

CURRICULUM

DIPLOMA in PHARMACY

(Second and Third year)



Council for Technical Education and Vocational Training

Curriculum Development Division

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Introduction

The Government of Nepal (GoN) is committed to bringing about tangible changes in access and utilization of Essential Health Care Services (EHCS), thereby improving the health status of the Nepalese population through health sector development process. Access to health care facilities continues to be a problem in rural areas as well as urban areas, especially for the most disadvantaged. Nepal's health policy and strategy documents over the past several decades repeatedly identify issues regarding the deployment and retention of health sector human resource as a major problem that our country is facing. The Council for Technical Education and Vocational Training (CTEVT) has been contributing towards the development of different middle level of health human resource. In this connection, CTEVT is producing Diploma in Pharmacy professional - as middle level pharmaceutical service providers. The CTEVT will award certificate of "**Diploma in Pharmacy**" to the candidates who successfully complete the requirements as prescribed by the council. The **Diplomain Pharmacy** professional will be able to work as **Pharmacy Assistant in the** Community Pharmacy, Hospitals and other Pharmaceutical services providing sites.

Mission of the Curriculum

To provide the document which direct CTEVT schools and faculty in the process of educating quality middle level pharmacy human resource to meet the requirements of pharmaceutical services in Nepal and abroad.

Strategy

The strategies to achieve our mission of professional excellence will be attained by maintaining expert faculty, implementing the curriculum, and enrollment of 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 healthcare 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 services for better health of the people.

Program Description

This course is based on the job required to perform by a pharmacy assistants at different levels of public and private health institutions in Nepal. The **Diploma in Pharmacy** program extends over three years. The first year focuses on basic science subjects; the second year focuses on basic medical science and pharmaceutical sciences. Similarly, the third year focuses on the professional practice focus courses and application of acquired knowledge and skills through comprehensive field practices in hospital, community pharmacies, drug manufacturing, regulation and quality assurance. The professionals are eligible for registration as pharmacy assistants in the Nepal Pharmacy Council. The contents of individual subjects prescribed in the curriculum are incorporated in the light of skills required for professional practice.

Aims and Objectives

The course aims to produce middle level pharmacy human resource with perfect technical skills that can face real life situation at the level they are aimed at.

The course enables students:

- To prepare technically competent middle level pharmacy human resource who will demonstrate excellent service attitude and respect for the profession and socio-cultural values.

- To develop middle level pharmacy human resource for good pharmacy practice in the hospitals as well as in the community settings.
- To demonstrate leadership in managing quality supply of pharmaceuticals and to promote rational use of medicine within the healthcare facilities and at the community pharmacies.
- To develop middle level pharmacy human resource in order to assist in production and quality assurance of pharmaceuticals.

Conceptual Framework

The course should reflect:

- The need of pharmaceutical service for the proper care of a patient.
- The roles and responsibilities of pharmacy assistant to improve the pharmaceutical supply system and to promote rational use of medicine.
- 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 and/or equivalent.

Group Size

40(Forty) students in a batch

Entry Criteria

The entry criteria are:

- SLC or equivalent 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 or equivalent certificate
 - Character certificate
 - Citizenship certificate (for the name, parents name, age, date of birth and address verification purpose only).
 - Medical fitness certificate (at the time of admission)
- Student quota for different category of students as per the policy of Nepal Pharmacy Council and 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 80% 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 1:20

- Student ratio for bench work 1:4
- Each professional subject should have one full time teacher. (For example to run the 2nd and 3rd year course five full time faculties are necessary)

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 in related field.

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, Books.). Student Textbook ratio 1:2, reference book 10:1
- **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 within the course are as follows:

- Consists of 8½ weeks.
- Comprehensive professional practice should be conducted in hospitals, PHC, Health Post, community pharmacies that are listed (accredited after regulation regarding accreditation is approved) in Nepal Pharmacy Council (NPC).
- Field visit to Pharmaceutical Industry (approved by DDA), Regulatory (DDA) and QA/QC Lab total 3 days.
- During field practice there should be at least one teacher (either from health facility or training institution).
- Student Field Log book according to NPC is compulsory.

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 and community 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.
- Extracurricular activities

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 college.
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/field assessment format must be developed and applied by the evaluators for evaluating student's performance in each subject related to the clinical experience.
- NPC regulations and guidelines have to be followed where ever instructed.

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 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

- Pharmacist faculties involved in the teaching learning must evaluate final practical examinations.
- One examiner 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 examiner from the concerned or affiliating institute led external examiner (subject expert) nominated by CTEVT. Provision of re-examination as per CTEVT's rules and regulations.

Pass Marks

The pass marks for theory and practical examinations are: 40% in theory examination and 60% in practical examination.

Grading System

The following grading system will be adopted

- **Pass division:** Pass aggregate to below 60%.
- **Second division:** 60% to below 65%.
- **First division:** 65% to below 80%
- **Distinction:** 80% or above.

Certificate Award

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

Career path

The professionals will be eligible for the position as Pharmacy Assistants or as prescribed by the Public Service Commission in the public health facilities. They are also eligible to provide the quality pharmaceutical service in the Hospital and community pharmacies according to Nepal Pharmacy Council Act and Regulation. The professional is eligible for registration with the Nepal Pharmacy Council in the grade as mentioned in the Nepal Pharmacy Council Act 2057(2000).

Course Structure

First Year, Diploma in Pharmacy											
S.N	Subject	Mode		Hours/ Week	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	3	-	3	10	40	3	-	-	-	50
4	Anatomy & Physiology	3	2	5	16	64	3	8	12	3	100
5	Physics	3	1	4	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
Total		27	11	38	146	584		48	72		850

Second Year, Diploma in Pharmacy											
S.N	Subject	Mode		Hours/ Week	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		150
2	Pharmacology & therapeutics I	3	2	5	20	80	3	20	30		150
3	Pharmaceutical Chemistry I	4	2	6	20	80	3	20	30		150
4	Pharmacognosy	3	2	5	20	80	3	20	30		150
5	Biochemistry & Microbiology	2	1	3	16	64	3	8	12		100
6	Pathophysiology	2	0	2	10	40	3	0	0		50
7	Pharmaceutical Management	2	1	3	16	64	3	8	12		100
8	Health Education & Health Care System	3	2	5	16	64	3	8	12		100
Total		22	12	34							950

Third Year, Diploma in Pharmacy											
S.N	Subject	Mode		Hours/ Week	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		150
2	Pharmacology & Pharmacotherapeutics II	3	2	5	20	80	3	20	30		150
3	Pharmaceutical Chemistry II	4	2	5	20	80	3	20	30		150
4	Hospital & Clinical Pharmacy	3	2	5	20	80	3	20	30		150
5	Social Pharmacy & Pharmaceutical Jurisprudence	3	2	5	20	80	3	20	30		150
6.	Pharmacoepidemiology & Environmental Health	2	1	3	10	40	3	20	30		100
7.	Comprehensive Professional Field Practice							100	100		200*
Total		17	12	29							1050

*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 equipment.
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 13 hrs

1.1 Different pharmaceutical preparations and dosage forms (10 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, Dispersible Tablets, Chewable tablets, Spirits, Sprays, Suppositories, Suspensions, Syrups, Tinctures.

1.2 Novel drug delivery system (3 hour):

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

Unit 2. Pharmacopoeias and formularies used in Nepal 3 hrs

2.1 Brief introduction about pharmacopoeias and their uses.

- 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 description of hammer mill, ball mill, fluid energy mill and colloid mill.
- 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** **7 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** **7 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.
- Unit 8. Extraction** **5 hrs**
8.1 Define extraction and provide concept of solid-liquid and liquid-liquid extractions.
8.2 Study of percolation and maceration and their modification, continuous hot extraction- Application in the preparation of tinctures and extracts.
8.3 Describe factors affecting the selection of extraction process.
- Unit 9. Heat Process** **6 hrs**
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.

Unit 10. Distillation**7 hrs**

- 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.

Unit 11. Drying process**6 hrs**

- 11.1 Define drying and mention its pharmaceutical applications.
- 11.2 Mention different types of dryers and explain tray dryer and fluidized bed dryers.

Unit 12. Physicochemical Principles of Pharmaceutics**21 hrs****12.1 Rheology and flow of fluids: (5hrs)**

- Define viscosity and rheology and classify fluids based on its flow properties.

Newtonian fluids

- Provide concept of laminar, transitional and turbulent flows and explain capillary and falling sphere viscometers.

Non-Newtonian fluids

- Provide concept of types of Non-Newtonian flow. Describe briefly plastic, pseudoplastic and dilatant flow.
- Describe pharmaceutical applications of rheology.

12.2 Surface and Interfacial Phenomena: (6hrs)

- Define surface and interfacial tension and mention the different methods of measurement.
- Describe contact angle and its pharmaceutical applications.
- Describe surface-active agents, their physical properties and their pharmaceutical applications.

12.3 Disperse Systems: (4hrs)

- Define colloids and describe their properties.
- Describe application of colloids in pharmacy.

12.4 Kinetics and stability testing: (6 hrs)

- Define different orders of reaction.
- Describe the factors that affect the stability of pharmaceutical products.
- 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.
- Briefly describe Guidelines for stability testing of pharmaceuticals.

