Republic of the Philippines
OFFICE OF THE PRESIDENT
COMMISSION ON HIGHER EDUCATION

CHED MEMORANDUM ORDER (CMO)
No. 03
Series of 2006

SUBJECT: **POLICIES, STANDARDS AND GUIDELINES FOR PHARMACY EDUCATION**

In accordance with the pertinent provisions of Republic Act (RA) No. 7722, otherwise known as the "Higher Education Act of 1994," and for the purpose of rationalizing Pharmacy Education in the country with the end in view of meeting the health needs of the people through quality health services and keeping it relevant and space with the demands of global competitiveness, the following policies and standards for Pharmacy Education are hereby adopted and promulgated by the Commission, thus:

Article I
INTRODUCTION

Section 1. Pharmacy education is a four year Bachelors Degree which provides a broad spectrum of scientific training and can lead to employment in a wider range of scientific fields principally in higher education institutions, community drug stores, hospitals, in government agencies, research establishments, public health and pharmaceutical industry. It should also encompass pharmaceuticals, cosmetics, household hazardous substances, drug delivery devices and veterinary medicines.

The main concern of Pharmacy Education is to provide the country with pharmacists who are scientifically competent to deliver the full spectrum of pharmaceutical services required in health care delivery. After finishing the program, the graduate shall have acquired and developed the knowledge, skills, aptitude and competencies in:

1. conducting scientific research methods and processes;
2. developing drugs for prevention, diagnosis, mitigation and treatment of diseases of man and animals;
3. identifying, compounding, manufacturing , storing and dispensing of drugs;
4. managing drug establishments based on sound entrepreneurial practice;

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5. providing pharmaceutical care as well as counseling clients in the proper use of both prescribed and patient chosen medications;
6. providing drug and health related information;
7. advocating professional and ethical pharmacy practice;
8. contributing to the overall social, mental, emotional and physical health of individuals, communities and the country;

Article II
AUTHORITY TO OPERATE

Section 2. All private higher education institutions (PHEIs) intending to offer the Bachelor of Science in Pharmacy program must first secure proper authority from the Commission in accordance with existing rules and regulations. State universities and colleges (SUCs), and local colleges and universities should strictly adhere to the provisions in these policies and standards.

Article III
PROGRAM SPECIFICATIONS

Section 3. Program Name – Bachelor of Science in Pharmacy

Section 4. Program Description:

Bachelor of Science in Pharmacy is a multi faceted four-year course as mandated by the pharmacy law as amended, composed of general education courses, core courses and professional pharmacy courses.

a) Objectives : The B.S. Pharmacy Program aims to prepare the graduates for the following roles:

- Health Care Provider
- Decision Maker
- Researcher
- Leader
- Manager
- Teacher
- Communicator/Counselor
- Entrepreneur
- Life Long Learner
- Agent of Positive Change

b) Specific pharmacy practice areas where a graduate may work:

1. Drug Outlets:

- Drug Store Owner/Manager
- Supervising Pharmacist
- Chain Drug Store Chief Pharmacist/Staff Pharmacist
- Hospital Pharmacist: Chief Pharmacist, Staff Pharmacist, Supervisor
- Clinical Pharmacist
- Botica ng Barangay Pharmacist

2. Drug establishments:
    - Pharmacist Owner/Manager/Supervisor/Staff
    - Regulatory Pharmacist
    - Company Pharmacist
    - Researcher/Clinical Researcher
    - Quality Control Analyst
    - Quality Assurance Inspector
    - Medical Representative
    - Product Manager
    - Production Pharmacist
    - Production Planning and Inventory Control Officer
    - Marketing Specialist

3. Academic Institutions:
    - Professor
    - Instructor
    - Lecturer
    - Administrator/Dean/Assistant Dean/Program Coordinator/Department Chair
4. Government agencies:
    - Board Examiner
    - Food and Drug Regulation Officer (FDRO)
    - Drug Regulation Officer (DRO)
    - Director of Bureau of Food and Drugs (BFAD)
    - Hospital/Clinic Pharmacist
    - Researcher
    - Consultant
    - Philhealth Pharmacist
    - Military Pharmacist
    - Forensic Pharmacist/Analyst

5. Health Maintenance Organizations (HMO):
    - HMO Pharmacist
    - Medical Transcriptor
    - Health Call Center Pharmacist

6. Research Institutions:
    - Researcher
    - Administrator

7. Non Government Organizations/Private Corporations:
    - Project Director
    - Consultant
    - Company Pharmacist

Article IV
COMPETENCY STANDARDS

Section 5. The competency standards present the minimum level of competence of pharmacy graduates required in community, hospital and industry/marketing/research/regulatory practice areas. The standards set will be used as guide and basis for upgrading the curriculum, formulating licensure examination questions, performance evaluation in the workplace and in monitoring the quality of pharmacy education.

Article V
CURRICULUM

Section 6. Curriculum Description:

Bachelor of Science in Pharmacy Curriculum consists of courses arranged from First Year to Fourth Year. Each level/year consists of two semesters.

The minimum requirements for the Bachelor of Science in Pharmacy curriculum are flexible depending on the needs of the profession and in accordance with the Policies and Standards of CHED.

Section 7. Curriculum Outline

a) Outline and Total Units of General Education (GE) Courses

Language and Humanities		**21 units**
English	6	
English 1	3	
English 2	3	
Filipino	6	
Filipino 1	3	
Filipino 2	3	
Humanities	9	
Logic	3	
Philo	3	
Phil. Lit.	3	

Math/Natural Science/Info Tech		**19 units**
Math 1	3	
Statistics	3	
Physics	5	
Gen. & Inorg. Chem.	5	
Computer 1	3	
Social Science		**12 units**
Health Eco. w/ LRT	3	
Socio Anthro	3	
Health Ethics	3	
Psychology	3	
Mandated Subjects		**6 units**
Rizal's Life, Works & Writings	3	
Phil. History & New Const.	3	
Physical Education		**8 units**
P.E.1	2	
P.E. 2	2	
P.E. 3	2	
P.E.4	2	
NSTP		**6 units**
NSTP 11	3	
NSTP 12	3	
TOTAL UNITS		**72 units**

b) Outline and Total Units of Core Courses

PBS 1 (Pharmaceutical Botany with Taxonomy)		5
Chem 2 (Organic Chemistry)	5	
PBS 2 (Human Anatomy & Physiology with Pathohysiology)		5
Pharm 1 (Intro to Pharmacy)	3	
Comp 2 (Pharmacy Informatics)		3
Pharm Care 1 (General Concept of The Health Care System)		3
Pharm Care 3 (Communication & Interpersonal Skills)		3
English 6 (Technical Writing)		3
TOTAL UNITS		**30 UNITS**

c) Outline and total units of Professional Courses

Pharm Care 2 (Public Health)	3
Pharmaceutics 1 (Drug Delivery Systems)	5
PBS 3 (Pharm Biochemistry)	5
Pharm 2 (Pharm Calculation)	3
Pharm. Chem.1(Pharm Chem of Med 1)	4
Pharm 3 (Physical Pharmacy)	4
Pharm 4 (Biopharm & Pharmacokinetics)	3
PBS 4 (Pharmacognosy & Plant Chemistry)	5
PBS 5 (Pharm. Microbiology & Parasitology)	5
Pharm. Chem. 2 (Pharm Chem of Med 2)	5
Pharmaceutics 2 (Manufacturing Pharmacy)	5
PBS 6 (Pharmacology 1)	4
Pharm 5 (Hospital Pharmacy)	3
Pharm. Chem. 3 (Quality Control 1- Drug Testing & Assay)	5
PBS 7 (Pharmacology 2 & Therapeutics)	4
Phar. Chem. 4 (Quality Control 2 - Drug Testing & Assay with Instrumentation)	4
Pharm Care 4 (Dispensing & Medication Counseling)	3
Ph Ad & Mgt 1 (Principles of Pharmacy Administration & Management)	3
Pharm Juris & Ethics	3
Pharm. Chem. 5 (Clinical Toxicology)	3
Pharm Care 5 (Clinical Pharmacy)	4
Ph Ad & Mgt 2 (Marketing & Entrepreneurship)	3
Research 1 (Research & Thesis Writing 1)	3
Research 2 (Research & Thesis Writing 2)	1
TOTAL UNITS	90

Section 8. Program of Study

BACHELOR OF SCIENCE IN PHARMACY
Proposed Minimum Curriculum Requirements

FIRST YEAR

1st Semester

Subjects	*Course Title*	*Lec*	*Lab*	*Units*
English 1	Communication Skills I	3		3
Filipino 1	Sining ng Pakikpagtalastasan	3		3
Math 1	College of Algebra	3		3
Ph. Bio. Sci. 1	Pharmaceutical Botany with Taxonomy	3	2	5
Chemistry 1	General and Inorganic Chemistry	3	2	5

Pharm 1	History and Orientation to Pharmacy	3		3
PE 1		2		2
NSTP 11		(1.5)		(1.5)
		20	**4**	**24**

2nd Semester

Subjects	*Course Title*	*Lec*	*Lab*	*Units*
English 2	Communication Skills II	3		3
Filipino 2	Panitikan	3		3
Logic		3		3
Statistics	Basic Statistics	3		3
Physics	General Physics	3	2	5
Psychology 1	General Psychology with Drug Abuse Education	3		3
Pharm Care 1	General Concept of the Health Care System	3		3
PE 2		2		2
NSTP 12		(1.5)		(1.5)
		23	**2**	**25**

SECOND YEAR

1st Semester

Subjects	*Course Title*	*Lec*	*Lab*	*Units*
Chemistry 2	Organic Chemistry	3	2	5
Philosophy	Philosophy of Man	3		3
Ethics	Health Ethics	3		3
Ph. Bio. Sci. 2	Human Anatomy & Physiology with Pathophysiology	3	2	5
Pharm Care 2	Public Health	3		3
Computer 1	Intro to Information Technology	2		2
PE 3		2		2
		20	**4**	**24**

2nd Semester

Subjects	*Course Title*	*Lec*	*Lab*	*Units*
English 5	Philippine Literature	3		3
Pharmaceutics 1	Drug Delivery Systems	3	2	5
Ph. Bio. Sci. 3	Pharmaceutical Biochemistry	3	2	5
Pharm 2	Pharmaceutical Calculation	3		3
Health Eco	Health Economics with Taxation & Land Reform	3		3
Computer 2	Pharmacy Informatics	3		3
PE 4		2		2
		20	**4**	**24**

THIRD YEAR

1st Semester

Subjects	*Course Title*	*Lec*	*Lab*	*Units*
English 6	Technical Writing	3		3
Phar. Chem. 1	Pharmacy & Chemistry of Medicinals I	3	1	4
Pharm 3	Physical Pharmacy	3	1	4
Pharm 4	Biopharmaceutics & Pharmacokinetics	3		3
Ph. Bio. Sci. 4	Pharmacognosy & Plant Chemistry 3	2	5	
Ph. Bio. Sci. 5	Pharmaceutical Microbiology and Parasitology	3	2	5
		18	**6**	**24**

2nd Semester

Subjects	*Course Title*	*Lec*	*Lab*	*Units*
Phar.Chem. 2	Pharmacy & Chemistry of Medicinals II	3	2	5
Pharmaceutics 2	Manufacturing Pharmacy	3	2	5
Ph. Bio. Sci. 6	Pharmacology I	4		4
Pharm 5	Hospital Pharmacy	2	1	3
Pharm. Chem. 3	Quality Control I- Drug Testing and Assay	3	2	5
Pharm Care 3	Communication and Interpersonal Skills 3		3	
		18	**7**	**25**

FOURTH YEAR

1st Semester

Subjects	*Course Title*	*Lec*	*Lab*	*Units*
History 3	Rizal's Life, Works and Writing	3		3
Ph. Bio. Sci. 7	Pharmacology 2 and Therapeutics	3	1	4
Pharm.Chem. 4	Quality Control 2 Drug Testing & Assay w/ Instrumentation	3	1	4
Research I	Pharmacy Research and Thesis Writing	1	2	3
Pharm Care 4	Dispensing and Medication Counseling	3		3
Pharm Ad & Mgt 1	Principles of Pharmacy Administration and Management	3		3
		16	**4**	**20**

2nd Semester

Subjects	*Course Title*	*Lec*	*Lab*	*Units*
Political Science II	Philippine History and Constitution	3		3

Pharm Juris & Ethics	Pharmaceutical Jurisprudence and Ethics	3		3
Pharm.Chem. 5	Clinical Toxicology	2	1	3
Research 2	Pharmacy Research and Thesis Writing 2	1		1
Pharm Care 5	Clinical Pharmacy	3	1	4
Phar Ad & Mgt 2	Marketing and Entrepreneurship	3		3
Socio Anthro	Sociology and Anthropology	3		3
		18	**2**	**20**

Section 9. Thesis/Research Project Requirement

Research & Thesis Writing is a 4 unit subject wherein the students should have completed the research requirement and submitted a thesis output.

