West African Health Organisation (WAHO)
Organisation Ouest Africaine de la Santé (OOAS)
Organização Oeste Africana da Saùde (OOAS)

West African Postgraduate College of Pharmacists (WAPCP)

Conseil Africain et Malgache pour l'Enseignement Superieur / African and Malagasy Council of Higher Education

HARMONIZED CURRICULUM FOR DOCTOR OF PHARMACY DEGREE (PharmD.) TRAINING IN THE ECOWAS REGION

DECEMBER 2015

Acknowledgements

The development of the harmonized curriculum for the undergraduate training of pharmacists within the ECOWAS Region was made possible via the resourceful input of members of a host of organizations that bear stake in the education and practice of pharmacists. Organisations whose members contributed to such development include the WAPCP, CAMES, Pharmacists Council or Pharmacy Boards, Deaneries of Pharmacy (including Joint Pharmacy and Medicine) Faculties, Pharmacy Directorates and National Pharmaceutical Associations (same as Societies) of all ECOWAS member countries. Others, as appeared in the Appendix, are ACAME, UEMOA, PHARMACTION, WHO, the erstwhile PRSAO, and indeed the West African Health Organisation that organized the meetings and provided the funding support there of.

The roles played by the Committee of Experts as well as the Ad hoc Committee that were constituted in situ to respectively produce and fine-tune the precursor versions of this curriculum cannot be forgotten. Same is true for that of the committee that edited this document. The West African Health Organisation (WAHO), the specialized institution of ECOWAS that is concerned with harmonisation of all aspects of health policies, facilitating the enhancement of national healthcare services within West Africa, hails the success scored in the production of this consensus document which is to be used as a framework or model in the undergraduate training of pharmacists throughout the West African region.

As we laud the formidable effort in developing this document, it is hoped that all ECOWAS member countries shall embrace and strongly support the implementation of the provisions enshrined herein. Towards this end, on behalf of WAHO, the Director-General wishes to express his fathomless gratitude to all who contributed towards this monumental achievement.

Director-General, WAHO

Foreword

As contained in the report of the workshop on harmonization of undergraduate Pharmacy curricula in Southern and Eastern Africa which was held in 2001 in Kariba, Zimbabwe, Pharmacy education, including Pharmacy curricula, varies widely in its scope and emphasis throughout the world. This is also true for Pharmacy education within West Africa, the fact that the differences in the Pharmacy curricula in those regions (of Africa) are of no exception in the ECOWAS Region. In addition to this, for the West African Region it has been noted that pharmacists' skills differ and that there is a lack of common basic competencies while the standards for the practice and training of pharmacists differ. Thus WAHO, after observing said variation in the ECOWAS region, embarked upon the respective processes of harmonization of curricula for the education or training and codes of the practice of pharmacists in West Africa.

Compounding the training and practice dissimilarity is also the observation that the practice of the Pharmacy profession throughout the West African Region is unsatisfactory in that, despite the existence of regulatory, legal and policy frameworks in countries of the region, the mechanisms for implementation of the provisions of these are very weak. Even despite efforts of some sub-regional pharmaceutical organizations (e.g. the WAPCP) in the running of special courses for the continuous professional growth of pharmacists, the practice of pharmacists in the region has still not been encouraging. This lapse in the professional practice of pharmacists in this part of the world is responsible for the negative trends in the pharmaceutical sectors of countries within the region.

Based on the above mentioned observations, in order to ensure the provision of quality pharmaceutical services to people on the one hand, and, secondly, to promote the practice of the Pharmacy profession in the West African region, WAHO began the process of harmonization of Pharmacy curricula and codes of ethics for Pharmacy practice in the ECOWAS.

Sequel to the inception of the Pharmacy curricula harmonization process, a total of six meetings (including the 2007 Abidjan-held meeting on the Status of Pharmacists) were held. These meetings culminated in the establishment of an *Ad hoc* Committee in Ouagadougou, Burkina Faso, in February 2009. The overall term of reference (TOR) of the *Ad hoc* was to meet and finalize the jointly draft harmonized pharmacists training curriculum (framework).
A meeting of the *Ad hoc* Committee was held in Bobo-Dioulasso from the 14th through 16th of September 2009. Despite the good work of the *Ad hoc* committee at its meeting, curricular issues such as the formulation of courses and their contents, etc. upon which the finalization of the harmonization of the curricula hence actually depended, were not resolved. This necessitated a dire need to convene a meeting of all relevant stakeholders in the training including those for licensing the post-training practice of pharmacists. In view of this, WAHO organized a meeting of said stakeholders from the 7th through 9th of September 2010. The meeting was intended for a review of the progress that had been made in the process of the pharmacists training curricula harmonization and to settle the outstanding issues including making of further recommendations thereof so as to pave the way for a full harmonization of same. A draft consensus document, to be used as the framework for the undergraduate training of pharmacists, was produced at the meeting.