Unit 13. Monophasic liquid dosage forms**8 hrs**

- 13.1 Define monophasic liquid dosage form and mention its advantages and disadvantages.
- 13.2 Describe factors affecting solubility.
- 13.3 Mention the components of formulation with examples.
- 13.4 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 14. Introduction to Biopharmaceutics**15hrs**

- 14.1 Provide the concept of bioavailability and biopharmaceutics.
- 14.2 Describe the basic concept of mechanism of drug transport across gastrointestinal barrier.
- 14.3 Mention different factors influencing bioavailability
- 14.4 Explain plasma concentration – time curves of oral, i. v. bolus and i. v. infusion and Cumulative urinary drug excretion curve.
- 14.5 Define absolute and relative bioavailability and bioequivalence.
- 14.6 Describe factors influencing steady state plasma drug concentration in the body.

Practical**Unit 1. Different pharmaceutical preparations and dosage forms****54 hrs**

- Prepare and supply chloroform water. (4 hrs)
- Prepare and supply aqueous iodine solution. (4 hrs)
- Prepare and supply chloroform spirit. (4 hrs)
- Prepare and supply camphor spirit. (4 hrs)
- Prepare and supply strong ginger tincture. (4 hrs)
- Prepare and supply orange/iodine tincture. (4 hrs)
- Prepare and supply root extract of *Rheum emodi*(Padamchal). (6 hrs)
- Prepare and supply extract of *Mentha species*(Pudina). (6 hrs)
- Prepare and supply thymol / chlorhexidine gargle. (4 hrs)
- Prepare and supply calamine lotion. (4 hrs)
- Prepare and supply compound sodium chloride mouthwash. (4 hrs)
- Prepare simple syrup. (4 hours)

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

- Determine surface tension using drop count method. (2 hour)
- Determine bulk density and void porosity of given powder. (6 hrs)
- Measure the viscosity of simple syrup using Ostwald viscometer. (6 hrs)
- Perform the mixing of different colored powders and examine their particle size microscopically. (6hrs)
- Carry out simple filtration experiment. (2 hours)
- Carry out simple experiment to measure moisture content in given powder material. (2 hours)

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3. Gaud and Gupta. Practical Physical Pharmacy, 2004, India.
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14. Pharmaceutics: The Science of Dosage Forms, M. E. Aulton, Churchill Livingstone.
15. Cooper and Gunn's Tutorial Pharmacy, Sixth Edition.

Pharmacology & Pharmacotherapeutics I

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 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.
- NSAIDs
- Autonomic Nervous System drugs.
- Respiratory System drugs.
- Antimicrobial Drugs

Theory

Unit 1. General pharmacological principles

20hrs

- 1.1 Terminologies used in pharmacology
- 1.2 Drug nomenclature
- 1.3 Routes of drug administration
- 1.4. Pharmacokinetics: Definition; process of absorption, distribution, biotransformation, elimination; factors affecting on these processes
- 1.4 Pharmacodynamics
 - 1.4.1 Mechanism and principle of drug action
 - 1.4.2 Receptor theory of Drug Action
 - 1.4.3 Half-life, plasma concentration of drug and bioavailability
- 1.5 Types of adverse drug reactions

Unit 2: Gastrointestinal Drugs

20 hrs

- 2.1 Management of Peptic ulcer, vomiting, diarrhea, and constipation
- 2.2 General mechanism of action, use, side effect, contraindication, precaution and dose of commonly used
 - antacids, ulcer healing drugs , ulcer protective an anti H. pylori drugs
 - antiemetic drugs: Metoclopramide, Domperidone, Ondansetron, promethazine
 - antidiarrheal: Diphenoxylate, ORS
 - drug used in constipation: Bulk forming laxatives, irritant Laxative, Stool softeners, Lactulose

Unit 3 Nsaids and Antipyretic Analgesics

8hrs

3.1 Define pain, pyrexia and inflammation

3.2 General mechanism of action, use, side effect, contraindication, precaution and dose of commonly used

- Analgesic, antipyretic and anti-inflammatory drugs: Ibuprofen, Indomethacin, Diclofenac, Nimesulide, paracetamol, Aspirin
- drugs used in rheumatoid arthritis: NSAIDS, Disease modifying agents: Steroids, Methotrexate, Azothioprine
- drug used in gout: Colchicine, Allopurinol, Febuxostat

Unit 4: Drugs acting on Autonomic Nervous System

17 hrs

4.1 Physiology of ANS

4.2 General mechanism of action, use, side effect, contraindication, precaution and dose of commonly used

- Cholinergic drugs: Pilocarpine, Neostigmine, Pyridostigmine
- Anticholinergic drugs: Atropine, Dicyclomine, Trihexyphenidol
- Adrenergic drugs: Adrenaline, Noradrenaline, Dopamine
- Antiadrenergic drugs: Prazosin, Terazosin, Tamsulosin, Propranolol, Atenolol, Timolol

Unit 5: Respiratory System Drugs

8hrs

5.1 Define cough, asthma, COPD

5.2 General mechanism of action, use, side effect, contraindication, precaution and dose of commonly used

- Drugs used in cough: Anti-tussives (Codeine, Dextromethorphan) Expectorant: (Ammonium Chloride, Bromohexine, Guafensin)
- Drugs used in asthma and COPD: Bronchodilators: Salbutamol, salmeterol, Theophyllin-Aminophylline

Unit 6: Antimicrobial Drugs

44 hrs

6.1 Classification of antimicrobials according to their mechanism of action, spectrum of activity, type of action, type of organism against which the antibiotics are active

6.2 General principles of antimicrobial therapy

6.3 microbial resistance, mechanism and types

6.4 General mechanism of action, use, side effect, contraindication, precaution and dose of commonly used

- Sulphonamides: Co-trimoxazole, Sulphasalazine, Sulphacetamide, Silver sulfadiazine
- Penicillin (including new generation penicillin e.g., meropenems, carbapenems and monobactams): Benzylpenicillin, Phenoxymethylpenicillin, Ampicillin, Cloxacillin, Amoxicillin
- Cephalosporin: Cephalexin, Cefaclor, Cefotaxime, Cefuroxime
- Beta lactam inhibitors and their combination: clavulanic acid, sulbactam
- Tetracycline: Tetracycline, Doxycycline
- Aminoglycosides: Streptomycin, Gentamycin, Kanamycin, Amikacin
- Macrolides: Erythromycin, Azithromycin, Clarithromycin
- Quinolones and fluoroquinolones: Norfloxacin, Ciprofloxacin, Ofloxacin, Nitrofurantoin, Levofloxacin
- Antitubercular drugs: First line: INH, Rifampicin, Pyrazinamide, Ethambutol
2nd line: PAS, Cycloserine, Ciprofloxacin
- Antileprotic drugs: Dapsone, clofazimine
- Antifungal : Nystatin, Griseofulvin, Clotrimazole, Ketoconazole, Fluconazole

- Antiviral : Amantadine, Antiretroviral drugs
- Antimalarial : chloroquine, primaquine, mefloquine, quinine, artemisin
- Antiprotozoal : Metronidazole, DiloxanideFuroate, Tinidazole
- Antihelmentics: Albendazole, Mebendazole, Pyrantalpamoate, Niclosamide, Praziquintel, Diethylcarbamazine citrate

Practical

Unit 1. Pharmacology laboratory set up	6 hrs
1.1 familiarize with the different instruments /equipment of pharmacology laboratory in specimen /slide show/ pictures and diagrams	
Unit 2. Clinical measurement	10hrs
2.1 measure the temperature /pulse rate/ respiration rate/blood pressure of human volunteers	
Unit 3. Interpretation of pharmacological data	25hrs
3.1 Simulated data interpretation from existing data base.	
Unit 4. Case studies	30hrs
4.1 Drugs use in clinical setting (at least 10 case studies)	
Unit 5. To prepare drug profile of commonly used drugs	7hrs

References

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- 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 (4hrs/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: H₂O₂, KMNO₄, 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 **10 hrs**

7.1 Acid-base balance and replacement Therapy,

7.2 NaCl, KCl, NaHCO₃, 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 Definition and handling of Radiopharmaceuticals and measurement of radiation with GM Counter

8.2 Alpha, Beta, Gamma Radiations, Radio Isotopes of Iodine 131, Gold 198, Technetium 99 M and Calcium 47

Unit 9: Quality Control of Inorganic active pharmaceutical ingredients. **92 hrs**

9.1. Define Quality control and Quality assurance

9.2 Describe sources of impurities in pharmaceutical ingredients.

9.2 Explain identification tests for cations and anions and limit tests for chloride, sulphate, iron and heavy metals as per pharmacopeias

9.3 Explain melting point, boiling point, specific gravity and other physico-chemical parameters of inorganic ingredients.

9.4 Volumetric Analysis

- Volumetric Analysis Formulae
- Eqv. Mass of Oxidant and Reductant
- Concentration of Solution
- Normality Factor (f)
- Standard Solution
- Titration
- Selection of pH indicator (choice of pH indicator)
- Determination of concentration of solution (Normality equation)
 1. Different ways of expressing the concentration of solutions
 - i. Molarity,
 - ii. Normality
 - iii. Molality
 - iv. Gram /Litre
 - v. Percentage
 2. Titration
 - i. acid-base titration
 - ii. Redox titration
- Primary standard substances, primary standard solution, secondary standard solution, end point, equivalence point, neutral point, indicators
Introduce normality equation
- Relation between normality, molarity and percentage
- Selection of indicators in acid-base titration and pH curve

9.5 Introduce Chromatography, introduce stationary phase and mobile phase. Describe the chromatographic techniques with special focus to Column Chromatography and introduce HPLC.