Section 10. Practicum/Internship Requirement. The student must have completed the number of hours for community, hospital and manufacturing pharmacy practicum as requirement for graduation. The number of hours required for major internship must be completed prior to taking the pharmacy licensure examination. The major internship can be done in any of the three areas of internship.

Community Pharmacy	200 hours
Hospital Pharmacy	200 hours
Manufacturing Pharmacy	200 hours
Major Internship	360 hours
TOTAL NO. OF HOURS	**960 hours**

Article VI
COURSE SPECIFICATIONS

Section 11. : The following are the course specifications for professional pharmacy courses.

Course Name : **Introduction to Pharmacy (Pharm 1)**

Course Description : The course orients the student in the history and development of pharmacy and the standards of its practice.

Course Objectives: : At the end of the course, the students should be able to:

1. Trace the evolution of pharmacy practice;
2. Describe the general education and professional courses in the pharmacy curriculum;
3. Source the different types of literatures used in pharmacy;
4. Differentiate the various areas of pharmacy practice;
5. Discuss the legal and ethical aspects of the practice of pharmacy;
6. Identify the different pharmaceutical associations and their objectives;
7. Define common medical terms used in the practice of pharmacy;
8. Distinguish the different therapeutic classifications of drugs, dosage forms and their corresponding mode of administration; and
9. Manifest appreciation and pride of the pharmacist's social and professional responsibilities.

Number of Units : 3 units

Number of Contact hours : 3 hours lecture per week

Pre-requisites : None

Course Outline :
Unit I. Historical Development of Pharmaceutical Practice
Unit II. Pharmaceutical Education
Unit III. Essential Pharmaceutical Literature
Unit IV. Specialties in Pharmacy Practice, Functions and Responsibilities
Unit V. Legal and Ethical Control in the Practice of Pharmacy
Unit VI. Pharmaceutical Organizations
Unit VII. Common Medical Terms and Abbreviations
Unit VIII. Introduction to the Different Therapeutic Classifications of Drugs, Dosage Forms and Their Corresponding Mode of Administration

Texts and References :

- Ansel, Howard, Popvich Nicholas G. and Allen, Jr Lloyd V. Pharmaceutical Dosage Forms and Drug Delivery System. 7th Ed., USA: Lea & Febiger, 2000
- CHED Policy and Standards on Pharmacy Education

- Genaro, Alfonso R. ED. Remington: The Science and Practice of Pharmacy. Philadelphia: William & Wilkins, 2000
- Smith, Mickery C. and David A. Knapp. Pharmacy, Drugs and Medical Care. 5th Ed., Philadelphia: William & Wilkins, 1992
- Soundecker, Glenn. Kremers and Urdang's History
- of Pharmacy. 4th Ed., Philadelphia: J.B.Lippincott, 1976

Course Name	:	**Pharmaceutical Calculations (Pharm 2)**
Course Description	:	This course covers metrology and calculations applied in the practice of pharmacy.
Course Objectives	:	At the end of the course, the students should be able to: 1. Demonstrate mastery of the different systems of weights and measures in pharmacy practice; 2. Interpret prescriptions and medication orders; 3. Perform mathematical operations used in the practice of pharmacy; 4. Solve problems related to compounding and dispensing of drugs; and 5. Manifest the values of accuracy, honesty, analytical thinking, scientific discipline, patience and industry.
Number of Units	:	3 units
Number of contact hours	:	3 hours lecture per week
Pre-requisites	:	Pharmacy 1
Course Outline	:	Unit I – Weights and Measures Unit II – Prescription and Medication Order Interpretation Unit III – Reducing and Enlarging Formula Unit IV – Density, Specific Gravity, and Specific Volume Unit V – Methods of Expressing Concentrations Unit VI – Dilution and Concentration Unit VII – Dosage Calculation Unit VIII – Introduction to Pricing
Texts and References	:	➢ Anderson, Ellen, Workbook of Solutions of Dosage of Drugs. ➢ Ansell, Howard and Stoklosa, Mitchell, Pharmaceutical Calculations.

- Daniels, Joanne M. and Smith, Loretta M., Clinical Calculations. A Unified Approach. 4th Edition Delmar Publishing Co., 1999.
- Genarro, Alfonso ed., Remington's Pharmaceutical Science. 19th Edition. Pennsylvania: Mack Publishing Co., 1995.
- Heystad L., Hayek W., Essential Drug Dosage Calculations. 4th Edition. Prentice-Hall Inc., 2001.
- Khan M., Reddy I., Pharmaceutical and Clinical Calculations. Technomic Publishing Company, Inc., 2000.
- Lyman, Rufus A. and Sprowis, Joseph, American Pharmacy. Philadelphia, J.B. Lippincott Company, 1995.
- Picker, Gloria D., Dosage Calculations. 5th Edition. Delmar Publishing Co., 1996.
- Rouse and Webber, Calculation in Pharmacy.

Course Name	:	**Physical Pharmacy** **(Pharmacy 3)**
Course Description	:	This course involves an analysis of application of basic physiochemical principles and methodology as they relate to drug dosage form design, preparation, stabilization and evaluation. It also considers the relationship of these principles to selected therapeutic problems.
Course Objectives	:	At the end of the course, the students should be able to: 1. Acquire basic knowledge and skills pertinent to dosage formulation; 2. Apply the physico-chemical properties of drugs as they relate to manufacture and therapeutic response; 3. Interpret theoretical principles in terms of concrete laboratory situations; 4. Analyze and solve accurately problems encountered in drug design.
Number of Units	:	4 units (3 units lecture / 1 unit laboratory)
Number of contact hours	:	3 hours lecture and 3 hours lab per week
Pre-requisites	:	Physics, Organic Chemistry, Pharmaceutics I
Course Outline	:	I. Introduction to the Course II. Solubility and distribution phenomena III. Colloids IV. Coarse Dispersions

V. Buffer system and isotonic solution
VI. Interfacial phenomena
VII. Micromeritics
VIII. Rheology and Biorheology
IX. Complexation and Protein-Binding application to the practice of Pharmacy
X. Kinetics and its significance to the manufacturers, physicians, pharmacists and patients

Laboratory Equipment : See Annex B (List of Laboratory Equipment, Facilities and Supplies)

Texts and References :
- Martin, Alfred, James Swarbrick and Arthur Cammarata, Physical Pharmacy 3rd Ed., Philadelphia: Lee and Fabiger, 1983 **(Latest)**
- Genarro, Alfonso, Ed.: Remington's The Science & Practice of Pharmacy 20th ed. Pennsylvania: Mack Publishing Co., 2000
- Ansel, Howard. Introduction to Pharmaceutical Dosage Forms, 4th Ed **(Latest)**

Course Name : **Biopharmaceutics and Pharmacokinetics (Pharm 4)**

Course Description : This course deals with the basic principles and factors affecting drug liberation, absorption, distribution, metabolism and excretion, including the appropriate mathematical models that describe drug behavior in the body in both normal and altered physiologic states which are necessary for the design of a rational dosage regimen.

Course Objectives : At the end of the course, the students should be able to:
1. Discuss the principles of liberation, absorption, distribution, metabolism and excretion, and the factors that affect these processes.
2. Define relevant pharmacokinetic terminologies.
3. Use raw data and derive pharmacokinetic models and parameters that best describe the pharmacokinetic behavior of drugs in the body.
4. Describe how changes in the physiologic state, including disease states affect drug behavior.
5. Apply knowledge of biopharmaceutics and pharmacokinetics in the design of a rational drug therapy and monitoring. (dosing regimen)

Number of Units	:	3 units
Number of contact hours	:	3 hours lecture per week
Pre-requisites	:	Pharmaceutical Calculations, Human Anatomy & Physiology with Pathophysiology, Physical Pharmacy (co-requisite)
Course Outline	:	1. LADMER System (and the different transport processes) 2. Description of the various kinetic orders 3. Compartmental model-based and compartment-independent analysis of drug behavior, rate constants, area-under-the-curve (AUC), and other kinetic parameters (Volume of distribution, clearance) 4. Pharmacokinetic parameters following multiple and continuous dosing 5. Dosage regimen design 6. Pharmacokinetic behaviors of drugs in altered physiologic states 7. Non-linear pharmacokinetics 8. Special Topic: Bioavailability and Bioequivalence
Texts and References	:	➢ Ritschel, W.A. Handbook of Basic Pharmacokinetics ➢ Leon Shargel, Andrew B.C. Yu. Applied Biopharmaceutics and Pharmacokinetics ➢ Malcolm Rowland and Thomas Tozer. Clinical Pharmacokinetics Concepts and Applications (3rd Edition)
Course Name	:	**Hospital Pharmacy (Pharm 5)**
Course Description	:	An introductory course to the practice of pharmacy in a hospital setting. It includes organizational structure of the pharmacy department and its relation to other departments. It covers the different drug distribution systems, bulk compounding methods, parenteral admixtures, practice standards, pharmacy and therapeutics committee and general pharmacy administration.
Course Objectives:	:	At the end of the course, the students should be able to: 1. State and explain the minimum standard for pharmacies in hospitals and the different competencies required of hospital pharmacists;

2. Appreciate the role of pharmacist in delivery of quality patient care;
3. Classify and evaluate the different drug distribution systems; and
4. Identify and experience the various aspects of institutional pharmacy.

Number of Units : 3 units (2 units lecture, 1 unit laboratory)

Number of Contact hours : 2 hours lecture and 3 hours laboratory per week

Pre-requisites : Physical Pharmacy and Drug Delivery System

Course Outline :

Unit I. Introduction to Hospital Pharmacy
Unit II. Hospital and Its Organization
Unit III. The Hospital Pharmacy Department
Unit IV. The Pharmacy and Therapeutics Committee
Unit V. Hospital Formulary
Unit VI. Management and Control
Unit VII. Drug Distribution Systems
Unit VIII. Bulk Compounding and Preparation of Sterile Products
Unit IX. Education and Training Programs
Unit X. Patient-Oriented Services
Unit XI. Legal Aspects of Institutional Practice

Laboratory Equipment : Dry laboratory; Overhead Projector, Transparencies, Video Presenter, LCD

Texts and References :

- Hassan, William. Hospital Pharmacy 5th Ed. Philadelphia: Lea & Febiger. 1986.
- Brown, Thomas & Smith, Mickey. Handbook of Institutional Pharmacy Practice. 2nd Ed. Baltimore: Williams. 1986
- Alfonso, G. Remington: The Science & Practice of Pharmacy. 19th Ed. Pennsylvania: Mack Publishing Company. 1995
- Winfield, A.J. & Richards, R.M. Pharmacy Practice. 1st Ed. Churchill Livingstone. 1990
- American Journal of Pharmacist

Course Name	:	**Pharmaceutical Botany with Taxonomy (Pharm. Bio. Sci. 1)**
Course Description	:	The course is an extensive presentation of plant life and related living forms, inclusive of morphoanatomy and hierarchical organization and its value as an integral part of the ecosystem and the pharmaceutical field.
Course Objectives	:	At the end of the course, the students should be able to: 1. Acquire the knowledge of structures, development and classification of plants 2. Appreciate the significance of plants to the environment and the economy 3. Recognize the importance of Botany in pharmacy and other related fields
Number of Units	:	5 units (Lecture 3 units; Laboratory 2 units)
Number of contact hours	:	Lecture 3 hours/week; Laboratory 6 hours/week
Pre-requisites	:	None
Course Outline	:	1. Introduction to Plant Science 2. Introduction to the Principles of Chemistry and its functions to plants 3. Cell Structure, Development and Function 4. Plant Tissues and Development 5. Morphogenesis and Development of Roots Functions and Interrelation to soil 6. Morphogenesis and Development of Stems: Secondary growth in woody stems and Stem physiology and adaptations 7. Energy Metabolism: Photosynthesis 8. Energy metabolism: Respiration 9. Types of transpiration and the factors 10. Plant Development and Morphogenesis 11. Ecology: Population and Ecosystems 12. Types of Biomes 13. Introduction to Taxonomy 14. Four components of Taxonomy 15. Major Plant Taxonomists and their contribution 16. General features of bacteria 17. Taxonomic groupings of Eubacteria with emphasis on blue-green algae 18. Taxonomic grouping of Archaebacteria 19. Kingdom Fungi 20. Fungus-like Protista 21. Kingdom Protista

22. Kingdom Plantae
23. Groups of non-vascular plants
24. Groups of non-seed vascular plants (lycopsids, sphenopsids, psilopsids and pteridophytes)
25. Gymnosperms, gnetophytes
26. Monocotyledonae
27. Dicotyledonae

Laboratory Equipment : See Annex B (List of Laboratory Equipment, Facilities and Supplies)

Texts and References :

- Prescribed Textbook: Mauseth, James D. Botany An Introduction to Plant Biology. 2nd Ed.Multimedia Enhanced Edition.Jones and Bartlett Publishers, Inc., 1998
- References: Moore, Randy,Clark, W. Dennis and Vodopich, Darrel. Botany.2nd Ed. International Editions.WCB/Mc Grawhill Book Co. Inc, 1999
- Yougken, Heber, Pharmaceutical Botany 7th ed, The Blakiston Co. 1951

Course Name : **Pharmaceutical Biochemistry (Pharm. Bio. Sci. 3)**

Course Description : The course deals with the molecular hierarchy of the living cell. It covers the study of the biomolecules carbohydrates, proteins, lipids and nucleic acids in relation to their structure and functions in the living system, the generation and storage of metabolic energy, biosynthesis of biomolecules and the transmission and expression of genetic information. It also discusses the importance and correlation of biomolecules to health and diseases.