This document is the result of chiefly two other meetings further to the above mentioned events, one of which was held in Cotonou, Benin, on 24 and 25 February 2011; the other was held in Bobo-Dioulasso on first to 3rd July 2014. Save for full details of the accreditation criteria, it contains the major component domains that are typical of a curriculum. Its structure spells out the nomenclature of the degree to be awarded upon completion, admission requirements to, the structure of the curriculum and human resource and infrastructural needs of the degree programme and defines its philosophy and objectives. It also comprises the core subject areas and their constituent course topics/contents as well as a list of textbooks recommended respectively for the courses, relevant for the envisaged Doctor of Pharmacy (PharmD) degree programme for West Africa.
As Pharmacy is not a static discipline, this curriculum shall be subject to periodic review and the needed resultant amendment as the need may arise.

Abbreviations and Acronyms

Abbreviations / Acronyms		Meaning
AHM	:	Assembly of Health Ministers
ECBLC	:	Examen Cyto-Bacteriologique du Liquide Cephalorachidien
ECBU	:	Examen Cyto-Bactériologique.des urines
COPD	:	Chronic obstructive pulmonary disease
CPR	:	Cardiopulmonary Resuscitation
CR	:	Credit (Hour)
FIP	:	Fédération internationale pharmaceutique
Fr.	:	French
Litr. Desgn.	:	Literal Designation
NGO	:	Non-governmental organization
Numr. Desgn.	:	Numerical Designation
PHC	:	Primary Health Care
PO	:	Professional Officer
PRSAO(Fr)	:	Programme Régional Santé en Afrique de l'Ouest;
(Prtg.)	:	Programa Regional de Saúde DaÁfrica Do Oeste).
Prtg/Port.	:	Portuguese
STD	:	Sexually Transmitted Disease(s)
UEMOA	:	Union Economique et Monétaire Ouest Africaine
WAHO	:	West African Health Organization
WHO	:	World Health Organisation

Glossary

BAC. Sc : Baccalauréat Scientifique *(Fr)*, this is an academic qualification (a diploma/certificate) which is awarded to students at the end of their high/actually senior secondary school (called lycée in French) studies and which serves most usually as the principally required document for admission to university studies in France and France-colonized or Francophone countries. Differentiated from the other types or series (Série or Streams, as referred to in French) such as the Série économique et sociale (ES), Série littéraire (L) and baccalauréat technologique of Baccalauréat général (General Baccalaureat) for respectively Economics and Social sciences, Literature and Technology, this is awarded to students who, as of the penultimate year of their high school studies, choose and pass science subjects such as Mathematics, Physics, Chemistry and Biology or, where required or available, engineering science subjects. Moreover, depending the discipline undertaken or chosen during their university degree studies, this qualification plus 3 - 4 years (i.e. Bac + 3 - 4 years) of successful studies thereafter earns the student an academic qualification that is equivalent to Anglophone countries' undergraduate (i.e. Bachelor's) degree. Or the BAC + a qualification of a duration of 4 - 5 years will award the student a Master's degree whereas that of (i.e. Bac +) a duration of at least 6 years qualifies the student for receipt of a professional Doctorate (e.g. Doctor of Pharmacy, PharmD.) degree.

CAMES : Conseil Africain et Malgache pour l'Enseignement Supérieur *(Fr)* = African and Malagasy Council of Higher Education, the authority, comprised of 19 countries from West and Central Africa, the Great Lakes Region and the Indian Ocean, that has the regulatory power on issues about Higher education. It is specifically concerned with *inter alia* the gathering and dissemination of all academic or research works (e.g. theses, statistics, information on examinations, directories, records, charts, etc.), preparation of conventions or projects concerning matters about higher education and scientific research amongst and between its member States and contribution to the execution of said conventions.

WAPCP : West African Postgraduate College of Pharmacists, is a college membered principally by Anglophone ECOWAS Countries. It is concerned with *inter alia* the advancement of knowledge and skills of practising pharmacists throughout postgraduate education and training as well as the pursuit of their continuing professional development in the ECOWAS Region through the conducting of postgraduate fellowship training and administration of examination and award of diplomas and certificates in Pharmacy and the pharmaceutical sciences thereof. It is responsible also for the holding of discussion on issues of legislation on Pharmacy and drug matters including national drug policies; identification and accreditation of Pharmacy institutions in the Region. For these and other activities that will ensure maintenance of high standard of professional Pharmacy practice and health care delivery, the College co-operates with other health professionals, scientists and organizations.