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 Handle instrument/apparatus for the given experiment/s and perform their operation.

Unit 2: Experiments on pharmacopoeial 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 reagent preparations, pH determination and volumetric analysis representing all methods of titrations **34 hrs**

- 5.1 Prepare necessary reagents- acid, alkali, salt solution and their standardization (percentage w/w, percentage w/v, Molarity, Molality, and Normality)
- 5.2 Perform the experiment on the change in pH on the addition of strong acid and strong base in acidic, basic, neutral and buffered solution.
- 5.3 Perform the titration of strong acid and strong base.
- 5.4 Carry out the titration of weak acid and weak base.
- 5.5 Perform the titration of weak acid and strong base.
- 5.6 Carry out the titration of strong acid and weak base.
- 5.7 Perform the titration of polyprotic acid and strong base.

References

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

1. Mahadik KR and Kucher BS- Concise inorganic Pharmaceutical chemistry, Nirali Prakashan, 2004.
2. Mahadik KR and Kucher BS- Concise organic Pharmaceutical chemistry, Nirali Prakashan, 2004.
3. Kasture AV and Wadker- Pharmaceutical chemistry I & II NiraliPrakashan.
4. Bekeet AH and Stenlk- Practical Pharmaceutical Chemistry 4th edition Part I & II.
5. Kasture AV and Wadker- Practical Pharmaceutical chemistry I & II, NiraliPrakashan.
6. Antheron LM-Bently's & Drivers text book of Pharmaceutical chemistry, Oxford University Press London.
7. Kadam et.al – Principles of Medicinal Chemistry Vol. I & II.
8. Kasture AV et.al – Pharmaceutical analysis Vol I & II, NiraliPrakashan.
9. Daniel C Harris- Quantitative Chemical Analysis, W H Freeman and Company.
10. Jeffrey GH et.al-Vogel's Textbook of Quantitative Chemical Analysis 5th Edition.
11. Tipins HP Dhake AS- Inorganic Pharmaceutical chemistry, Career publication, 2002.
12. Belsare P and Dhake AS- Inorganic Chemistry (Practical), Career publication.
13. Indian Pharmacopoeia latest edition.
14. British Pharmacopoeia latest edition.

Pharmacognosy

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 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
5. Explain the source, characteristics and uses of pharmaceutical aids of natural origin.
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 various medicinal plants of Nepal having economic importance.

Theory

Unit 1: Introduction

14hrs

- 1.1 Introduction to Pharmacognosy
- 1.2 History, scope and importance of Pharmacognosy
- 1.3 Classification of crude drugs
- 1.4 Complementary and alternative system of medicine and its different dosage forms (focusing on Ayurveda, Homeopathy, Siddha and Unani systems of medicine).

Unit 2: Plants to crude drugs

5hrs

- 2.1 Method of cultivation
- 2.2 Collection, drying and storage of crude drugs

Unit 3. Introduction to parts of plants

10hrs

- 3.1 Cell and its organelles
- 3.2 Cell inclusion (ergastic cell contents)
- 3.3 Plant tissues
- 3.4 Microscopy and morphology of plants (leaves, root, stem, flower, fruits, seed, bark and rhizome).

Unit 4. Quality control and evaluation of crude drugs

15hrs

- 4.1 Drug adulteration
- 4.2 World Health Organization (WHO) guidelines for the quality assessment of crude drugs
- 4.3 Evaluation methods (macroscopical, microscopic, physical, chemical and biological)
- 4.4 Principles and types of chromatographic techniques (Thin layer chromatography and paper chromatography)
- 4.5 Microscopical Techniques of analysis

Unit 5. Phytochemistry

26 hrs

5.1 Plant analysis

5.2 General properties, method of extraction, classification, chemical tests and uses of the following phytoconstituents.

- ❖ Alkaloids
- ❖ Glycosides
- ❖ Volatile oil
- ❖ Tannin
- ❖ Resin

Unit 6. Pharmacognostic study of crude drugs

30hrs

- Different phytochemical constituents containing plants with reference to biological source, geographical distribution, macroscopical characters, microscopical characters, chemical constituents and uses:

Alkaloids: Stramonium, Belladonna, Rauwolfia, Vinca, Ergot, Ipecacuanhua, Ephedra, Vasaka, Berberis

Glycosides: Digitalis, Senna, Rhubarb, Glycyrrhiza, Dioscorea, Podophyllum, Sapindus, Chiraita, Neem

Volatile oil: Fennel, Lemon grass, Clove, Cinnamon, Eucalyptus, Ajwain, Mentha, Cardamom, Nardostachys, Gaultheria, Ginger, Acorus, Valeriana

Resin: Cannabis, Picrorhiza

Unit 7: pharmaceuticals Aids (focusing on source, properties, and uses)

10hrs

7.1 Starch, Gum Acacia, Tragacanth, Agar

7.2 Cod liver oil, Gelatin, Beeswax, Honey

7.3 Liquid paraffin

Unit 8: Status of medicinal plants of Nepal

7 hrs

State vernacular name, English name, botanical name, family, distribution, habitat, parts used, morphological characteristics and uses of following medicinal plants of economic importance found in Nepal.

- Panchaunle (*Dactylorhiza hatagirea*)
- Sugandhakokila (*Cinnamomum glaucescens*)
- Yarshagumba (*Cordyceps sinensis*)
- Harro (*Terminalia chebula*)
- Pipla (*Piper longum*)
- Barro (*Terminalia balerica*)
- Satawari (*Asparagus racemosus*)
- Timur (*Zantoxylum armatum*)
- Gurjo (*Tinospora sinensis*)
- Amala (*Emblica officinalis*)
- Taxus (*Taxus wallichiana*)

Practical

Unit 1. Pharmacognostical studies

22hrs

Perform the organoleptic test, physical and chemical test and microscopical examination of medicinally useful parts of the following drugs:

Digitalis, Chiraita, Ephedra, Mentha, Rhubarb, Stramonium, Vinca, Fennel, Berberis, Clove, Cinnamon, Ginger, Vasaka and Acorus

Unit 2. Extraction procedures

14hrs

1. Carry out the extraction of the following medicinal and aromatic plants applying hydro distillation and solvent extraction technique: Vasaka, Rauwolfia, Fennel and Clove

Unit 3: Thin Layer Chromatography

8hrs

1. Carry out thin layer chromatographic method of analysis of plant extracts.

Unit 4: Chemical test for active ingredients

10hrs

1. Carry out chemical tests for alkaloids, glycosides, tannins and volatile oils

Unit V: Field trip

1. Perform field trip of at least three institutions related to medicinal plants 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. 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. Dr. SB Malla et al., Identification Manual for some Non Timber Forestry Products of Nepal: Forest Resource information system project HMG/FINIDA.

Biochemistry and Microbiology

Theory total: 78 hrs (2 hrs/week)
Practical total: 39 hrs (1 hrs/week)

Full marks: 100 (Th.80+Pr.20)
Pass marks: 40(Th. 32+Pr.8)

Course Description

This course is designed to equip students with the knowledge and skills of Biochemistry and Microbiology. The course is also focused on the basic metabolism and qualitative and quantitative tests biomolecules. The course equips the students with the basic knowledge of microbiology.

Course Objectives

After completing the course the student will be able to:

1. Develop general concept of basic metabolism and tests of Carbohydrate, amino-acids and fats.
2. Understand the role of minerals and water for biochemical process.
3. Understand the immunity and role of T-cell, B-cell and antibody.
4. Understand the basic concepts of nucleic acid and recombinant DNA technology
5. Understand the properties of Microorganisms (Bacteria, Fungus and Virus).
6. Understand the culture media and aseptic techniques.

Theory

Unit 1: Introduction

6hrs

- 1.1 Introduction to biochemistry and its importance for health science students.
- 1.2 Explain structure, composition, classification and multiplication of cell.

Unit 2: Definition, Classification, Importance and Basic metabolism of the followings:

25hrs

- 2.1 Carbohydrates
 - Glycolysis, Gluconeogenesis, Citric acid cycle
- 2.1 Amino acids, Peptides and Proteins
 - Transamination, Deamination, Urea cycle
- 2.2 Lipids and fatty acids
 - Beta-oxidation of palmitic acid
- 2.3 Interpret the relation of Carbohydrate, Fat and protein metabolism.
- 2.4 Vitamins; Definition, Classification and Clinical significances
- 2.5 Enzymes; Definition, Classification, Coenzymes, Isoenzymes, Clinical enzymology
- 2.6 Role of Minerals, ions and water in life processes

Unit 3: Fundamental of Immunology

6hrs

- 3.1 Explain Immune system and type of Immunity.
- 3.2 Describe Sources and properties of antigens, vaccines and sera
- 3.3 Describe Anti-bodies, T and B-lymphocytes, T-cell

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

6hrs

- 4.1 Describe about DNA, RNA.
- 4.2 Introduce DNA replication.
- 4.3 Introduction to pharmaceutical recombinant products

Unit 5: Microbiology

35 hrs

5.1 Introduction to Pharmaceutical Microbiology.(5 hrs)

- Define Microbiology.
- Describe the historical development of microbiology
- Application of microbiology with special reference to pharmaceutical sciences.