Course Objectives : At the end of the course, the students should be able to:

1. Recognize the structure of the different biomolecules carbohydrates, proteins, lipids and nucleic acids
2. Understand basic concepts and principles in the isolation of biomolecules
3. Apply the methods and techniques in the isolation, characterization and analysis of the different biomolecules
4. Correlate structure with the biological function of the biomolecules
5. Understand the importance of transmission and expression of genetic information

6. Describe the pathways that lead to the generation and storage of metabolic fuel
7. Explain derangements in metabolic disorders in relation to health and disease
8. Apply principles of biochemistry to pharmacy, genetics, biotechnology and other related fields

Number of Units : 5 units (3.0 units lecture and 2.0 units laboratory)

Number of contact hours : 3 hours lecture, 6 hours laboratory per week

Pre-requisites : Organic Chemistry, Anatomy and Physiology with Pathophysiology

Course Outline :
Unit 1: Introduction to Biochemistry
Unit 2: Proteins
Unit 3: Enzymes
Unit 4: Nucleic Acids
Unit 5: Carbohydrates
Unit 6: Lipids
Unit 7: Generation and Storage of Metabolic Energy

Texts and References :

- Campbell, M.K. and S.O. Farrell, Biochemistry. 4th ed. Canada: Thomson Learning, Inc., 2003.
- Berg, J., J. Tymoczko and L. Stryer. Biochemistry. 5th ed. New York: W.H. Freeman and Co., 2002.
- Devlin, T.M., Textbook of Biochemistry with Clinical Correlations. 5th ed. New York: Wiley-Liss, 2002.
- Mathews, C.K., K.E. van Holde and K.G. Ahern. Biochemistry. 3rd ed. San Francisco: Addison Wesley Longman, Inc., 2000.
- Sylianco, C.L. and L. Sylianco-Wu. Modern Biochemistry. Quezon City: Aurum Technical Books, 1990.
- Voet, D., J.G. Voet and C. Pratt. Biochemistry. New York: John Wiley and Sons, 1999.

Course Name : **Pharmacognosy and Plant Chemistry (Pharm. Bio. Sci. 4)**

Course Description : The course deals with the study of the classification, physical and chemical properties, pharmacological and pharmaceutical uses of natural drugs (including Philippine medicinal plants). It also covers the biosynthesis, extraction, isolation, purification and

identification of drug constituents.

Course Objectives : At the end of the course, the students should be able to:

1. Understand the concepts and principles of Pharmacognosy and Plant Chemistry
2. Acquire knowledge and skills in classifying and evaluating natural drugs
3. Recognize the various plant constituents of importance in Pharmacy and Medicine
4. Understand the different biosynthetic pathways of plant constituents
5. Correlate the principles of biotechnology to the course
6. Perform activities applying the laboratory techniques for research/investigation of various medicinal plants
7. Appreciate the pharmacist's social and professional responsibilities to restore and maintain the health of men and animals
8. Uplift the moral and ethical standards expected of the Pharmacy profession

Number of Units : 5 units (3 units lecture, 2 units laboratory)

Number of contact hours : Lecture 3 hours/week; Laboratory 6 hours/week

Pre-requisites : Pharmaceutical Botany with Taxonomy, Organic Chemistry and Pharmaceutical Biochemistry

Course Outline :

I. Introduction
   1. Historical Background
   2. General Considerations
   3. Chemistry of Drugs
   4. Research and Development

II. Carbohydrates
   1. Biosynthesis of Carbohydrates
   2. Classification of Carbohydrates and Drugs Containing Carbohydrates
   3. Extraction and Purification
   4. Tests for Carbohydrates
   5. Sources and Uses of Carbohydrates

III. Glycosides
   1. Biosynthesis of Glycosides
   2. Classes of Glycosides
   3. Extraction and Purification
   4. Tests for Glycosides
   5. Sources and Uses of Glycosides

IV. Tannins
   1. Biosynthesis of Tannins
   2. Classes of Tannins
   3. Extraction and Purification

4. Tests for Tannins
5. Sources and Uses of Tannins

V. Lipids
1. Biosynthesis of Lipids
2. Classes of Lipids
3. Extraction and Purification
4. Tests for Lipids
5. Sources and Uses of Lipids

VI. Volatile Oils
1. Biosynthesis of Volatile oils
2. Classes of Volatile Oils
3. Extraction and Purification
4. Tests for Volatile Oils
5. Sources and Uses of Volatile oils

VII. Resins, Resinous Combinations And Latex
1. Biosynthesis of Resins and Resin Combinations
2. Classes of Resins and Resin Combinations
3. Extraction and Purification
4. Tests for Resins and Resin Combinations
5. Sources and Uses of Resinous Products and Latex

VIII. Alkaloids
1. Biosynthesis of Alkaloids
2. Classes of Alkaloids
3. Extraction and Purification
4. Tests for Alkaloids
5. Sources and Uses of Alkaloids

IX. Endocrine Products
1. Classes of Hormones
2. Regulation in the Production of Hormones
3. Sources and Uses of Hormones
4. Conditions, Symptoms and Treatment of
5. Biotechnology in Commercial Hormone Production
Production

X. Enzymes and Other Proteins
1. Classification and Nomenclature of Enzymes
2. Sources and Uses of Enzymes

XI. Vitamins and Vitamin – containing Drugs
1. Classes of Vitamins
2. Biosynthesis of Vitamins
3. Sources and Uses of Vitamins (including Minerals)

XII. Antibiotics
1. Classes of Antibiotics
2. Sources of Antibiotics

XIII. Biologics

1. Classes of Biologics
2. 0Sources and Uses of Biologics
3. Biotechnology in Production of Biologics

XIV. Herbs and Health Foods
1. Definition of Herbs and Health Foods
2. Safety and Efficacy Considerations

Laboratory Equipment : See Annex B (List of Laboratory Equipment, Facilities and Supplies)

Texts and References :
- Tyler, V.E., L. R. Brady and J.E. Roberts, Pharmacognosy 9th ed. Lea and Febiger, Philadelphia, 1988
- Cantoria, Magdalena C. Pharmacognosy in Action, National Research Council of the Philippines. Bicutan, Taguig, Metro Manila, 2003
- Guevara, Beatrice Q. ed., A Guidebook to Plant Screening: Phytochemical and Biological. Research Center for the Natural Sciences, UST, Manila. 2004
- Evans, William Charles. Pharmacognosy 15th ed., W.B. Saunders 2002
- Robbers, J. E., M. K. Speedie and V. E. Tyler, Pharmacognosy and Pharmacobiotechnology, Williams and Wilkins, 1996

Course Name : **Pharmaceutical Microbiology and Parasitology (Pharm. Bio. Sci. 5)**

Course Description : The course deals with microorganisms, particularly those pathogenic to man, and the parasitic helminthes of man – their biology, the infections they cause, host response to these infections, and their mode of transmission, prevention and treatment.
The course provides laboratory experience in studying microorganisms and parasitic helminthes, and in utilizing aseptic techniques for microbial control. It also discusses microbiological aspects of the pharmaceutical industry. Special attention is given to :sterilization and disinfection, antibiotics and chemotherapeutic agents.

Course Objectives : At the end of the course, the students should be able to:
1. Differentiate the various groups of microorganisms identify the events and people involved in the development of microbiology; describe the basic laboratory equipment and procedures in the study

of microorganisms, and discuss the biology of microorganisms.

2. Appreciate the importance of microorganisms in research study.
3. Understand the importance of aseptic techniques both in laboratory and hospital set-up.
4. Be updated on the Microbial Current Good Manufacturing Practice (CGMP) guidelines in controlling microbial contamination during drug manufacture.
5. Explain the techniques for the control of pathogenic microorganisms and the use of antimicrobial agent in therapy.
6. Define infection and infectious diseases; characterize nonspecific and specific devices the human body uses in response to the invasion of disease organisms; and explain the application of the principles of immunology toward the elimination of disease.
7. Assess the significant roles of microorganisms, including viruses in the development of diseases and their preventive and therapeutic measures.
8. Evaluate the roles of microorganisms in food production and preservation.

Discuss the major diseases of man caused by pathogenic microorganisms and parasitic helminthes, their epidemiology, control, immunology and treatment.

Number of Units : 5 units (3 units lecture / 2 units laboratory)

Number of contact hours : Lecture (3 hours per week); Laboratory (6 hours per week)

Pre-requisites : Human Anatomy and Physiology with Pathophysiology; Pharmaceutical Biochemistry

Course Outline :

I. Fundamentals of Microbiology
   A. Introduction to Microbiology
   B. Basic Met0hods of Studying Microorganisms
      1. Examination of Morphological Characteristics
      2. Examination of Cultural Characteristics
      3. Evaluation of Biochemical Characteristics

III. Control of Microbial Growth

IV. Principles and Updates on Microbial Control

V. Host-Parasite Relationship

VI. Antimicrobial Drugs

VII. Microorganisms of Human Diseases

VIII. Parasitology

A. Introduction
B. Nomenclature and Classification of Parasites
   1. Phylum Protozoa
   2. Phylum Nematoda
   3. Phylum Platyhelminthes
      3.1. Class Cestoda
      3.2. Class Trematoda

Laboratory Equipment : See Annex B (List of Laboratory Equipment, Facilities and Supplies)

Texts and References :
- Tortora, Funkie. Microbiology, 8th Ed. 2003
- Forbes, Betty, etal. Bsiley and Scott's Diagnostic Microbiology, 11th ed., 2002
- Jawetz, E., etal, Medical Microbiology, 22th Ed., 2001
- Mims, Cedric, etal, Medical Microbiology, 2nd ed., 1993
- Roberts, Janovy. Foundation of Parasitology, 2000
- Wistreich, George. Microbiology Perspectives. New Jersey: Prentice Hall Inc., 1999

Course Name : **Pharmacology I**
(Pharm. Bio. Sci. 6)

Course Description : The course deals with the study of drugs and their biochemical and physiological effects, mechanisms of action, pharmacokinetic properties, therapeutic uses, adverse reactions, toxicological effects, and interactions.

