmacy Council
Dr. Panna Thapa,	KU
Mr. Radha Raman Shah,	DDA
Mr. Raju Acharya	Kantipur Colleges of Medical Sciences
Mr. Raman Dev Pant,	IOM
Ms. Reena Rajbhandari,	National Vision
Mr. Sagar Mani Lamsal	CTEVT
Ms. Shobha Basnet,	Nepal Pharmacy Council
Ms. Shobha Basnet,	Nepal Pharmacy Council
Dr. Shyam Lohani,	Forum of Health Science
Ms. Tirtha Maiya Shrestha,	KU
Mr. Tirtha Ratna Shakya,	Nepal Pharmacy Council
Mr. Uttam Budhathoki,	KU
Mr. Yam Prasad Adhikari,	Forum of Health Science

## **Review Committee**

Dr. Panna Thapa	KU	Coordinator
Mr. Uttam Budhathoki	KU	Member
Mr. Baburam Humagain	Nepal Pharmaceutical Association	Member
Ms. Shobha Basnet	Nepal Pharmacy Council	Member
Ms. Chanda Chapagain	Forum for Health Science	Member
Mr. Muktar Ansari	School of Health Science	Member
Mr. Sagar Mani Lamsal	Curriculum Development Division, CTEVT	Member
Mr. M.K.Minali	Curriculum Development Division, CTEVT	Member Secretary