5.2 Microorganisms (20 hrs)

BACTERIA: General morphology, Classification of Bacteria. Growth curve, growth factors, Nutrition, Requirements and factors affecting growth. Culture Media, Bacterial cultures and staining methods, Bacterial resistance to antibacterial therapy

VIRUSES: General introduction and Classification

FUNGI/YEAST/MOLDS: Types, morphology, pharmaceutical importance of fungi and yeasts

5.3 NORMAL FLORA: Normal flora of skin, Intestinal tract, ear, nose. (2 hrs)

5.4 Control of Microbes: (5 hrs)

- Different method of sterilization and disinfections-
- Aseptic techniques
- Sterility Testing,
- Sterilization of pharmaceutical ingredients and dosage forms.
- Environmental monitoring

5.5 Explain microbial assay of antibiotics and vitamins-method. (3 hrs)

Practical

Unit 1: Identification and estimation of the following: 21hrs

- 1.1 Perform the test of Carbohydrate: Molisch Test/ Benedict's test and iodine test for starch.
- 1.2 Perform the test for Proteins: Biuret test
In urine: Heat + Acetic acid, Sulphasalicylic acid, Strip method.
- 1.3 Perform the test for Amino acids: Ninhydrin Test
- 1.4 Perform the test of Lipid: Cholesterol (Lieberman Burchard test).
- 1.5 Perform the test of dextrose as blood sugar (Enzymatic test).
- 1.6 Perform the test for:
 - Urea (DAM method) and Creatinine (Jafrie reaction method).
 - Bilirubin (Vandenberg reaction)
 - Calcium (OCP Method).
- 1.7 Perform qualitative tests of abnormal urinary constituents (Glucose, ketone bodies, hemoglobin)

Unit 2: Microbiology practical (18hrs)

- 2.1 Perform staining and microscopic examination of Sputum by ZN stain
- 2.2 Identify microorganism by gram stain
- 2.3 Demonstrate various bacterial colonies
- 2.4 Carry out dry heat sterilization and moist heat sterilization
- 2.5 Demonstrate the antibiotic sensitivity test

References

1. Furest R - Micorbiology in Health and Disease, W.B Saunder & Co,
2. Bialley and Scott - Dignonostic Microbiology.
3. Rawling's EA-Benty's text book of Pharmaceutics. All India Traveller Book Sellers

Pathophysiology

Theory total: 78hrs (2 hrs/week)

Full marks: 50

Pass marks: 20

Course Description

This course is designed to equip students with the knowledge and skills of Pathophysiology

Course Objectives

After completing the course the student will be able to:

1. Know about the human body system.
2. Understand the Pathophysiology of blood and urine.
3. Understand the basic concepts of hormones.

Unit-1: Introduction to pathophysiology

38hrs

1.1 Introduction, Pathogenesis, Sign and symptoms and management of the following diseases

- Gastric/peptic ulcer, hepatitis, diarrhea, vomiting, constipation and Typhoid fever.
- Hypertension, Angina Pectoris, Congestive heart failure and rheumatic heart disease.
- UTI, Nephritis and Renal failure.
- Epilepsy, Depression, Psychosis, conjunctivitis and otitis media.
- Pneumonia, Asthma and COPD.
- Meningitis, Myasthenia gravis, Spondylitis.
- Syphilis, Gonorrhea and HIV-AIDS.
- Hypothyroidism and Thyrotoxicosis, Diabetes mellitus

Unit 2: Pathophysiology of blood and urine

20hrs

2.1 Blood: function, composition and their characteristics

2.2 Introduce pathology related to blood cells (Anemia, Leukemia, and Thrombocytosis)

2.3 Explain normal and abnormal constituents of urine.

Unit 3: Basic concepts of hormones

20hrs

3.1 Introduction, classification and mode of action of hormones

3.2 Introduction to hypothalamic hormones and hormones of anterior pituitary gland

3.4. Thyroid hormones: functions, release, transport and TFT,

3.5. Insulin and Glucagon: structure, release, functions and synthesis

3.6. Adrenocorticoides and Mineralocorticoids: functions, release and transport

3.7. Parathyroid Hormone: functions and release

3.8. Male and Female sex hormones: functions, release and transport

References

1. Kulkani MV et.al- Biochemistry, Nirali Prakashan.
2. Essentials of pathophysiology for pharmacy, Martin M. Zdanowicz, CRC Press.
3. Hugo & Russell's Pharmaceutical Microbiology, Stephen P Denyer, Norman Hodges, Sean P. Gorman Brendan F. Gilmore
4. Chaudari MA and Gokhale S B- Biochemistry and Clinical Pathology, Nirali Prakashan.
5. Mc Murry J and Castellion E Mary- Fundamentals of Organic and Biological Chemistry, Prentic Hall
6. Kale-Practical Biochemistry and Clinical Pathology, Book Syndicate Mumbai
7. Robins et.al. Pathological basis of Disease, Churchil Livingtion

8. Lenniger AC- Principles of Biochemistry, CBS Publication
9. Chessebrough M - Medical laboratory Manual for Tropical Countries Vol. I and II ELBS
10. Mukarjee K.C- Handbook of medical Laboratory Technology
11. Handbook of Medical Laboratory Technology CMC Vellore
12. Herold Varley - Practical Clinical Biochemistry
13. I D P Watton Microanalysis in Medicinal Chemistry.
14. Manual methods In Clinical Chemistry - WHO publication.

Pharmaceutical Management

Theory total: 78 hrs (2 hrs/week)

Practical total: 39 hrs (1 hr/week)

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

Pass marks: 40(Th. 32+Pr.8)

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 Public Medicine supply and 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 management

15hrs

- 1.1 Describe the concept of management: process, discipline and characteristics.
- 1.2 Illustrate in brief about major management functions.
- 1.3 Distinguish between management and administration
- 1.4 Describe management skills and abilities.
- 1.5 Explain in brief about general principles of management, Taylor's scientific management theory.
- 1.6 Explain in brief about planning and organizing
- 1.7 Describe nature and process of controlling.
- 1.8 Explain decision-making.
- 1.9 Describe direction and motivation. Maslow's theory of motivation
- 1.10 Explain leadership and supervision.

Unit 2: Entrepreneurship and Pharmaceutical Organization

3hrs

- 2.1. Define entrepreneurship, general characteristics of entrepreneur and its types
- 2.2. Explain business organization in pharmaceutical enterprises (industry, trade, hospital and Community).

Unit 3: General concept on economic theory with focus to pharmaceuticals

10hrs

- 2.1 Define economics (Adam Smith and Robin's definition) and pharmaco-economics
- 2.2 Define market economy and its types
- 2.2 Explain theory of demand.
- 2.3 Illustrate consumer behavior.
- 2.4 Describe revenue and cost curves.
- 2.5 Describe theory of price and output determination in perfect competition and monopolistic market
- 2.6 Define public finance
- 2.7 Define taxation and its types

Unit 3: Pharmaceutical Finance and Accounting management **15hrs**

- 3.1 Describe general concept of cost and cost accounting.
- 3.2 General concept of Journal Voucher, Ledger, Trial Balance and Balance Sheet.
- 3.3 Describe concept of capital and capital management.
- 3.4 Explain calculation of turnover, working capital, Income statement, cost volume profit analysis and investment return ratios.
- 3.5 Define break-even point with graphical and mathematical calculation

Unit 4: Drug Supply Management in Public Sector **10hrs**

- 4.1 General concept on Essential medicine and essential medicine list, selection criteria for essential medicine list
- 4.2 Define Standard Treatment Schedule and its importance
- 4.3 Quantification techniques for medicine procurement
- 4.2 General concept on procurement cycle. Describe purchasing procedure including tender procedures.
- 4.3 Explain storage of medicines including vaccines.
- 4.4 General concept on the distribution system of medicine for outreach supply
- 4.5 Describe monitoring process in distribution of medicine
- 4.6 Define rational drug use and explain its importance

Unit 5: Pharmaceutical marketing **22hrs**

- 4.6 Define market and its types
- 4.7 Explain general concepts on elements of marketing
- 4.8 General concept on creation of demand for pharmaceutical goods
- 4.9 Basic concept of Marketing and marketing management (traditional and modern concept) i.e. production, product, sales marketing and societal marketing.
- 5.5 Marketing segmentation of pharmaceuticals: marketing segmentation, target marketing, product positioning, tools of product differentiation.
- 5.6 Define marketing mix. Explain the elements of marketing mix
- 5.7 Explain marketing process in general
- 5.8 Explain general concept on sales promotion
- 5.9 Product and Pricing Decision of pharmaceutical: New product development, Decisions relating to product: product mix and product line decisions, branding and packing decision, product pricing.
- 5.10 Product promotion and Modern marketing of pharmaceuticals: a) Definition and promotional decision including personal selling, designing of promotional materials, advertising and sale promotion, public relation, personal selling. b) Introduction to export marketing globalization, web marketing, green marketing, network marketing, event marketing.
- 5.11 Tactics in detailing on pharmaceutical products

Unit 6: Human Resource Management in Pharmaceuticals **3hrs**

- 6.1 Basic concept of Human resource management
- 6.2 Components of HRM [Recruitment and selection: a) concept, process, source b) process of selection, interview. c) Placement: orientation, socialization]
- 6.3 Motivation and training for HRM

Practical

Unit 1: Pharmaceutical organization & management

10 hrs.