Course Number Pharmacology I

Course Objectives : At the end of the course, the students should be able to:
1. Classify drugs according to their therapeutic and biochemical categories
2. Describe the pharmacodynamic, pharmacokinetic, and toxicological properties of drugs used in various disease conditions
3. Integrate knowledge on the pharmacodynamic, pharmacokinetic, and toxicological properties of drugs as they relate to the pathophysiology of the disease conditions for which the drugs are used
4. Discuss the rational use of drugs in the management of specific diseases according current therapeutic practice guidelines, recommendations and clinical trials
5. Provide updates on current trends and researches

on drugs and their therapeutic applications

Number of Units : 4 units (4 units lecture)

Number of contact hours : 4 hours lecture/week

Pre-requisites : Human Anatomy, Physiology & Pathophysiology, Pharmaceutical Chemistry Medicinals 1 & 2 Chemistry, Microbiology and Parasitology (co-requisite)

Course Outline :

I. General Principles of Pharmacology
- A. Introduction
- B. Review of Pharmacokinetic Principles
- C. Pharmacodynamic Principles
  1. Molecular mechanisms of drug action
  2. Dose-Response relationships
  3. Concepts of agonism, antagonism, allosteric modulation
  4. Pharmacotherapeutic Principles

II. Autacoid Pharmacology
- A. Histamine
- B. 5-Hydroxytryptamine
- C. Prostaglandins and Eicosanoids
- D. Kinin-Kallikrein sytem

III. Pharmacology of the Autonomic Nervous System Drugs
- A. Physiology of the Autonomic Nervous System
- B. Drugs Acting at the ANS

III. Pharmacology of CNS drugs and drugs for pain management
- A. Psychotropic Drugs
  1. Psychosis and the Antipsychotic agents
  2. Mood disorders and the anti-depressants and mood stabilizers
  3. Anxiety disorders, Anti-anxiety agents, sedative-hypnotics
- B. Parkinsonism and its treatment
  1. Biochemical imbalance in parkinsonism
  2. Dopaminergic agents
  3. Anticholinergic agents
  4. Enzyme inhibitors: MAO and COMT
- C. Drugs for seizure disorders
- D. Skeletal muscle relaxants
- E. General and local anesthetics
- F. Analgesics related agents
  1. Non-narcotic
  2. Narcotic analgesics

G. Ethanol and other drugs of abuse

Texts and References :

- Katzung, Bertram G. Basic and Clinical Pharmacology, 10th Ed. Norwalk , Connecticut/San Mateo, California. Appleton and Lange, 2003
- Goodman, Louis and Alfred Gillman. The Pharmacological Basis of Therapeutics, 9th edition, NY: Macmillan Publishing Co., Inc., 1996
- Page, Clive. Integrated Pharmacology, 2nd edition, California: Mosby, 2002
- Grundy HF. Lecture Notes in Pharmacology. Singapore/Hong Kong/ New Delhi: PG Publishing PTC. Ltd 1985
- Grajeda-Higley L. Understanding Pharmacology: A Physiologic Approach. 2000
- Shargel, Leon and Andrew B.C. Yu Applied Biopharmaceutics and Pharmacokinetics, 3rd edition. Appleton and Lange, 1994
- Hitner, Henry and Barbara T. Nagle. Basic Pharmacology for Health Professions, 2nd edition. Bennet and McKnight Division: Glencoe Publishing Company.
- MacDermott, Barbara L. Understanding Basic Pharmacology: Practical Approaches for Effective Application FA Davis Company: Philadelphia, 1994
- Edmunds, Marilyn W. Introduction to Clinical Pharmacology, 2nd edition, Mosby 1995

Course Name : **Pharmacology 2 and Therapeutics (Pharm. Bio. Sci. 7)**

Course Description : This course, a continuation of Pharmacology I, deals with the pharmacodynamic, pharmacokinetic, toxicological and therapeutic properties of drugs used in the management of cardiovascular, respiratory, gastrointestinal, renal, endocrine, metabolic, coagulative, CNS, immunologic, oncologic, and infectious conditions.

Course Objectives : At the end of the course, the students should be able to:

a. Describe the pharmacodynamic, pharmacokinetic, and toxicological properties of drugs used in various disease conditions
b. Integrate knowledge on the pharmacodynamic

and pharmacokinetic properties of drugs as they relate to the pathophysiology of the disease conditions for which the drugs are used

c. Discuss rational use of drugs in the management of specific disease conditions

d. Design procedures to test pharmacologic and physiologic activities of common drug classes using animal models

Number of Units : 4 units (3 units lecture, 1 unit laboratory

Number of contact hours : 3 hours lecture and 3 hours laboratory per week

Pre-requisites : Pharmacology I

Course Outline :

I. Diuretics and Cardiovascular Drugs
   A. Diuretics and Drugs for the treatment of Hypertension
   B. Mechanisms of drugs used in the management of angina pectoris and other ischemic heart conditions
   C. Pharmacologic approach to heart failure
   D. Cardiac rhythm and drugs used for arrhythmia
   E. Miscellaneous agents: adenosine, magnesium

II. Respiratory Drugs:
   A. Drugs used for bronchial asthma and COPD
   B. Cough and mucus production: Expectorants, Antitussives

III. Gastrointestinal Drugs:
   A. Pharmacotherapy of Acid Peptic Disorders
   B. Drugs affecting gastrointestinal motility and secretion

IV. Hormonal Agents
   A. Hypothalamic and Pituitary Hormones and Antagonists
      1. Physiology of hypothalamic-pituitary control of target organ hormone secretion
      2. Specific hypothalamic and pituitary hormones and antagonists
      3. Gonadal hormones and other reproductive drugs
      4. Pharmacotherapy of thyroid disorders
      5. Adrenocortical hormones
      6. Insulin and drugs for diabetes mellitus

V. Drugs for Metabolic and Coagulative Disorders:

Hyperlipidemia, Osteoporosis, Thrombsis, Bleeding
A. Drugs for Hyperlipidemia
B. Drugs for Coagulative Disorders: Anti-Thrombotics, Procoagulants
C. Vitamin D and Bisphosphonates
(Addendum: Drugs for hematologic disorders- hematinics, erythropoietin, G-CSF, Folic-cyanocobalamin)

VI. Drugs that Modify Immune Function: Allergy, Rheumatoid Arthritis and Vasculitides, Nephritic Syndrome, Immunosuppression Therapy
A. DMARDs
B. Immunosuppressive Agents: Glucocorticosteroids, Cyclosporine, Mycphenolate, Interferon, Cytotoxic Agents
C. Immunomodulating Agents

VII. Chemotherapeutic Agents: Microbial and Parasitic Infections, Cancer
A. Antibacterial: Beta-Lactams, Macrolides, Tetracyclines, Chloramphenicol, Lincosamides, Aminoglycosides, Quinolones, Sulfonamides, Antimycobacterials
B. Antifungal
C. Antiviral
D. Antiprotozoals
E. Anthelminthics
F. Cancer Chemotherapeutic Agents

VIII. Autacoid Pharmacology

Laboratory Equipment : See Annex B (List of Laboratory Equipment, Facilities and Supplies)

Texts and References :
- Katzung, B.G., Basic and Clinical Pharmacology.
- Mardman, J.G. and Limbird, L.E., Goodman and Gilman's The Pharmacological Basis of Therapeutics.

Course Name : **General Principles of Health Care (Pharm Care 1)**

Course Description : The course deals with the holistic approach in the promotion of health. It includes discussions on the human life cycle, health problem identification, health care strategies, essential health intervention, and health sectors that support health-related issues and policies.

Course Objectives : At the end of the course, the students should be able to:

1. Understand the dynamics of health in the context of different interacting dimensions leading to total health;
2. Categorize the human life cycle and determine variances among the stages in physical, physiological and psycho-social development;
3. Identify the sources of arising health problems and to describe basic assessment tools in providing patient care;
4. Illustrate optimal health through general disease management, health strategies and intervention; and
5. Introduce different health-support sectors in private and public practice, including different professions responsible in providing health care in the community.

Number of Units : 3 units

Number of contact hours : 3 hours lecture per week

Pre-requisites : None

Course Outline :

Unit I. Health Care Process
- A. Definition
- B. Principles

Unit II. Dimensions of Health
- A. Physical Health
- B. Emotional Health
- C. Intellectual Health
- D. Spiritual Health
- E. Social Health
- F. Occupational Health

Unit III. Stages and Needs of Human Life
- A. Infants
- B. Children
- C. Adolescents
- D. Adult
- E. Elderly

Unit IV. Wellness and Illness
- A. Maslow's Hierarchy of Needs
- B. Health Status Indicator
- C. Causes of Illness
- D. Introduction to Assessment
  1. Vital Signs
  2. Diagnostic / Screening Tests

Unit V. Health Care Strategies

A. Preventive
B. Promotive
C. Curative
D. Rehabilitative

Unit VI. Health Intervention
A. First Aid
B. Nutrition and Diet
C. Pharmacotherapy
D. Traditional Medicine
E. Alternative or Complementary Medicine

Unit VII. Health Sectors
A. Government Agencies / Institutions
B. Non-Government Organizations
C. Inter-Disciplinary Health Management Teams

Texts and References :

- Edge, Raymond S., and Groves, John Randall, Ethics of Health Care: A guide for Clinical Practice, 2nd ed., Delmar Publishers, 1999
- Getzen, Thomas E., Health Economics:Fundamentals and Flow of Funds, USA: John Wiley & Sons, Inc., 1997
- Shortell, Stephen M. and Kaluzny, Arnold A., Essentials of Health Care Management, Delmar Publishers, 1997

Course Name : **Public Health**
(Pharm Care 2)

Course Description : This course will introduce the students to community health which includes both the private and public (government) efforts of individuals, groups, and organizations to promote, protect and preserve the health of those in the community.

Course Objectives : at the end of the course, the students should be able to:

1. Describe health promotion and disease prevention methods;
2. Identify and describe the structure and function of government and non-government health organization in the international, national and local levels;
3. Understand infectious diseases and its impact on the community;
4. Explain the relationship of environment to health; and
5. Correlate health to sustainable national development.

Number of Units : 3 units

Number of contact hours : 3 hours lecture per week

Pre-requisites : Microbiology and Parasitology, Pharmaceutical Care I

Course Outline :

Unit I – Public Health Concepts
- A. Definition of Terms
- B. Public Health Concepts

Unit 2 – Factors that Affect Health
- A. Individual
  - 1. Host–defense Mechanisms
- B. Community
  - 1. Environmental Pollution
    - a. Water
    - b. Air
    - c. Soil
  - 2. Environmental Sanitation
    - a. Water Sanitation
    - b. Housing Sanitation
    - c. Food and Milk Sanitation
    - d. Control of Air Pollution
    - e. Insect and Rodent Control
    - f. Sewage Disposal

Unit 3 – Etiology of Diseases
- A. Factors of Disease Causation
- B. The Natural History of Disease
- C. Ecologic Concept of Disease
- D. Agents of Infectious Disease
- E. Sources of Infection and Disease in a community
- F. Means of Transmission
- G. Measures of Disease Outbreaks
- H. Epidemiologic Methods
- I. Investigation of Epidemics

Unit 4 - Disease Prevention and Control
- A. Techniques
- B. Levels Of Prevention

Unit 5 – Health Promotion in Industry
- C. Objectives of Occupational Health
- D. Legal Control of Occupational Health Services

Unit 6 – Government and Non-government Health Programs and Services
- A. Local
- B. National
- C. International

Unit 7 – Infectious Diseases in the Philippines

A. Water / Food borne Diseases
   1. Typhoid fever
   2. Hepatitis A
   3. Cholera
   4. Amebic dysentery
   5. E.coli diarrheal illness
   6. Bacillary dysentery
B. Sexually Transmitted Diseases
   1. Syphilis
   2. AIDS
   3. Non-gonococcal urethritis
   4. Herpes Simplex genitalia
   5. Gonorrhea
   6. Hepatitis B
C. Airborne Diseases/Droplet
   1. Pulmonary tuberculosis
   2. Chickenpox
   3. Measles
   4. SARS
   5. Pneumonia
   6. Diphtheria
   7. Mumps
E. Vector Borne Disease
   1. Dengue fever
   2. Malaria
F. Zoonotic
   1. Rabies
   2. Anthrax
   3. Foot and Mouth disease
   4. Birds flu
   5. Mad Cow Disease
G. Others
   1. Leprosy

Laboratory Equipment : See Annex B – List of Laboratory Equipment, Facilities and Supplies

Texts and References :

- Brooks, Geo F., Butch, Janet and Stephen Morse. Jawetz Medical Microbiology, 22nd ed., Connecticut USA: Prentice Hall Inc., 2001
- Ciabal, Laura Evelyn P. Introduction to Public Health Issues. 1st ed. Manila: Educational Publishing House, 1999
- Conte, John E. Manual of Antibiotics and Infectious Diseases (Treatment and Prevention). 1st ed. Massachusetts, USA: Allyn and Bacon Viacom Company, 1999.