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

Unit 2: Financial management in pharmaceutical sectors

25 hrs.

- 2.1 Calculate turnover, working capital, Income, cost volume, profit and investment return ratios.
- 2.2 Perform break-even point with graphical and mathematical calculation

Unit 3: Management of Different Pharmaceutical product

4 hrs.

- 3.1 Prepare a survey report on the market of the given pharmaceutical product in different location.

References:

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

Health Education & Health Care System

Theory total: 117 hrs (3 hrs/week)

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

Practical total: 78 hrs (2 hrs/week)

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

28hrs

1.1: Concept of Health

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

1.2 Principles and scope of health education:

- Describe scope of health education.
- Explain principles of health education.
- State importance of health education in pharmacy
- Identify health education needs related to pharmacy

Unit 2: Learning

4 hrs

- Define learning.
- Describe different way of learning such as; by hearing, by seeing, by doing, by repetition, and by imitation.
- Change process: concept, need for change, hindrance of change
- Explain factor-affecting learning.
- Biological factors such as condition of sensory organs.
- Physical factors.
- Socio-culture factors.
- Physiological factors.

Unit 3: Health education methods and media

15 hrs

3.1. Health education methods

- Explain role of different methods for providing health education.
- Classify different methods with advantages and disadvantages
 - Individual method: Interview and Counseling.
 - Group method: Group discussion, Role-play, Brain storming, Work-shop etc.
 - Mass Method: Lecture, exhibition etc.

3.2. Health education media:

- Classify different health education media.
- Advantages and disadvantages of each media.
- Describe criteria for the selection of media.

3.4. Planning of health education

- 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.

Unit 4: Primary Health Care and health care delivery system in Nepal

23 hrs

4.1: Primary Health Care (10 hrs)

- Define Alma-ata Declaration

- 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.

4.2: History of health care delivery system in Nepal (13 hrs)

- Describe the health care delivery system in Nepal.
- Health care delivery systems
 - Traditional health care
 - Without system: Dhami, Jhankri, Lama, Guvaju etc.
 - With system: Ayurvedic, Homeopathy, Unani, Accupuncture/naturopathy
 - Modern health care
 - Concept of Allopathic medicine
- Health policies and programs
 - Objectives of current National Health Policy
 - Current National Health Sector Support Program
 - Concept of Millennium development goal on health
- Describe recent organogram of Ministry of Health (MoH).
- Explain healthcare management models.

Unit 5: Vector Borne Disease

5 hrs

- Define vector
- Source of vector
- Vector borne diseases (Malaria/Filiarisis/Kala-azar/Influenza 1 & 2/Dengue Fever/Japanese Encephalitis)
- Preventive measures of vector borne disease

Unit 6: Nutrition

3 hrs

- Define Nutrition
- Classification of food (Carbohydrate, Fat, Protein, Minerals, Vitamins)
- Nutrition deficiency disorders (Night blindness, Goitre, Kwashiorker, Marasmus and Anemia)

Unit 7: Family Planning **2 hrs**

- Define family planning
- Methods of family planning

Unit 8: First Aid **35 hrs**

8.1 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.

8.2 Abdominal Pain 2 hrs

Identify the following:

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

8.3 Cough and breathing problems 3 hrs

Identify the following:

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

8.4 Diarrhea and vomiting (rehydration and fluid therapy) 4 hrs

Identify and manage the following:

- Diarrhea.
- Vomiting.

8.5 Fever 2 hrs

Identify and manage the following:

- Acute fever.
 - Chronic fever.
- 8.6 Minor skin problems 2 hrs
- Identify and manage the following:
- General illness, fever and rashes.
 - Itching.
 - Ulcers.
 - Red, scaly, flaking rash.
- 8.7 Musculo-skeletal problem 2 hrs
- Identify and manage the following:
- Backache.
 - Pain in joints.
 - Weakness in arm, legs, difficulty in walking.
- 8.8 Nutritional deficiency 4 hrs
- Identify and manage the following:
- Failure to weight gain in child.
 - Weight loss in adult.
 - Weakness with anaemia.
- 8.9 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: 12 hrs

- Prepare subject or text.
- Present those texts by using different health education methods.

1.5 Demonstration of operating process of Overhead Projector (OHP): 6 hrs

- Prepare appropriate text in transparencies.
- Operate overhead projector.
- Deliver that text using mini-lecture method.

Unit 2: Health care system 12 hrs

2.1 Visit of health facility (PHCC/HP/SHP): 12 hrs

- Make an organogram of health facility.
- Observe activities delivered to the patient and community.
- Identify eight elements of PHC focusing on most frequently and rarely performed elements.
- Make a field visit report.

Unit 3: First-aid 24 hrs

3.1 Demonstration of different types of splint: 3 hrs

- Demonstrate the process of immobilization using splint.
- 3.2 Demonstration of tourniquet: 3 hrs
- Locate suitable place for tourniquet.
 - Use tourniquet appropriately.
- 3.3 Demonstration of ORS: 2 hrs
- Demonstrate the process of making ORS.
- 3.4 Visit of health facility (Hospital/PHCC/HP/SHP): 16 hrs
- Observe signs and symptoms of common emergency problems.
 - Observe management procedure of common emergency problems.
 - Diagnose common emergency problems.
 - Manage common emergency problems.

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Third Year

Pharmaceutics II

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 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, cosmetics and ophthalmic products. Additionally, it deals with packaging materials, quality control, method of dispensing, surgical devices and medical appliances and brief introduction about cosmetics and toiletries.

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. Explain and understand different types of cosmetics and personal care products.
6. Prepare simple solid dosage forms and biphasic preparations including intravenous solutions.

Theory

Unit 1: Oral administration of solid dosage **14 hours**

1.1 Tablets: **10 hours**

- Define tablet and describe its merits and demerits.
- Mention different types of compressed tablets and their uses.
- Briefly introduce controlled release tablet, sustained release tablet and their examples.
- Mention formulation of tablets with examples.
- Mention processes involved in the production of tablets (Direct compression, dry granulation and wet granulation).
- Evaluation of Tablets: Pharmacopoeial and non pharmacopoeial tests.
- Describe the defects in tablets.
- Describe the reasons for tablets coating and types of tablet coating (film coating, sugar coating and enteric coating) and their merits and demerits.
- Describe the packaging and storage of Tablets.

1.2 Capsule: **4 hours**

- Define capsule and mention its types and advantages and disadvantages.
- Mention different sizes of Hard and soft gelatin capsule, filling materials in hard and soft gelatin capsule, and describe method for calculation of filling weight.
- Describe different parts and filling procedure of hard gelatin capsule using manual filling machine.
- Mention the difference between hard and soft gelatin capsules.
- Describe the Packaging and storage of capsule.

Unit 2: Biphasic pharmaceutical products **26 hrs**

2.1 Emulsion: **(7 hrs)**

- Define emulsion and mention its types.
- Identification for emulsions.

- Define and classify emulsifying agents.
- Mention the components of formulation with examples and describe the method of preparation in brief.
- Instabilities in emulsions
- Describe the storage condition for emulsion.

2.2 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.

2.3 Semi solid dosage form

Ointment: (7 hrs)

- Define ointment and mention the characteristics of an ideal ointment.
- Classify ointments.
- Classify ointment bases.
- Describe preparation of ointment (trituration, fusion and chemical reaction) and its stability aspects in brief.
- Describe packaging and storage condition.

Cream, Paste and Jellies: (5 hrs)

- Define cream, paste and jellies.
- Mention formulation components with examples.
- Describe preparation, packaging and storage of each in brief.

Unit 3: Packing of pharmaceutical dosage form 5 hrs

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

Unit 4: Aerosol 4 hrs

- Define aerosol and mention its merits and demerits.
- Describe aerosol principle.
- Illustrate components of aerosol.
- Describe aerosol system operation.
- Describe metered dose inhalers (MDI) and Dry power inhaler (DPI).
- Mention the advantages of Aerosol over other dosage forms.

Unit 5: Parental preparation 10 hrs

- Introduce parenteral preparations, types of products and mention its different routes of administration with examples.
- Mention its advantages and disadvantages.
- Briefly introduce small volume and large volume parenteral.
- Mention types and formulation components with examples.
- Describe aseptic condition and its need in manufacturing of parenteral preparation.
- Describe the steps involved in manufacturing of parenteral preparation in brief.
- Describe the quality control test for parenteral products. (Sterility, Pyrogen, Particulate matter and leak test of ampoules.)

- Briefly describe Total Parenteral Nutrition (TPN) and dialysis fluid.

Unit 6: Biological products **6 hrs**

- Define immunity and describe its types.
- Define immunological terminologies.
- Classifications of immunological preparations.
- Describe the preparation of vaccines, sera and toxoids in brief.
- Describe cold chain equipment and maintenance of cold chain for different vaccines.
- Introduction to the storage practice and cold chain maintenance.

Unit 7: Dispensing pharmacy **9 hrs**

7.1 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.

7.2 Pharmaceutical Incompatibilities in prescriptions:

- Describe physical, chemical and therapeutic incompatibilities.

7.3 Posology:

- Define dose and dosage form, describe the factors influencing dose, and calculate doses on the basis of age, sex and surface area.

Unit 8: Powders **3 hrs**

- Define and classify powders, mention its advantages and disadvantages.
- Describe preparation of different types of powders encountered in prescriptions.
- Describe its packaging and storage.

Unit 9: Suppositories **6 hrs**

- Define suppositories and mention its types.
- Mention the formulation components and describe the preparation in brief.
- Describe the packaging and storage.

Unit 10: Ophthalmic products **6 hrs**

- Introduce and classify ophthalmic products.
- Describe the pharmaceutical requirements of ophthalmic products.
- Describe the preparation in brief.
- Describe packaging and storage conditions.

Unit 11: Quality assurance **6 hrs**

- Define quality control and quality assurance.
- Describe the meaning of quality of drugs.
- Orient with GMP and GLP.
- Provide concept of total quality management.
- Describe documentation in quality assurance.

Unit 12: Surgical devices and medical appliances **7 hrs**

- Define surgical products and explain suture and ligature.
- Classify suture and ligature with examples.
- Orient with other medical appliances such as contact lens, urinary catheters, medical and Surgical gloves, cottons, syringes, nebulizers surgical gauzes, bandages, adhesive tape, protective cellulosic homeostasis etc.

Unit 13: Introduction to Cosmetics and toiletries**15hrs**

Introduction to the following cosmetic preparations

- Skin Preparations: creams and lotions, classification of skin creams, cold, vanishing, all purpose and emollient creams, cleansing creams, foundation creams, hand creams, protective and barrier creams.
- Hair preparations: Shampoos, hair setting lotions, conditioners, hair tonics, hair bleaches, hair coloring dyes, permanent waving, hair straighteners, antidandruff preparations.
- Face powders and makeup : Face powders, compact powder, cake makeup, make- up cream, Liquid make up, stick make up and liquids, powder, beauty masks.
- Colored make up: Lipsticks, rouges and eye makeup.
- Manicure preparations: Cuticle remover, nail bleach, nail whites, nail creams, nail lacquer and enamel remover.
- Dental Products: Dentifrices and mouth washes.
- Astringents and skin tonics.
- Body cosmetics : Antiperspirants and deodorants, sun screen, suntan and
- Antiburn preparations, skin lighteners and bleaches.
- Bath preparations: Foam baths, bath salts, bath oil and after bath products.
- Shaving preparations: Shaving creams lather and brushless, aerosol shaving foams, dry shaving preparations and after shave preparations.
- Baby cosmetics: Baby powders, oils, lotions, shampoos and soaps.

Practical**Unit 1: Oral administration of solid dosage****24 hrs****1.1 Tablets:**

- Prepare any type of tablet using direct, dry or wet granulation technique and evaluate it. (8 hrs)
- Determine physical parameter of any marketed product (paracetamol tablet). (4 hrs)
- Comparative study of disintegration test of different products (uncoated tablet, film coated tablet, dispersible tablet, enteric coated tablet, sugar coated tablet etc.) (6 hours)

1.2 Capsule:

- Prepare hard gelatin capsule of aspirin/ any other relevant product. (4 hrs)
- Determine physical parameter of formulated hard gelatin capsule or any marketed product. [2 hrs]

Unit 2: Biphasic pharmaceutical products**20 hrs****2.1 Emulsion:**

- Prepare and supply liquid paraffin 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**

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

- Prepare and supply compound magnesium trisilicate oral powder. (2 hrs)
- Prepare and supply compound calcium carbonate powder. (2 hrs)

Unit 6: Suppositories

4 hrs

- Prepare glycerogelatin suppository. (2 hrs)
- Prepare boric acid suppository. (2 hrs)

Unit 7: Ophthalmic products

6 hrs

- Prepare and supply sulphacetamide eye drops. (2 hrs)
- Prepare and supply sodium bicarbonate eye lotion or chloramphenicol eye ointment. (2 hrs)
- Transfer sterile product under aseptic condition. (Laminar airflow). [2 hrs]

Unit 8: Cosmetics and Toiletries

8 hours

- Prepare cold creams and vanishing creams.
- Prepare tooth paste and tooth powder.
- Prepare shaving cream.

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Pharmacology and Pharmacotherapeutics II

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:
 - Cardiovascular drugs
 - Histamine and antihistamine
 - Hormones and related drugs
 - Drug acting on peripheral nervous system
 - Drug acting on CNS
 - Chemotherapy and neoplastic drugs
 - Drugs acting on skin and mucous membrane
 - Nutritional supplement
 - Eye, Ear and Nasal preparation
 - Life saving and emergency drugs
 - Urinary acidifiers and alkalizers

Unit 1 Cardiovascular drugs

25hrs

- 1.1 Describe Hypertension, Angina, Congestive cardiac Failure, Arrhythmia, Coagulation, Hyperlipidemia, Myocardial infarction
- 1.2 Classifications, General mechanism of action, use, side effect, contraindication, precaution and dose of commonly used
 - Diuretics and anti-diuretics: Frusemide, Hydrochlorothiazide, Spironolactone, Mannitol Acetazolamide
 - Beta Blockers: Atenolol
 - Calcium channel Blockers : Amlodipine, Verapamil, Nifedipine
 - ACE inhibitors: Enalapril, Ramipril
 - ACE-II inhibitors: Losartan, Telmisartan
 - Cardiac glycosides: Digoxin
 - Lipid lowering: Atorvastatin, Simvastatin, Clofibrate, Fenofibrate
 - Anti-platelet: Aspirin
 - Anticoagulant: Heparin, Warfarin, Enoxaparin

Unit 2 Histamine and antihistamine

4hrs

2.1 Classifications, General mechanism of action, use, side effect, contraindication, precaution and dose of commonly used

- Antihistamines: Chlorpheniramine, Pheniramine, Cetrizine, Levocetirizine, Fexofenadine, Loratidine, Promethazine
- Decongestants: Local: Oxymetazoline, Xylometazoline, Nafazoline
Systemic: Phenylephrine, Pseudoephedrine

Unit 3 Hormones and related drugs

20hrs

3.1 Classifications, General pharmacological actions, mechanism of action, use, side effect, contraindication, precaution and dose of commonly used

- drugs used in hypothyroidism and hyperthyroidism: Thyroxine, Propylthiouracil carbimazole
- anti-diabetic drugs: Insulin, Glimeperide, Metformin, Sitagliptin, Pioglitazone, Glipizide, Glibenclamide
- glucagon
- corticosteroids: Betamethasone, Dexamethasone, Hydrocortisone
- Gonadal hormones and their antagonist: Testosterone, Progesterone, Estrogen, Tamoxifen, Clomiphene citrate
- oxytocin

Unit 4 Drugs acting on peripheral nervous system

6hrs

Classifications, General pharmacological actions, mechanism of action, use, side effect, contraindication, precaution and dose of commonly used

- Skeletal muscle relaxant drugs: Suxamethonium, Tizanidine, d-tubocurarine (Curare drugs)
- local anaesthetics: Lignocaine, Procaine, Oxythiazine

Unit 5 Drugs acting on central nervous system

22hrs

5.1 Classifications, General pharmacological actions, mechanism of action, use, side effect, contraindication, precaution and dose of commonly used

- general anaesthetics: Nitrous, Oxide, Halothane, Ketamine, Propofol
- sedative, hypnotics : Diazepam, Alprazolam, Zolpidem, Phenobarbitone, Chlordiazepoxide
- antiepileptic drugs: Carbamazepine, Phenytoin, Valproic Acid
- antiparkinsonian drugs: Levodopa, Carbidopa
- Opioid analgesics and antagonists: Morphine, Pethidine, codeine, Naltrexone, Naloxone
- antipsychotic, antianxiety, antimanic and antidepressant drugs: Fluoxetine, Amitriptylline, Chlorpromazine, Haloperidol, lithium salts

5.2 pharmacological actions and guidelines for safe drinking of ethyl and methyl alcohol

5.3 management of migraine headache: Ergometrine

Unit 6 Chemotherapy and neoplastic drugs

10hrs

6.1 Mechanism of action, use, side effect, contraindication, precaution and dose of commonly used anticancer drugs: Cyclophosphamide, Methotrexate, Doxorubicin, Bleomycine, Taxol, Vincristine, Cytarabine, and Cisplatin)

6.2 handling of anticancer drugs

Unit 7 Miscellaneous drugs**6hrs**

7.1 Classifications, mechanism of action, use, side effect, contraindication, precaution and dose of commonly used immunosuppressant

7.2 application of gene therapy

Unit 8 Drugs acting on skin and mucous membrane**8hrs**

8.1 Definition and Uses of following

- Demulcents
- Emollients
- adsorbents and protectives
- astringents
- irritants and counter irritants
- keratolytics
- antiseborrheics
- antipsoriasis
- drugs for acne vulgaris
- antiseptic and disinfectant with their classification and spectrum of activity
- drugs scabies and pediculosis
- single versus combination therapy for management of skin disease