Course Name	:	**Interpersonal Communications Skills for Pharmacists (Pharm Care 3)**
Course Description	:	This course deals with the study of basic concepts of interpersonal relationships and effective communication. It covers a variety of areas of learning interpersonal communications and acquiring skills needed by pharmacists to meet the responsibilities of a patient-centered pharmaceutical care services.
Course Objectives	:	At the end of the course, the students should be able to: 1. Explain the various assumptions, basic concepts, theoretical perspectives and contemporary issues surrounding the professional pharmacists-client relationships; 2. Discuss the communication process; 3. Demonstrate effective listening, writing and speaking skills with special attention to the application of these to patient interaction and relationships with other health care professionals; 4. Define and describe characteristics of therapeutic communication; 5. Identify the purposes of therapeutic communication; 6. Demonstrate the ability to establish patient relationships that create true "partnerships" with patients in helping them reach their therapeutic goals; and 7. Apply assertiveness skills needed when pharmacists take an active role in patient care.
Number of Units	:	3 units
Number of contact hours	:	3 hours lecture per week
Pre-requisites	:	English 1 & 2 ; General Psychology ; Philosophy of Man
Course Outline	:	Unit I - Basic Concepts / Theoretical Perspectives and Contemporary Issues Surrounding the Professional Pharmacists-Client Relationship 1. Maslow's Hierarchy of Needs 2. Sigmund Freud's Transference / Counter-Transference of Feelings / Stages of

Personality Development
3. Carl Jung ; Gender Traits
4. Different Models of Therapeutic Relationships

Unit II - The I-model of Interpersonal Relationships
- A. Interaction
- B. Inquiry
- C. Directive Influence
- D. Strategic Influence

Unit III - Basic Assumptions on Communication / Communication Process
- A. Principles and Elements of Interpersonal Communication
- B. Communication Styles: Meta Communication; Verbal Communication / Non Verbal Communication
- C. Conditions for Effective Communications in Pharmacy
- D. Communication Barriers
- E. Improving Communication Behavior

Unit IV - Developing Therapeutic Communication Skills in Pharmacists-Client Relationship
- a. Purpose of Therapeutic Communications
- b. Active Listening Techniques
- c. Applications:
  - Assessment Strategies: Building Rapport, Observation
  - Asking Questions: Open-ended, Close-ended, Circular Questions, Follow-up Questions
  - What the Pharmacist Listens for: Communication Pattern, Intuitive Communication
  - Therapeutic Listening Responses
  - Verbal Responses

Unit V - Practical Skills for Pharmacists
- a. Assertiveness, Theoretical Foundations and Techniques
- b. Communicating to Special Patients
- c. Communicating with Children and Elderly About Medications

Texts and References :

- Arnold, Elizabeth and Boggs, Kathleen Undermann, Interpersonal Relationships, Professional Communication Skills for Nurses. St. Louis, Missouri: Saunders, 1999.

- Longe, Leon and Calvert, Jon C., Physical Assessment: A Guide for Evaluating Drug Therapy. Philadelphia: Lippincott William & Wilkins, 1999.
- Sigband, Norman, Effective Communication for Pharmacists and Other Health Professionals. California: Counterpoint Publication, 1995.
- Tindall et al., Communication Skills in Pharmacy Practice. 4th Edition. Philadelphia: Lippincott William & Wilkins, 2003.
- Veatch, Robert and Haddadd, Amy, Case Studies in Pharmacy Ethics. New York: Oxford University Press, 1999.

Course Name : **Dispensing and Medication Counseling (Pharm.Care 4)**

Course Description : This course deals with the basic concepts of dispensing, dispensing techniques and the ethical policies that govern this important facet of the professional practice of pharmacy. It also deals with the study of theoretical perspectives and contemporary issues relevant to social and behavioral aspects concerning therapeutic medication counseling. Furthermore, this course provides opportunities for experiential learning of the techniques and skills of patient medication counseling roles of pharmacists.

Course Objectives : At the end of the course, the students should be able to:

1. Discuss relevant concepts/principles of social and behavioral sciences and how these concepts apply to practice of pharmacy, specifically dispensing and patient counseling;
2. Demonstrate the ability to follow good dispensing practices;
3. Read and recognize correctness/validity of prescriptions as mandated by the Generics Law;
4. Demonstrate adept manipulative skills when using dispensing equipment and correct dispensing procedures
5. Demonstrate a systematic work behavior and positive attitude;
6. Discuss basic principles of patient medication counseling;
7. Demonstrate proper attitude and skills when

conducting patient medication counseling; and

8. Relate/translate theory to real life patient medication situations and dispensing practices.

Number of Units : 3 units (2 units lecture, 1 unit laboratory)

Number of contact hours : 2 hours lecture and 3 hours laboratory per week0

Pre-requisites : Pharm Care 3

Course Outline : Unit I – Introduction: Theoretical Perspectives and Contemporary issues on Dispensing and Patient Medication Counseling

A. Recent Developments in Services Being Provided by Pharmacists
   - Contribution of Pharmacy to Today's Health Care Provision
   - Health Promotion and Health Education, A Review of Pharmacist's Roles

B. Social and Behavioral Aspects of Pharmacy
   - Relationship Between Social Inequalities and Health
   - Personality, Motivation, Empowerment and Compliance
   - Illness, Stress and Coping Mechanisms
   - The Cycle of Change, How to Bring it About in Pharmacy Services

C. Pharmaceutical and Medical Interface
   - The Medical and Pharmaceutical Professions
   - The Primary Health Team
   - Inter-professional Relations within the Health Team

D. Critical Thinking, Characteristics of Critical Thinker

Unit II – Dispensing

A. Dispensing Concepts and Laws Governing Dispensing in the Philippines
   - The Prescription
   - Generic Dispensing Requirements as Provided for by the Generics Law

B. Dispensing Techniques
   - Processing of Prescriptions
   - Dispensing Different Drug Delivery Systems

C. Principles of Quality Assurance

Unit III – Patient Counseling

A. Basic Concepts / Principles in Therapeutic Counseling
   - Understanding the Counseling Perspective
   - The Pharmacy-Client Therapeutic Relationship
   - Bridges and Barriers in the Therapeutic Relationship
   - Defining Patient Counseling
   - Understanding Patient's Needs, Wishes and Preferences

B. Medication Counseling Basics
   - Preparing for the Counseling Encounter
   - The Counseling Process
   - Nonprescription Drug Counseling

C. Educational Methods and Counseling Aids
   - Educational Methods
   - Stages of Learning
   - Counseling Aids
   - Developing an Individual Patient Education Program
   - Evaluation of Patient Education Materials

D. Communication Skills in Patient Counseling
   - Communication as a Counseling Challenge
   - Transactional Analysis Theory
   - Counseling Skills

E. Tailoring Counseling
   - Factors to be Considered in Tailored Counseling
   - Tailoring Counseling to Overcome Difficulties
   - Social (Preventive Healthcare) Counseling Developing

F. Optimal Counseling Involvement
   - Barriers to Effective Patient Counseling
   - The 4As for Effective and Efficient Patient Counseling
   - Self-Development of the Counseling Pharmacist

Equipment : Simulated Counseling Area

Texts and References :

- Barber, Nick and Wilson, Alan, eds. Clinical Pharmacy Survival Guide. London: Churchill Livingstone, 1999.
- Boh, Larry E., ed. Pharmacy Practice Manual: A Guide to the Clinical Experience. Philadelphia: Lippincott William & Wilkins, 2001.
- Ciprole, Robert et al., Pharmaceutical Care Practice. Singapore: McGraw-Hill, 1998.
- Longe, Leon and Calvert, Jon C., Physical Assessment: A Guide for Evaluating Drug Therapy. Philadelphia: Lippincott William & Wilkins, 1999.
- Rantucci, Melanie, Pharmacists Talking with Patients: A Guide to Patient Counseling. Philadelphia: Lippincott William & Wilkins, 1997.
- Schwinghammer, Terry L., ed., Pharmacotherapy casebook. New York: McGraw-Hill, 2002.
- Winfields, A.J. R.M.E. Richards, Pharmaceutical Practice. London: Churchill Livingstone, 1998.

Course Name : **Clinical Pharmacy**
(Pharm Care 5)

Course Description : This course defines the role of pharmacists in drug therapy, which includes P-R-I-M-E, C-O-R-E, and F-A-R-M.

Course Objectives : At the end of the course, the students should be able to:

1. Provide knowledge and develop basic skills necessary to contribute to the identification, evaluation and solution of drug therapy problems in practice;
2. Develop the skill in the critical appraisal of information in the solution of drug therapy problems in practice;
3. Expose students to situations that will require their participation in the patient care process;
4. Provide experience in integrating and applying pharmaceutical, biomedical and clinical knowledge to patient care; and
5. Apply interpersonal skills relevant to clinical

pharmacy practice.

Number of Units : 4 units (3 units lecture, and 1 unit laboratory)

Number of contact hours : 3 hours lecture and 3 hours laboratory per week

Pre-requisites : Hospital Pharmacy, and Pharmaceutical Care 4

Course Outline :

I. Introduction and Overview of the Course
   A. Definition and scope of clinical pharmacy
   B. Brief history and present status of clinical pharmacy

II. Concepts in Clinical Pharmacy
   A. Evidence-based Medicine and Therapeutic Guidelines
   B. Complementary and Alternative Interventions
   C. Physical Assessment Skills and Interpretation of Laboratory and Diagnostic Test Results
   D. Therapeutic Planning and Patient Counseling
   E. Monitoring of Drug Therapy and Utilization
   F. Monitoring and Reporting of Adverse Drug Reactions and Drug Interactions
   G. Drug Use Review
   H. Monitoring and Reporting of Medication Errors, and Pharmacovigilance
   I. Dose Adjustment
   J. Pharmacoeconomic Considerations Nutrition

III. Disease Orientation and Management
   A. Definition
   B. Classification
   C. Etiology
   D. Clinical Features
   E. Treatment and Monitoring

Laboratory Equipment : Case Studies

Texts and References :

- Tietze, Karen J. Clinical Skills for Pharmacists. St. Louis, Missouri, USA: Mosby-Year Book, Inc., 1997
- Chernecky, Cynthia C. Laboratory Tests and Diagnostic Procedures. 3rd ed. Pennsylvania: W.BN. Saunders Company, 2001.
- Gennaro, Alfonso R. ed. Remington: The Science and Prcatice of Pharmacy. 20th ed. 2000. Reprint Copyaright Taiwan.
- Herfindal, Eric T. and Dick R. Gouley. Textbook of Therapeutics: Drug and Disease Management, 7th ed. Baltimore,USA: Lippincott Williams and Wilkins, 2000.

➢ Malone, Patrick M. et.al. Drug Information: A guide for Pharmacists, Appleton and Lange, 1996.

Course Name	**Drug Delivery Systems (Pharmaceutics 1)**
Course Description	: This course deals with the basic pharmaceutic principles and technologies applied in the preparation of pharmaceutical dosage forms and drug delivery system.
Course Objectives	: At the end of the course, the students should be able to: 1. Acquire and apply the knowledge and skills pertinent to the basic principles, processes, methods, and techniques to the different dosage forms that have been developed and standardized for use in modern health care; 2. Appreciate the social and professional responsibilities of pharmacists in restoring and maintaining the high moral and ethical standards required in the preparation of different pharmaceutical dosage forms and drug delivery systems.
Number of Units	: 5 units (3 units lecture; 2 units laboratory)
Number of contact hours	: 3 hours lecture, 6 hours laboratory per week
Pre-requisites	: Pharmaceutical Calculations (Pharmacy 2)
Course Outline	: I – Principles of Dosage Form Design and Development II - Classifications of Pharmaceutical Preparations A. Solid Dosage Forms and Modified-Release Drug Delivery Systems B. Semi-solid Dosage Forms, Pharmaceutical Inserts and Transdermal Systems C. Liquid Dosage Form D. Sterile Dosage Forms and Delivery Systems E. Novel and Advanced Dosage Forms
Laboratory Equipment	: See Annex B (List of Laboratory Equipment, Facilities and Supplies)
Texts and References	: ➢ Ansel, Honald. Pharmaceutical Form and Drug Delivery System. 7th EditionUnited States Pharmacopeia 25/ National Formulary 20 ➢ Genaro, Alfonso. Remington's Pharmaceutical

Sciences. Latest Edition
- Merck Index, Latest Edition

Websites

Course Name : **Manufacturing Pharmacy (Pharmaceutics 2)**

Course Description : This course presents the basic principles, methods and technology involved in the production of various drug dosage forms and delivery systems, from the initial design of the dosage forms to their actual manufacture, including the requirements for packaging, equipment and facilities.

Course Objectives : At the end of the course, the students should be able to:

1. Enumerate and discuss the requirements for facilities, equipment, methods and processes, organization and personnel as specified in the Current Good Manufacturing Practices (CGMPs);
2. Outline the different pharmaceutical unit operations;
3. Describe the principles and technology involved in the design, formulation, manufacture and packaging of the various drug dosage forms and delivery systems;

Discuss how adjuvant ingredients, technological procedures, and material physical and chemical properties affect the formulation, design and production of the various drug dosage forms.

Number of Units : 5 units (3 units lecture/ 2 units laboratory)

Number of contact hours : 3 hours lecture, 6 hours laboratory per week

Pre-requisites : Pharmaceutics I and Physical Pharmacy

Course Outline : A. Organizational structure of a pharmaceutical company

B. Current Good Manufacturing Practices (CGMPs)

C. Preformulation Process

General pharmaceutical plant design and construction, room classification based on air particle density, environmental control (humidity, temperature and air-conditioning), and industrial hazards and safety.