Unit 9 Nutritional supplement**10hrs**

9.1 classification, sources and roles of commonly used vitamins: Water soluble and fat soluble vitamins

9.2 sources and therapy of iron and common minerals in the body

9.3 management of anemia

Unit 10 Lists different types of Eye, ear and nasal preparation**2hrs**

10.1 Toxicology with emphasis on organophosphorous Paracetamol, Barbiturates and opioid poisoning

Unit 11. List of life saving and emergency drugs**2hrs**

Classification according to the condition they used

1. Drugs used in Anaphylactic shock
2. Drugs used in Myocardial infarction and cardiogenic shock
3. Drugs used in peripheral circulatory collapse
4. Drugs used in status epilepticus
5. Medicines for Hypertensive Crisis
6. Antisnake venom for snake bite

Unit12. Urinary acidifiers and alkalizers**2hrs**

Practical

Unit 1. Case studies	18hrs
1.1 Drug crossing the blood brain barrier	
1.2 Drugs not crossing the blood brain barrier	
1.3 Dose adjustment in hepatic disease , kidney disease , elderly patients , pregnancy and during lactation	
Unit 2 Drug effects	20hrs
2.1 carry out the study on the effect of cholinergic and anticholinergic drugs on rabbit cornea	
Unit 3 Behaviour test in mice	10hrs
3.1 handling of mice	
3.2 Dose Calculation	
Unit 4. Other theory related case studies	30 hrs

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.

10 hrs

- 2.1 Explain the Nomenclature of Organic Compounds, IUPAC rule special reference to heterocyclic system.
- 2.2 Definition, characteristics of aromatic compounds, Huckel's rule, structure of benzene, isomerism and orientation of benzene derivatives
- 2.3 Explain the numbering system different position of benzene ring.
- 2.4 Physical properties of benzene
- 2.5 Chemical properties of benzene
 - i. Addition reaction: hydrogen, halogen and ozone
 - ii. Electrophilic substitution reactions: nitration, sulphonation, halogenation Friedal craft's alkylation and acylation
 - iii. Combustion of benzene and uses

Unit 3: Structure, storage, handling and quality assurance of the molecules of following organic drugs (from section 3.1 to 3.18)

142hrs

- 3.1 Antiseptic and disinfectants: (20 hrs)
 - Explain Formaldehyde.
 - Introduce Acriflavine, Proflavine, Benzylkonium chloride, Cetrime, phenol and cresol.
 - Explain Sulfonamide and Anti-leptotics.
 - Explain Sulfanilamide, 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, and Doxycycline.

- 3.5 Aminoglycosides and Macrolides: (2 hrs)
- Explain Erythromycin, Gentamicin, Azithromycin, and 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 Anthelmintics: (12 hrs)
- Explain Metronidazole, albendazole and chloroquin.
 - Explain Tinidazole, Secnidazole, Diloxanidefuroate, Mebendazole, Paryntelpamoate, DEC. Anti-malarials: Quinine group (Chloroquine and others) TMP and pyrimethamine, Artemisinin derivatives.
- 3.9 Scabicides and pediculocides (2 hour)
- Explain GBHC, Benzyl benzoate.
- 3.10 Psychotropic agents: (14 hrs)
- Define Antipsychotics and introduce Chlorpromazine, Trifluoperazine, Haloperidol, Diazepam, Lorazepam
 - Define Hypnotics and introduce Barbiturates, Nitrazepam.
 - Define Anti-depressants and introduce Amitriptyline, Imipramine, Alprazolam.
 - Define Antiepileptics, Anticonvulsants and antirigidity. Introduce Carbamazepine, Phenytoin, sodium Valproate, Trihexyphenidyl.
- 3.11 Drugs Acting on CNS and ANS.: (26 hrs)
- Define General anaesthetic, Halothane, Methohexital, Trichloroethylene, Ketamine.
 - Define Local Anaesthetic, Lignocaine, Benzocaine, and Ethyl Chloride.
 - Define Adrenergic Drugs, Adrenaline, Noradrenaline, Salbutamol, Ephedrine, and 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 Furosemide, Amlodipine, Atenolol, Enalapril and Aspirin.
 - Explain Thiazides, Urea, Mannitol, Nitrate anti-anginals, Quinidine, Procainamide, Heparin, Warferin, Ticlopidine, Aspirin, Ethamsylate, Coumarins, Digitalis, Simvastatin.
- 3.13 Hormones and Related drugs: (12 hrs)
- Explain Insulin, Chlorpropamide, and dexamethasone.
 - Explain Glibenclamide, Metformin, Rosiglitazone, Thyroxine, Carbimazole, Methylthiouracil, Steroids (Dexamethasone, Prednisolone, and 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: (10 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, Serratiopeptidase, Chemotrypsine.

3.18 Diagnostics: (2 hour)

- Define BaSO₄, 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 (Metronidazole, Paracetamol, Iodine, Starch, lactose,).

Unit 3: Identification of unknown organic compounds.

20 hrs

- 3.1 Identify at least two unknown organic compounds.

References

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

1. Mahadik KR and Kucher BS- Concise inorganic Pharmaceutical chemistry, Nirali Prakashan, 2004.
2. Mahadik KR and Kucher BS- Concise organic Pharmaceutical chemistry, Nirali Prakashan, 2004.
3. Kasture AV and Wadker- Pharmaceutical chemistry I & II Nirali Prakashan.
4. Bekeet AH and Stenlk- Practical Pharmaceutical Chemistry 4th edition Part I & II.
5. Kasture AV and Wadker- Practical Pharmaceutical chemistry I & II, Nirali Prakashan.
6. Antheron LM-Bently's & Drivers text book of Pharmaceutical chemistry, Oxford University Press London.
7. Kadam et.al – Principles of Medicinal Chemistry Vol. I & II.
8. Kasture AV et.al – Pharmaceutical analysis Vol I & II, Nirali Prakashan.
9. Daniel C Harris- Quantitive Chemical Analysis, W H Freeman and Company.
10. Jeffrey GH et.al-Vogel's Textbook of Quantitative Chemical Analysis 5th Edition.
11. Tipins HP Dhake AS- Inorganic Pharmaceutical chemistry, Career publication, Dec 2002.
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13. 14. 26. Indian Pharmacopoeia latest edition.
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Hospital and Clinical Pharmacy

Theory total: 117hrs (3 hrs/week)

Practical total: 78hrs (2hrs/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, extemporaneous preparations, inventory management, nomenclature and uses of surgical instruments and hospital equipment and drug monitoring. Similarly, clinical pharmacy focuses drug Interactions, adverse drug reaction, therapeutic drug monitoring, and concept of patient counselling, 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 outpatient department and in-patient department.
2. Provide the patient counselling services for rational drug use.
3. Familiarize with drug procurement system in hospitals
4. Familiarize with Pharmacovigilance programme
5. Management of drugs and store
6. Train them for the management of common illness
7. Familiarize with common laboratory and diagnostic tests

Part A: Hospital Pharmacy

Unit 1: Hospitals

3hrs

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

Unit 2: Hospital Pharmacy

10hrs

- 2.1 Define hospital pharmacy.
- 2.2 Explain functions and objectives of hospital pharmacy services.
- 2.3. Layout design of hospital with flow of materials and men.
- 2.4. Regulatory and professional requirement for hospital pharmacy practice
- 2.5 Explain requirements and abilities required for hospital pharmacists.

Unit 3: Drug distribution system in hospital

10hrs

- 3.1 Explain drug distribution system in hospitals with emphasis on:
 - Outpatient services.
 - In-patient services.
 - Types of services.
 - Detailed discussion of unit dose system.
 - Floor/ward stock system.
 - Satellite pharmacy system.
 - Bedside pharmacy.

Unit 4. Central sterile services.

2 hrs

- Functions and objectives of CSSD,
- Role of pharmacist in CSSD,
- Flow chart of CSSD

Unit 5: Extemporaneous compounding and dispensing **5 hrs**
5.1 Definition, manufacturing requirement, scope and limitations
5.2. Some common hospital formulations like salicylic acid ointment, coal tar ointment, Whitefield ointment, iodine solution etc
5.3 Concept of Total Parenteral nutrients.

Unit 6: Drug and Therapeutic Committee **5 hrs**

- Introduction to Drug and Therapeutic committees
- Goals, objectives, structure, principle and Functions of the DTC
- Hospital Formulary

Unit 7: Drug information **3 hrs**
7.1 Explain sources of drug information
7.2 Elaborate drug information services
7.3. Drug information bulletin.

Unit 8: General concept on Surgical and Sterilization **5 hrs**
8.1 Familiarize with surgical dressing like cotton, gauze, bandages and adhesive tapes, Sutures, I.V. sets, Ryle's tubes, Catheters, Syringes.
8.2. Health Accessories
8.3. Sterilization

Unit 9: Drug Store management **10hrs**

- Demand Estimation for procurement of drug supplies
- Requirement for drug storeroom and storage requirement of general drugs including vaccines and narcotic drugs
- Principle of drug inventory management: ABC analysis, VED Analysis, FSN analysis, FIFO, FEFO.
- Handling of cytotoxic drugs and radioisotopes.