Material handling systems for solids, liquids and gas

C. Pharmaceutical unit operations and equipment: milling, granulation and size separation; mixing; filtration; drying

D. Facilities, materials, methods and technology in the

design, formulation and production of various dosage forms:

a. Solid dosage forms:

b. Non-sterile liquid dosage forms:

c. Semi-solid dosage forms and other topical products:

E. Cosmetics

Laboratory Equipment : See Annex B (List of Laboratory Equipment, Facilities and Supplies)

Texts and References :
- Ansel, L. Allen Jr., N. Popovich. Pharmaceutical Dosage Forms and Drug Delivery Systems
- WHO's Good Manufacturing Practice and Inspection
- Wade and P.J. Walker. Handbook of Pharmaceutical Excipients
- Genaro. Remington: the Science and Practice of Pharmacy. Latest Edition.
- S. Turco. Sterile Dosage Form. 4th Edition
- Lachman, et.al. The Theory and Practice of Industrial Pharmacy. 3rd Edition.
- G.S. Banker and C.T. Rhodes. Modern Pharmaceutics. 4th Edition.

Course Name : **Chemistry and Pharmacy of Medicinals I (Pharm Chem. I)**

Course Description : The course covers the chemistry and pharmacy of inorganic and organic medicinals, with emphasis on those official in the USP and NF, their preparations, properties, tests and uses. It includes the concepts and chemical reactions related to qualitative analysis of inorganic compounds. This also includes the study of structure and physico-chemical properties in relation to biological activity, preparation and/or synthesis, uses and doses of organic medicinals.

Course Objectives : At the end of the course, the students should be able to:
1. Apply the knowledge, skills, principles of inorganic chemistry to medicinal and pharmaceutical chemistry.
2. Discuss the official inorganic substances used as therapeutic and diagnostic agents.
3. Manifest an appreciation of the pharmacist's social and professional responsibilities in maintaining or restoring the health of men and animals.

4. Correlate the structure of the drug with its absorption, biological activity and metabolism.
5. Understand the high moral and ethical standards of the pharmacy profession.

Number of Units : 5 units credit (3 units lecture, 2 units laboratory)

Number of contact hours : (3 hours lecture, 6 hours lab / week)

Pre-requisites : Chemistry 1 (General & Inorganic Chemistry)
Pharmacy 1 (Introduction to Pharmacy)

Course Outline : Unit I. Kinetics and Chemical Equilibrium
Unit II. Group Properties of Elements (including qualitative tests for ions)
Unit III. Pharmaceutical Aids and Necessities
Unit IV. Major Intra and Extra-Cellular Electrolytes
Unit V. Essential, Non-essential and Trace Ion
Unit VI. Gastrointestinal Agents
Unit VII. Topical Agents
Unit VIII. Dental Products
Unit IX. Miscellaneous Pharmaceutical Agents
Unit X. Inorganic Pharmaceutical Excipients
Unit XI. Radiopharmaceuticals and Contrast Media
Unit XII Introduction to Organic Pharmaceutical Chemistry

Unit XIII Physicochemical properties in relation to biological action

Laboratory Equipment : See Annex B (List of Laboratory Equipment, Facilities and Supplies)

Texts and References :

- Block, John H. et.al., Inorganic Medicinal and Pharmaceutical Chemistry, 1974, Philadelphia, Lea and Febiger, ix, 472 p.
- Cotton, Frank Albert, et.al., Basic Inorganic Chemistry, 3rd ed., 1995, New York, John Wiley and Sons, xii, 838 p.
- Discher, Clarence A., Modern Inorganic Pharmaceutical Chemistry, 2nd ed., 1985, Waveland, Prospect Heights, 631 p.
- Gennaro, Alfonso R. ed., Remington's Pharmaceutical Sciences, 20th ed., 2000, Pennsylvania, Mack Publishing Company, xvi,

2000 p.
- Gould, Edwin S., Inorganic Reactions and Structure, 1995, New York, Henry Holt and Company, 470 p.
- Halperin, Jerome A., et.al., United States Pharmacopoeia and National Formulary, 24th rev and ed., 1995, Maryland, United States Pharmacopoeial Convention Inc., Lix, 2391 p.
- Katakis, Dimitris, Gilbert Gordon, Mechanisms of Inorganic Reactions, 1987, New York, John Wiley and Sons, xxiii, 384 p.
- Perry, Dale L., Sidney, L., Phillips, ed., Handbook of Inorganic Compounds, 1995, Florida, CRC Press, Inc., lv.
- Solne, Taito O., Charles O. Wilson, Roger's Inorganic Pharmaceutical Chemistry, 8th ed., 1967, Philadelphia, Lea and Febiger, x, 704 p.

Course Name : **Chemistry and Pharmacy of Medicinals II (Pharm Chem. 2)**

Course Description : This is a continuation of Medicinals I which emphasizes on the study of structure, physicochemical properties in relation to biological activity, preparation and/or synthesis, uses and doses of organic medicinals.

Course Objectives : At the end of the course, the students should be able to:
1. Discuss the metabolic pathway and point out
2.
3.

the importance of the process in drug research and development
2. Understand that a molecular modification in structure could result in a change in the biological activity and pharmacokinetic profile of the drug.
3. Understand the high moral and ethical standards of the pharmacy profession

Number of Units : 4 units (3 unite lecture, 1 unit laboratory)

Number of contact hours : 3 hours lecture, 3 hours lab/week

Pre-requisites : Pharmaceutical Biochemistry

Course Outline : Unit I. Metabolic Changes of Drugs and related Organic Compounds
1. General pathways of drug metabolism
2. Sites of drug biotransformation

3. Factors affecting drug metabolism

Unit II. Chemistry and Pharmacy of Organic Medicinals

Organic medicinals to be discussed according to the ff.

Aspects:

1. Definition
2. Classification
3. Structure-Activity Relationship
4. Preparation and Uses of the ff:
   a. Sulfonamides
   b. Antimalarials
   c. Antibiotics
   d. Antineoplastics
   e. CNS Depressants
   f. CNS Stimulants
   g. Adrenergic agents
   h. Cholinergic Drugs and related agents
   i. Diuretics
   j. Cardiovascular agents
   k. Local Anesthetics
   l. Antihistaminic agents
   m. Analgesic agents
   n. Steroids and Therapeutically-related compounds
   o. Carbohydrates
   p. Amino acids, proteins, enzymes and peptide hormones
   q. Vitamins and related compounds
   r. Miscellaneous organic medicinals

Laboratory Equipment : See Annex B (List of Laboratory Equipment, Facilities and Supplies)

Texts and References :

- Burger, Alfred, etal, Vol.I, Principles and Practice [in Burger's Medicinal Chemistry and Drug Discovery, Manfred E. Wolff, ed.], 1995, New York, John Wiley and Sons, Inc., xi, 1064 p.
- Burger, Alfred, Medicinal Chemistry, 3rd ed., 1970, New York, Wiley-Interscience, xix, 1712, 4183 p.
- Burley, Denis, Joan Clarke and Louis Lasagna, Pharmaceutical Medicine, 2nd ed., 1993, London, Edward Arnold, 361 p.
- Doerge, Robert (Ed.), Wilson and Gisvolds' Textbook of Organic Medicinal and Pharmaceutical Chemistry, 8th ed., 1982,

Philadelphia, Lippincott Co., 1053 p.
- Foye, William O., Principles of Medicinal Chemistry, 3rd ed., 1989, Philadelphia, Lea and Febiger, 925 p.
- Kennewell, Peter and John Taylor, Modern Medicinal Chemistry, 1993, New York, Ellis Hornwood, 290 p.
- Roberts, Stanley and Barry Price, Medicinal Chemistry: The Role of Organic Chemistry in Drug Research, 1985, London, academic Press, xix, 296 p.
- Wolff, Manfred E. and Alfred Burger, Burger's Medicinal Chemistry and Drug Discovery, 5th ed., 1995, New York, Wiley and Sons, 1354 p.
- Gennaro, Alfonso R. (Ed.), Remington's Pharmaceutical Sciences, 20th ed., 2000, Pennsylvania, Mack Publishing Company, xvi, 2000 p.

Course Name : **Quality Control I-Drug Testing and Assay (Pharm. Chem. 3)**

Course Description : This course deals with the important theories, principles, techniques and applications of various quantitative pharmaceutical analyses, as applied in the quality control of raw materials and drug products.

Course Objectives : At the end of the course, the students should be able to:
1. Apply the principles of quantitative analytical chemistry in the analysis of raw materials and drug products.
2. Perform basic calculations related to pharmaceutical quantitative analysis.
3. Interpret the results of analysis as to conformance to standards and specifications.
4. Manifest the values of accuracy, honesty and integrity.

Number of Units : 5 units (3 units lecture, 2 units laboratory)

Number of contact hours : 3 hours lecture and 6 hours laboratory

Pre-requisites : Pharmaceutics I

Course Outline : A. Introduction to Quality Control
B. General Principles: Monograph Definitions, Standards and

Specifications; Assay, Precision, Accuracy, Error; Statistics and
Sampling

C. General Methods Used in Official Pharmaceutical Analyses

D. Principles of Volumetric Analysis Stoichiometry, Indicators,
Expressions of Concentration, Primary and Secondary Standards

E. Titrimetric Analysis:
F. Gravimetric Analysis
G. Analysis of Crude Drugs

Laboratory Equipment : See Annex B (List of Laboratory Equipment, Facilities and Supplies)

Texts and References :

- Knevel, A.M. and Digangi, F.E., Jenkin's Quantitative Pharmaceutical Chemistry.
- Harris, D.C., Quantitative Chemical Analysis, 6th Edition.
- United States Pharmacopoeia and National Formulary, latest edition
- Remington: The Practice of Pharmacy, latest edition.

Course Name : **Quality Control II-Drug Testing and Assay with Instrumentation**
(Pharm. Chem. 4)

Course Description : This is a continuation of Quality Control I with application of instrumental methods of analysis. It includes the principles, organization and function of quality control in the pharmaceutical and cosmetic industry. In-process test, the use of quality control charts for solid pharmaceuticals, stability testing as well as quality assurance functions in various stages of manufacture are discussed.

Course Objectives : At the end of the course, the students should be able to:

1. Discuss the general quality control process and validation procedures.
2. Apply the principles of instrumental methods of analysis in various pharmaceutical products.
3. Understand the application of stability tests, statistical quality control as tools for evaluating

processes.
4. Interpret results obtained as to specification.
5. Show the relevance of quality assurance in various stages of manufacture.
6. Foster awareness and appreciation of the pharmacists concern in insuring product quality

Number of Units : 4 units (3 units lecture , 1 unit laboratory)

Number of contact hours : 3 hours lecture, 3 hours laboratory per week

Pre-requisites : Quality Control I, Pharmaceutics II

Course Outline : I. Introduction
II. Quality Control
III. Sampling and Sampling Plans
IV. Material Control
V. Manufacturing Control
VI. Packaging Control
VII. Distribution Control (Finished Goods/Warehouse)
VIII. Statistical Quality Control
IX. Stability Studies
X. Dissolution Testing
XI. Validation
XII. Instrumentation
1. Spectrometry
2. Electrometric Method
3. Chromatography
4. Radioactivity

Laboratory Equipment : See Annex B (List of Laboratory Equipment, Facilities and Supplies)

Texts and References :

- Knevel, Adelbert and Frank DiGangi editors, Jenkin's Quantitative Pharmaceutical Chemistry, 7th ed., New York, McGraw-Hill, Book Co., 1977.
- Lerma, Norma V. and Osi, Marina O. Drug and Cosmetic Quality Control with Instrumentation.
- Evans, James Robert. The Management and Control of Quality. St. Paul: South Western, 1999
- Andres, Tomas Q. How to be Globally Competitive: An ISO Guide. Giraffe Books, 1997
- World Health Organization. Quality Assurance of Pharmaceuticals: A Compendium of Guidelines and Related Materials. Geneva: World Health Organization, 1999
- World Health Organization. WHO Expert

Committee on Specifications for Pharmaceutical Preparations: Thirty-fifth Report. Geneva: World Health Organization, 1999
- Smith, Gerald M. Statistical Process Control and Quality Improvement. Upper Saddle River, NJ: Prentice Hall, 1998
- USP/NF, latest edition
- Genaro Alfonzo ed. The Science and Practice of Pharmacy 20th ed. (Pensylvania) Mack Publishing Co., 2000

Course Name : **Clinical Toxicology (Pharm. Chem. 5)**

Course Description : The fundamentals of clinical toxicology including a study of the general classes of toxic agents, mechanism of toxicity, target organ toxicity, management, and their detection.

Course Objectives : At the end of the course, the students should be able to:
1. Acquire basic knowledge in the origin and type of exposure, stages in the induction of toxicity and evidences in poisoning.
2. Identify the commonly encountered deleterious chemicals and drugs to man and his environment.
3. Manifest the pharmacist responsibility in the risk assessment and management of poisoning.

Number of Units : 3 units (2 units lecture, 1 unit laboratory)

Number of contact hours : 2 hours lecture, 3 hours laboratory per week

Pre-requisites : Pharmacology 1 , Pharmacology 2 (co-requisite)

Course Outline :
A. General Concepts
B. Clinical Toxicology
1. Principles of Clinical Toxicology
2. General Management of a Suspected Poisoned Patient
3. Management of Specific Poisons
   a. Therapeutic agents
   b. Drugs of Abuse
   c. Household Poisons
   d. Pesticides
   e. Heavy metals
   f. Inhalatory Poisons
   g. Environmental Poisons

Laboratory Equipment	:	See Annex B (List of Laboratory Equipment, Facilities and Supplies)
Texts and References	:	➢ Aldridge, W. Norman, Mechanism and Concepts in Toxicology, USA: Taylor and Francis LTD., 1996 ➢ Berman, Eleanor, The Laboratory Practice of Clinical Toxicology, USA: Charles C. Tomas, 1996 ➢ Olson, Kent R., Poisoning and Drug Overdosage, 2nd ed. USA: Prentice-Hall Inc., 1995 ➢ Schonwald, Seth., Medical Toxicology: A Synopsis and Study Guide, USA: Lippincott Williams and Wilkins, 2001
Course Name	:	**Pharmaceutical Administration and Management 1 (Ph Ad & Mgt 1)**
Course Description	:	This is an introductory course designed to teach the concepts, principles, and fundamentals of pharmaceutical administration and management. This includes the basic functions of planning, organizing, staffing, directing and controlling as they relate to fiscal, personnel and merchandizing management. The course is also intended to provide the students with the tools and skills necessary to effectively manage themselves and to participate fully in their organizations in a changing world environment.
Course Objectives	:	At the end of the course, the students should be able to: 1. Increase awareness of management principles and functions in pharmacy practice. 2. Define and discuss the concepts of management and administration 3. Understand financial reports and be able to analyze the financial position of a business. 4. Understand the rudiments of inventory management and be able to relate the importance of inventory control to the financial viability of the pharmacy. 5. Understand the role of managing information systems in pharmacy practice 6. Understand the basic personnel management functions and their use in organizational effectiveness and efficiency 7. Apply management principles in a simulated business setting via case studies and related exercises.

Number of Units	:	3 units
Number of contact hours	:	3 hours lecture per week
Pre-requisites	:	Senior Standing
Course Outline	:	Unit I. Introduction to Pharmacy Administration and Management Unit II. Financial and Operations Management Unit III. Management Information Systems Unit IV. Personnel Management Unit V. Case Studies and Related Exercises
Texts and References	:	➢ Carrol, Norman V. Financial Management for Pharmacists: A Decision-Manking Approach. 2nd ed. Lea and Febiger: Philadelphia, 1998 ➢ Tootelian, Dennis H. and Gaedeke, Ralph M. Essentials of Pharmacy Management. Mosby Yearbook, Inc. St. Louie, USA, 1993. ➢ Dubrin, Andrew J. Essentials of Management. 5th ed. Cincinnati: SouthWestern College Pub. 2000.

Course Name	:	**Marketing and Entrepreneurship (Ph Ad & Mgt 2)**
Course Description	:	The course deals with concepts, theories and principles of marketing such as product, price, promotion and place of distribution combined with learning about entrepreneurship. It includes application through case study methods and business planning, and marketing strategy and elements of display
Course Objectives	:	At the end of the course, the students should be able to: 1. Identify the pharmaceutical industry and the pharmaceutical market system 2. Distinguish the difference between marketing and entrepreneurship. 3. Understand marketing theories and be able to implement it accordingly. 4. Identify the target market and be able to come up with a business plan or a feasibility study
Number of Units	:	3 units
Number of contact hours	:	3 hours lecture per week
Pre-requisites	:	Pharmaceutical Administration and Management 1

Course Outline	:	I. The Pharmaceutical Industry in the Philippines II. The Health Care Business in the Philippines III. Pharmaceutical Marketing - The Marketing System Markets and Products IV. The Marketing Management Process in the Drug Industry V. Entrepreneurship VI. Business Plan
Texts and References	:	➢ Lao, Felix M. Pharmaceutical Marketing in the Philippine Setting. Third Edition. ➢ Tangco-Fernanda Belmonte. Pharmaceutical Economics, Second Edition ➢ Hizon, Flora. Pharmaceutical Economics, Latest Edition ➢ Lambing, Peggy and Charles Kuehl, Entrepreneurship, Second Edition ➢ Chaston, Ian. Entrepreneurial Marketing, Latest Edition
Course Name	:	**Pharmaceutical Jurisprudence and Ethics (Pharm Juris and Ethics)**
Course Description	:	The course deals with the study of legal rules and regulations as applied to pharmacy and Pharmacy practice. It also embodies a code of ethics of the profession.
Course Objectives:	:	At the end of the course, the students should be able to: 1. Acquire a theoretical and practical knowledge regarding the legal and ethical control of the pharmacy education and the practice of the profession; 2. Identify the rights and duties of the pharmacists towards the public, colleagues, pharmacy assistants, physicians and other allied medical professionals; 3. Appraise the different provisions of the laws concerning the pharmaceutical education and profession.
Number of Units	:	3 Units
Number of Contact hours	:	3 hours lecture per week

Pre-requisites : Health Ethics/ Hospital Pharmacy, Pharmaceutics 2

Course Outline : I. Introduction to Pharmacy Jurisprudence and Ethics
II. Standards of the Practice of Pharmacy and Pharmaceutical Education
III. Standards for Food, Drug, Devices and Cosmetics
IV. Ensure Affordability and Accessibility of Drugs
V. Control of the Use of Dangerous Drugs

Texts and References :

- Bureau of Food and Drugs and Philippine National Drug Policy Program – Facilities, Functions and Capabilities. DOH, Manila
- BFAD – Drug Related Administrative Orders and Memorandum Circulars (with Summaries and Annotations), DOH. Manila. 1982
- Comprehensive Dangerous Drugs Act of the 2002, DDB, Manila. 2002
- The Consumers Act of the Philippines, RA 7394, Reprinted by the BFAD and DOH, DOH Complex, Alabang, Muntinlupa
- Philippine National Drug Formulary – Essential Drug List, vol. 1, 5th ed., DOH, Manila, 2000
- Reference Manual on the Philippine National Drug Policy and the Generics Act of 1988, DOH, Manila –1991
- Seminar Workshop on Monitoring and Enforcement (RA7581)
- Hizon, Flora. Notes on Pharmaceutical Jurisprudence and Ethics. UST
- Limuaco, Olivia M. and Emma G. Peña. Pharmaceutical Jurisprudence and Ethics.
- Limuaco, Olivia M. and Mary Jane C. Cruz. Pharmaceutical Jurisprudence and Ethics. 4th ed., Manila. 2003

Course Name : **Pharmacy Informatics (Computer 2)**

Course Description : An introduction to methods of gathering and using drug and health-related information from various sources with focus on Information Communication Technology (ICT) using different web sites and search engines.

Course Objectives : At the end of the course, the students should be able to:
1. Describe various sources of information and their uses,
2. Successfully search and retrieve information for

different drug and health information needs, and
3. Communicate properly oral and written responses to information queries from various clients.
4. Evaluate the quality of information obtained from various sources based on a set of criteria
5. Utilize the evaluated information in solving drug Therapy problems, evaluation of drugs, patient counseling, research studies , thesis writing and health education.
6. Present a design brief addressing recent pharmaceutical and health problems

Number of Units : 3 units (2 units lecture, 1 unit laboratory)

Number of contact hours : 3 hours lecture per week

Pre-requisites : Computer I

Course Outline : I. Importance of Drug and Health Information in Pharmacy Practice
A. Current uses of drug and health-related information in various areas of the practice of pharmacy
B. Definitions
C. Classification and examples of information relevant to pharmacy practice
II. Various Information Sources
A. Primary Sources
1. Description and uses
2. Limitations
3. Examples
B. Secondary Sources
1.Description and uses
2.Limitations
3.Examples
C. Tertiary Sources
1. Description and uses
2. Limitations
3. Examples
III. The Internet and Other Sources of Information (Computer Aided Instructions, Application software)
A. Description and uses
B. Limitations
C. Examples of websites and their available drug

and health-related information

IV. Search Process
   A. Internet search engines and book marking
   B. Classification of question as to clinical or research-related
   C. Gathering of additional relevant patient information
   D. Identification of search keywords, synonyms and related terms
   E. Formulation of search strategies
   F. Selection of relevant sources
   G. Retrieval of information
   H. Formulation of responses
   I. Follow-up and documentation

V. Guidelines in Formulating Responses to Drug Information Requests

VI. Considerations in the Evaluation of Biomedical Literature

VII. Publication Writing

VIII. Exercises on Drug and Health-Related Information Queries

Laboratory Equipment : Computers with internet connection, LCD, printer, Laptop

Texts and References :
- Tietze, 1996. Clinical Pharmacy
- Drug Information 2000
- Remington's The Science and Practice of Pharmacy, 20th ed. Y2000
- Shargel Comprehensive Review of Pharmacy, 2003
- American Journal of Pharmaceutical Education
- Biomedical Journals
- Drug Info Software: eFActs, Clin Phar, MIMS CD
- Internet websites

Course Name : **Research and Thesis Writing 1 & 2 (Research 1 and 2)**

Course Description : This course deals with the specific problem related to pharmaceutical sciences that would be worthwhile to investigate during the laboratory work. It will comprise actual pharmaceutical and pharmacologic principles and animal testing which will be conducted inside the laboratory. It also includes the thesis writing after experimental results are completed.

Course Objectives : At the end of the course, the students should be able to:

1. Relate the purpose(s) of choosing the problem for search.
2. Discuss the steps of the procedure for the investigation.
3. Present, organize, analyze and interpret the data collected and write scientifically.
4. Begin an independent study using logical thinking and scientific methods.
5. Gather new knowledge or data from primary or first-hand sources and not merely restate or reorganize what is already known or has been written.
6. Perform successfully the experimental procedures in the laboratory portion of the subject.

Present and defend a written output of the research.

Number of Units : Research & Thesis Writing 1: 3 units (1 unit lecture, 2 units laboratory)
Research & Thesis Writing 2: 1 unit (1 unit lecture)

Number of contact hours : Research and Thesis Writing I-1 hour lecture, 6 hours laboratory per week
Research and Thesis Writing II – 1 hour lecture per week

Pre-requisites : Senior Standing

Course Outline : Unit 1 – Introduction to Research and Thesis Writing
A. Orientation to the course objectives and content
B. Form and Style
C. The research problem
Laboratory
a. Research and referencing
Unit 2 – Review of Related Literature
A. Types of Literature
B. Bibliography and Cataloguing
Laboratory
a. Research and referencing
b. Informatics
Unit 3 – Review of Basic Statistics and Research Methodology
A. Sampling
B. Statistical formulas
C. Statistical tools

D. Types of research methodology

Laboratory

a. Finalization of the research
b. Proposal defense

Unit 4 – Laboratory, Checking / Monitoring of the laboratory work until completion of the Thesis

Unit 5 - Thesis Writing and Preparation of the Final Manuscript and Oral Defense as scheduled

Laboratory Equipment : See Annex B (List of Laboratory Equipment, Facilities and Supplies)

Texts and References :

- Books on Medicinal Plants authored by E. Quisumbing, de Padua and other published new books, both local and foreign sources
- Philippine Formulary
- USP/NF, latest edition
- Remington's Pharmaceutical Sciences, latest edition
- Chemical Formulary of Formulations
- Pharmacognosy books and manuals
- Quantitative Pharmaceutical Chemistry books authored by Jenkin's etal
- Pharmaceutical Dosage Forms and Drug Delivery Systems by Howard Ansel
- Books on Chemical Investigation of Plants, authored by L. Rosenthaler
- Journals and Magazines on Plants or Herbal Medicines

Article VII
GENERAL REQUIREMENTS

Section 12. Program Administration

a.) The school/college/department of pharmacy shall be administered by a duly appointed Dean/Program Head with the following minimum qualifications:

- must be a currently registered pharmacist with a master's degree in pharmacy.
- must have 5 years of teaching experience, and preferably with two (2) years administrative or supervisory experience.
- must be a member of good standing in national pharmacy organizations.

b) The general function and responsibility of the Dean is to effectively and efficiently manage the pharmacy education program.