Unit 10: Application of computers in Pharmacy **5hrs**
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 **7 hrs**
1.1 Introduction to clinical pharmacy practice.
1.2 Define and elaborate clinical pharmacy
1.3 Define and list out the elements of pharmaceutical care

Unit 2: Taking Medication History **4 hrs**
Demographic information, Dietary information, Social habits, Current and Past Prescription Medications, Current and Past Non-prescription, Medication Allergies, ADR

Unit 3: Review of Common Laboratory and Diagnostic tests **3 hrs**

- List out common liver function test and kidney function test with specific reference to normal value

Unit 4: Drug Interactions **10 hrs**

4.1 Drug interactions:

- Define
- Explain Mechanism of drug interaction with examples
- Elaborate drug-food interaction with examples

Unit 5: Adverse drug reaction

5 hrs

- Adverse drug reactions, Type of ADR
- ADR monitoring and pharmacovigilance
- Examples of some drug induced diseases and teratogenicity.

Unit 6: Responding to Symptoms

20hrs

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, COPD, Asthma, Gout, Thyroid Disease, Psoriasis, motion sickness, headache, musculoskeletal problems, women's health (dysmenorrhea, ECP)

Unit 7: Therapeutic Drug Monitoring

5 hrs

7.1 Define Therapeutic Drug Monitoring.

7.2 Explain Importance of monitoring.

7.3 State the Techniques of monitoring.

7.4 Drug monitoring with special focus on narrow therapeutic index and its range.

Unit 8 Drugs used in Special population

5hrs

- Pregnancy
- Lactation
- Pediatrics
- Geriatrics
- Hepatic and Renal diseases

Practical

78hrs

1. Preparation of different extemporaneous preparation and dispensing.
2. Sterilize surgical instruments, glassware and hospital supplies.
3. Familiarize with different sutures, catheters, Ryle's tube, ET tube, IV sets, and blades.
4. Pharmacovigilance and Adverse Drug monitoring system.
5. Interpretation of Common laboratory values
6. Use of Glucometers, BP set, Insulin Devices, Inhaler, Rotahalers, pregnancy test kits, ECP.
7. Handle and use data processing software and equipment.
8. Administer and counsel special dosage forms like; suppository, eye and ear drop, Nebulizer, Metered dose inhaler and Insulin devices

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.
5. Hospital Pharmacy Service Guidelines 2070 published by Government of Nepal, Ministry of Health and Population.

Social Pharmacy and Pharmaceutical Jurisprudence

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 help students to acquaint with the knowledge and skills on different aspects of community Pharmacy. This course focuses on the different ethical aspects of pharmacy and different components of the community pharmacy. It also 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.

Course objectives

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

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

Theory

Part - One: Social Pharmacy

Unit 1: Social pharmacy

15 hrs

- 1.1 Define profession & professionalism.
- 1.2 Explain pharmacy as profession.
- 1.3 Describe the role of community pharmacy in the society, Primary Health Care, public Health
- 1.4 Explain the different component of prescription and list pharmaceutical abbreviations
- 1.5 Explain different steps of dispensing of prescription and dispensing techniques.
- 1.6 Pharmaceutical calculations.
- 1.7 Explain extemporaneous dispensing.
- 1.8 Explain labeling of dispensed products.
- 1.9 Explain patient counseling.
- 1.10 Explain patient compliance.
- 1.11 Explain patient profile.
- 1.12 Explain Drug profile.

Unit 2: Management of a community pharmacy

6 hrs

- 2.1 Explain location analysis.
- 2.2 Describe establishing and financing a community pharmacy.
- 2.3 Describe pharmacy layout design.
- 2.4 Describe legal structure of ownership.
- 2.5 Explain risk management and insurance.
- 2.6 Elaborate on purchasing and inventory control.

Unit 3: Communication skills

8 hrs

- 3.1 Explain nonverbal communication.
- 3.2 Explain patterns of behavior in communication.
- 3.3 Explain questioning and listening skill.
- 3.4 Explain barriers of communication.
- 3.5 Explain confidentiality.

Unit 4: Good community pharmacy practice **8 hrs**

- 4.1 Describe the requirements of premises/layout.
- 4.2 Describe the requirements of equipment.
- 4.3 Describe the requirements of manpower.
- 4.4 Describe the requirements of material.
- 4.5 Describe the requirements of storage and inventory control.
- 4.6 Describe the requirements of services.
- 4.7 Describe the requirements of documentation.

Unit 5: Ethical aspects of Pharmacy **3 hrs**

- 5.1 Describe rules of moral conduct in pharmacy
- 5.2 Describe how pharmacy profession is different from other profession with suitable example
- 5.2 Describe the importance of ethics in pharmacy

Part-2: Pharmaceutical Jurisprudence

Unit: 1 History of pharmaceutical legislation, pharmaceutical industry, pharmaceutical education system of Nepal **3 Hrs**

Unit: 2 Explain the following Acts and Regulations **25 Hrs**

- Drugs Act, 2035 /1978
- Drug Consultation Council and Drug Advisory Regulation 2037 (1980).
- Drug Registration Regulation 2038 (1981).
- Drug Inspection Regulation 2040 (1983).
- Drug Standard Regulation 2043 (1986).
- Drug Manufacture Codes 2041 (1984).
- Drug Sale and Distribution Codes 2071
- Good Manufacturing Practices (Ausadi Utpadan Sangita 2041)
- Pharmacy Council Act (NPC- 2057 (2000)).

Unit: 3 A brief accounts on the following **10 Hrs**

- Hospital pharmacy guideline with amendment
- National Health policy
- National Drug policy
- Consumer Protection Act 2054 (1998).
- Narcotic drug control act relating to pharmaceutical product and the relation of act with Drugs Act 1978
- Control of poisonous and hazardous chemical substances and their control mechanism
- Pharmaceutical Institutions and organizations of Nepal and their function
- Drugs banned in Nepal and the reason of drug banning

Practical

Part 1: Social Pharmacy

50 hours

1. Draw a model prescription showing different parts of the prescriptions.
2. Collect the label of different dosages form and comment on the label on the basis of general labeling requirements.
3. Role plays in for communication skill.
4. Pharmacy design and layout.
5. Prescription handling.
6. Good pharmacy practice audit.
7. Extemporaneous preparation calculation in different dosage forms.

Part 2: Pharmaceutical Jurisprudence

28 hours

1. Seminar on National Health policy
2. Seminar on National Drug policy
3. Discuss the banded list of drugs with rational and enlist the detail list.
4. Seminar on veterinary, ayurvedic and other system of medicines
5. Discuss the importance and provision of different “Anusuchies” included in the following regulations:
 1. Drug Registration Regulation 2038 (1981).
 2. Drug Inspection Regulation 2040 (1983).
 3. Drug Standard Regulation 2043 (1986).
 4. Drug Manufacture Codes 2041 (1984).
 5. Drug Sale and Distribution Codes 2041

References:

1. Alfonso R. Gennaro: Remington the Science and Practice of Pharmacy, Volume II (20th Edition) 2002, Lippincott Williams & Wilkins, Philadelphia.
2. J. Winfield and R. M. E. Richards: Pharmaceutical Practice (2nd Ed.) 1998, Churchill Livingstone, Edinburg.
3. Kevin Taylor and Geoffrey Harding – Pharmacy Practice. Taylor and Francis, Latest edition.
4. Regulations and others guidelines of DDA related to community Pharmacy, MOHP, Government of Nepal.
5. Drug Act 2035 and Rules and Regulations under it. Government of Nepal. MOHP.
6. Patent Act and Company Act of Nepal, Government of Nepal, MOIC.
7. Health Related Regulations and Policies, Government of Nepal. MOHP.
8. Consumer Protection Act 2054(1998), Government of Nepal.
9. Nepal Pharmacy Council Act 2057 (2000)
10. National Drug Policy 1995.

Pharmacoepidemiology and Environmental Health

Theory total: 78 hrs (2 hrs/week)

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

Practical total: 39 hrs (1hr/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 hrs
- Define confounding and bias.
 - Classify different types of bias.
- 1.5 Drug Utilization Stud: 6 hrs
- 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, waste 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, and 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:
 - 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.
- Calculate the amount of bleaching powder necessary for well disinfections.
- Visit water treatment plant.
 - Observe water treatment process.
 - Make a field visit report.
- Visit pasteurization plant.
 - Observe pasteurization process.
 - Identify pasteurization type.
 - Make a field visit report.
- Visit solid waste management project.
 - Observe solid waste management process.
 - Make a field visit report.
- Visit municipality.
 - Observe municipality's activities related with environmental health and sanitation.
 - Make a field visit report.

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1. Miller, Tyler (1988), Environmental Science, USA: Wadsworth Inc.
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4. Nathanson, Jerry A. (2003), Basic Environmental Technology- Water Supply, Waste Management & Pollution Control,
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Comprehensive Professional Field Practice

Nature: Practical
Total: 340 hrs (40 hrs/week)

Full marks: 200
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)	I=100
2.	Drug Regulatory bodies		
3.	Health facility/Hospital		
4.	Community practice	4½ weeks (180 hours)	II = 100
Total		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 Council 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 voice separately.