Section 13. Faculty

a) Qualifications

The faculty for the professional pharmacy courses must have the following qualifications:

- A currently registered pharmacist.
- Have completed a Master's degree in their major field and/or allied subjects, and must have credentials on file.
- An active member of accredited scientific and professional organization as properly documented.

b) Teaching Assignment/Load

The faculty must have a teaching assignment/load in accordance with their academic preparation.

The teaching load must be in accordance with the provisions stated in the Manual of Regulation for Private Schools/State Universities and Colleges.

c) Employment Status

At least sixty percent (60%) of the total number of faculty handling professional subjects must be full time.

Section 14. Library

a) Librarian

- Every school/college/university offering Pharmacy Program should have one full-time licensed librarian.

b) Book collection

- There should be at least three (3) titles of latest edition per professional course. (See appendix A for book collection)
- There should be at least five (5) titles subscription to scientific and/or professional journals as well as periodicals.
- There should be state-of-the-art learning resources and equipment including computers and internet facilities.

c) Space Requirements

The library must have adequate space to accommodate ten percent (10%) of the total population at a given time.

Annex A
List of Book Collections

I. GENERAL EDUCATION SUBJECTS (3 titles per course)

1. Comm. Skills I and II
2. Speech
3. Effective Writing
4. Introduction to Literature
5. General Psychology
6. Socio Anthropology
7. Philosophy
8. Logic
9. College Algebra
10. Statistics
11. Filipino
12. Gen. And Inorganic Chem.
13. Physics
14. Health Economics
15. Computer Science
16. Health Ethics
17. Philippine Govt. & New Constitution
18. Philippine History
19. Rizal's Life, Works and Writings

II. CORE SUBJECTS (3 titles per course)

1. Pharmaceutical Botany with Taxonomy
2. Organic Chemistry
3. Human Anatomy and Physiology with Pathophysiology0
4. Technical Writing
5. General Concept of the Health Care System
6. Interpersonal Communication Skills for Pharmacist
7. Pharmacy History

III. PROFESSIONAL PHARMACY SUBJECTS (3 titles per course)

1. Pharmaceutical Calculation
2. Pharm. & Chem. Of Inorg. Med.
3. Pharmaceutical Biochemistry
4. Pharmaceutical Microbiology & Parasitology
5. Biopharmameculics & Pharmacokinetics
6. Pharm.& Chem. of Organic Medicinals
7. Physical Pharmacy
8. Drug Delivery System
9. Pharmacology
10. Pharmaceutical Marketing
11. Hospital Pharmacy
12. Quality Control I and II
13. Pharmacognosy w/ Plant Chemistry
14. Dispensing and Medication Counseling
15. Pharmacy Jurisprudence & Ethics
16. Pharmacy Administration & Management
17. Clinical Toxicology
18. Clinical Pharmacy
19. Public Health
20. Manufacturing Pharmacy
21. Research Methods

IV. REFERENCE BOOKS (latest edition)

1. Remington: The Science and Practice of Pharmacy
2. Combined USPNF
3. British Pharmacopeia
4. Merck Index

V. PHARMACEUTICAL JOURNALS (5 titles)

Section 15. Facilities and Equipment

a) Classroom requirements

The schools/ college/department of pharmacy must provide lecture and laboratory rooms, facilities, materials and equipment that are adequate for instruction, laboratory work and research.

b) Laboratory requirements

The school/college/department of Pharmacy should have a laboratory coordinator, who is a registered pharmacist to oversee the needs of pharmacy laboratory concerns.

- A laboratory room should:
    - Be well lighted, well-ventilated and well-maintained, and provided with accessible functional safety devices and first aid facilities;

- Have adequate working and free spaces for the convenience of students and faculty;
- Have laboratory tables that are chemical-resistant and fire-resistant;
- Have a minimum floor space of one (1) square meter per student
- Have one (1) locker per 1-4 students as needed.
- Have two (2) doors for entrance and exit.

- Separate laboratories for the physical, biological, pharmaceutical sciences and research should be provided.
  - Facilities in the science laboratory should include:
    - A continuous and adequate supply of purified/distilled water, electricity properly identified as to voltage, water and gas.
    - Safety, emergency and first aid devices, such as fire extinguisher, first aid cabinet, emergency shower, eye wash station, exhaust system and fume hoods should be available, accessible and properly maintained.
    - There must be separate storage rooms for chemicals and equipment under the supervision of a trained laboratory technician.

d) Laboratory equipment

- Equipment and supply should:
  - Be adequate for each laboratory course based on the year level and number of students
  - Should be functional, properly maintained and periodically calibrated
  - Include other teaching aids as needed for efficient instruction in the laboratory
- Provision should be made for maintaining live plants, animals and microorganisms for study

- Special equipment should be provided for the teaching of professional pharmacy courses.

- Adequate space should be provided in the school campus for botanical garden.

- There should be a separate well maintained animal house.

c) Audio-visual equipment

There should be a separate multi media facilities consisting of OHP, LCD, VHS, computers with internet access (if possible) to enhance instruction of professional pharmacy courses.

Annex B
List of Laboratory Equipment / Facilities/ Supplies

A. PHYSICAL PHARMACY AND QUALITY CONTROL I AND II

Analytical Balance Digital
Mohr's Westphal balance
Refractometer
Ovens for Drying
Melting-Point Apparatus
Disintegration Apparatus
Soxhlet Apparatus
Andrescence Pipet
Hardness Testers
Hydrometers
Buret (acid/alkali)
Aspirator
Percolators
Porcelain crucibles
TLC)
Stalagmometers
Calipers
Pycnometers
Viscometer
Polarimeter
Moisture Analyzer
UV-Vis Spectrophotometer
Friabilator
Tensiometer
Dissolution Apparatus
Hygrometers
Glassware – 1 set for a group of 4
Pipet
Distilling Apparatus
Dumas bulbs
Assembly for chromatographic methods (CC, PC,

Suction pump
High Performance Liquid Chromatography

B. PHARMACEUTICS 1 AND 2

Glassware 1-set per group
Stirrers (stainless)
Controlled room-air conditioned
Filter assembly
Blenders
Mixer
Tablet machine/Compression machine
Pill tile
Capsule filler
Sieves
Crimper
Suppository mold
Mixing container (preferably stainless)
Funnels (stainless)
Filling apparatus
Sterilizers/Autoclaves
Mortar and pestles
Granulator
Drying oven
Weighing scale – analytical and top-loading balance
Coating pan
Mixing bowl
Ointment slab

C. PHARM CHEM OF MEDICINALS 1 AND 2/ PHARMACOGNOSY AND PLANT CHEMISTRY/PHARMACEUTICAL BOTANY/ RESEARCH

- Basic Glassware
- Soxhlet Apparatus
- Distilling unit
- Percolators
- Thin Layer Chromatograph
- IR Spectrophotometer
- Circulating Oven
- Clavenger Apparatus
- Separatory Funnels
- Metabolic Cage
- Plantar Apparatus
- PLethysmometer
- Pyrogen Test Apparatus
- Drying Oven
- Muffle Furnace
- Botanical Garden
- Kjeldahjl Assembly
- Rotary Evaporator

D. CHEM 1/CHEM 3/ BIOCHEM

- Basic Glasswares
  - Beakers
  - Erlenmeyer flasks
  - Watch glass
  - Evaporating dishes
  - Glass rods
  - Graduated cylinders
  - Spatula
  - Funnel
  - Test tubes/rack/holder/brush
  - Wire gauze
- Science Interface Workshop
  - Computer
  - Temperature sensor
  - Pressure sensor
  - PH sensor
- Iron stand
- Volumetric flask
- Burette
- Pipet
- Microscope
- Electric centrifuge
- Ignition tube
- Percolator cups
- FTIR
- Quick-fit Simple Distillation Set-Up
- Separatory funnel
- Microscope
- pH meter
- Polarimeter
- Triple beam balance
- pH Paper
- Burner
- Whatman's filter paper
- Crucible tong
- Crucible with cover
- Clay triangle
- Litmus paper
- Beral pipets
- Electric hot plates
- Mortar and pestle
- Iron clamp
- Conductivity apparatus
- Magnetic stirrer and spin bars
- Rubber aspirator
- Water bath
- Urinometer
- Filter paper
- Capillary tubes
- KBr Cell

E. MICROBIOLOGY AND PARASITOLOGY

- Refrigerators
- Incubators
- Autoclaves
- Stoves
- Inoculating Chamber
- Inoculating needle and loop
- Microscopes
- Glasswares
  - Erlenmeyer flasks
  - Petri dishes
  - Glasswares for biochemical reactions
  - Slides

F. PHARMACOLOGY, TOXICOLOGY, ANATOMY & PHYSIOLOGY

- Kymograph
- Endoctrium

Animal Cage
Disposable syringe and needles
Equipment for pyrogen test
Sphygmomanometer
Stethoscope
Anatomical model
Hand lens
Metabolic cage
Plethysmometer
Plantar apparatus
Glucometer
Oral gastric lavage tube
Rectal/Oral/Digital Thermometer

Section 16. Instructional Standards

- The institution shall maintain a high standard of quality instruction.

  - All the courses shall have course syllabi with appropriate teaching strategies reflected therein.

  - The institution shall provide for a continuing faculty development program by providing logistical support.

  - It shall provide for a systematic and continuing plan of evaluation of student progress through a grading system that is consistent and congruent with the objectives set by the college/university.

  - The pharmacy curricular program may adopt any textbook of the latest edition and which reflects current trends in the pharmacy profession. Adopted basic textbooks may be changed only once in every three (3) years.

- The ratio of faculty to students in science laboratory classes should be a maximum of 1:35.

- Evaluation must be part of the teaching-learning process and the students must be informed of the results. A variety of appropriate test and assessment methods must be utilized.

- The Internship Training Program should be monitored, where the student develops professional pharmacy skills by a systematic application of scientific knowledge to actual life situations in the community pharmacies, hospitals and pharmaceutical industry.

  The following conditions shall be considered:

- There shall be a close correlation of theoretical knowledge to the Internship Training Program;

- The Internship Training Program shall be organized to meet the objectives of the pharmacy education program;

- The Internship Training program should be conducted in drug establishments and outlets accredited by the Bureau of Food and Drugs (BFAD)

- There must be a pharmacy internship coordinator for each area of pharmacy practice with corresponding remuneration.

- Student interns shall undergo training for 200 hours in each of the three (3) areas (community, hospital, industry) and an additional 360 hours for the chosen area as their major field.

- Student interns shall submit proof of completion for each practicum area with evaluation as a prerequisite for graduation.

Section 17. Research

- The school/college/university must encourage basic and applied research activities in the field of pharmacy to be done by competent and academically qualified research faculty team.

- Faculty members assigned to do research activities shall be credited with an equivalent teaching load for time engaged in research activities or some other means of compensation based on school/college/university policy.

- The institution shall be encourage and support research among its students and faculty members for the improvement of the pharmacy profession.

Section 18. Admission and Retention

- The applicant for admission to a degree course in Pharmacy must:

  - Have graduated from a general secondary course authorized by the government.

  - Have satisfactory complied with the admission requirements of the school/college/university

- Have never been convicted guilty or found guilty of any misconduct involving moral character.

- Have complied with the selection and retention policies of the university.

Section 19. Sanction

- A school/college/department of pharmacy that failed to comply with the minimum requirements set in the policies and standards shall not be issued permit to operate the program. (for new applicant)

- A recognized school/college/department of pharmacy that failed to maintain compliance with the minimum requirements set in the policies and standards after monitoring and evaluation by the Technical Committee for Pharmacy Education shall be initially issued a warning. The program shall be recommended for phase out upon failure to comply with the deficiencies noted within one (1) year upon receipt of the warning.

- A school/college/university that failed to comply with the average cut-off percentage passing in the government licensure examination for five (5) successive years shall be recommended for phase out of the program. The average cut-off percentage passing shall be determined by CHED upon the recommendation of the Technical Committee for Pharmacy Education.

Article VIII
REPEALING CLAUSE

Section 20. This Order supersedes all previous issuances concerning Pharmacy Education which maybe inconsistent or contradictory with any of the provisions hereof.

Article IX
EFFECTIVITY CLAUSE

Section 21. This set of Policies and Standards for Pharmacy Education shall take effect beginning school year 2006-2007.

Pasig City, Philippines Jan. 20, 2006.

Carlito S. Puno
Chairman