WASSCE : West African Senior Secondary School Certificate Examination (Certificate), this is a high school-leaving academic qualification that is awarded to students who sit and successfully pass the West African Senior School Certificate Examination (WASSCE) , itself a standardized examination administered by the West African Examinations Council (WAEC) to senior high/secondary school students and is a compulsory required qualification for admission to universities in Anglophone West Africa. This certificate can be given upon completion of anyone of the only two types of the exams - namely the November/ December-administered one which was formerly referred to as the General Certificate Examinations (GCE) or the May/June-administered WASSCE which is otherwise known as the Senior School Certificate Examinations (SSCE).

TABLE OF CONTENTS

TABLE OF CONTENTS

PART I: GENERAL PROVISIONS

1.1 PHILOSOPHY AND OBJECTIVES OF THE PHARMACY TRAINING PROGRAMME

1.1.1 PHILOSOPHY

The Philosophy of Pharmacy Education is to produce well educated and competent Pharmacy professionals.

1.1.2 OBJECTIVES

1.1.2.1 General Objective

The ultimate goal of the program is to produce pharmacists with the knowledge, attitudes and skills to provide comprehensive pharmaceutical services.

1.1.2.2 Specific Objectives

At the end of the training a graduate should be able to:

1. Contribute to the development and implementation of national, regional medicines and pharmaceutical policies.
2. Design, develop, formulate, produce, distribute and dispense high quality, safe and effective medicines and other healthcare products and devices.
3. Assure the rational use of medicines and other healthcare products and devices.
4. Manage laboratory services.
5. Manage Medicines Quality Assurance.
6. Promote use of herbal and other alternative medicines.
7. Counsel and monitor patients as well as promote and document their appropriate medicine treatment.
8. Promote public health
9. Become a life-long learner

I.2 - NOMENCLATURE

The name of the degree to be awarded under the program shall be Doctor of Pharmacy (PharmD.).

I.3- MINIMUM ADMISSION REQUIREMENTS

Eligible for admission to the programme shall be holders of:

- SSSC / WASSC (in the case of Anglophone countries) or
- BAC Sc. (in the case of Francophone countries) or their equivalents.

I.4 - DURATION OF THE DOCTOR OF PHARMACY TRAINING PROGRAMME

The duration of the programme shall be six (6) years.

I.5 LEVEL OF HARMONISATION FOR UNIVERSITIES/INSTITUTIONS

a. This harmonized curriculum is for the purpose of regional integration and not necessarily uniformity of programmes.

b. Core and Elective Courses: Participating countries/schools should decide on what constitutes core and elective courses. Thereof, the correct load of the core courses should be at least 60% of total credit required to graduate. Implied, where any of the courses herein listed is already contained in the curriculum of a Pharmacy training institution of an ECOWAS member country, it could be offered as specified by the said Pharmacy institution.

Also, courses done in General Education Subjects (e.g. humanities, social and behavioural sciences) such as Sociology, Communication Skills, Languages, etc.; the Basic Sciences and related disciplines that are (particularly early years) university-based and listed outside the herein contained spread sheet , as applicable in in-country institutions that offer undergraduate Pharmacy training, may be considered as being additional requirements to the minimum course requirements on said spread sheets in Part VIII of this curriculum document. As such, their coding may in some cases appear different from that used for those on the spread sheet.

c. Member countries are to adopt and feel free to modify its provisions so as to suit their needs.As such, institutions therein are at liberty to prescribe textbooks, for their programmes, in addition to what are herein recommended or their contemporaneously latest editions and other learning and teaching aides, where mention of these was not made for any of the courses.

d. Any College/ Faculty/ School of Pharmacy that implements 70% and above, shall be deemed to have complied with the conditions of harmonization.

PART II: GENERAL STRUCTURE OF THE DOCTOR OF PHARMACY TRAINING IN THE ECOWAS REGION

The curriculum is structured to provide the student with knowledge and competencies in the following areas of education:

1. General Education;
2. Basic and Biomedical Sciences;
3. Pharmaceutical Sciences;
4. Professional Studies and Training;
5. Training Methodology, Support & Environment and Quality Management

II.1 GENERAL EDUCATION/STUDY COURSES

The area of General Educationshall include courses in the subjects of humanities, social and behavioral sciences. Examples of these are:

1. Ethics
2. Communication
   - Communication Skills
3. Languages
   - English
   - French
   - Portuguese
4. Psychology
5. Sociology

II.2- BASIC AND BIOMEDICAL SCIENCE SUBJECTS

2A) Basic Sciences

The Basic sciences are:

1. Biology:
   - Botany
   - Cryptogamic Botany (Non-flowering Plant Biology)
   - Phenarogamic Botany (Flowering/Higher Plant Biology)
   - Plant Physiology
   - Zoology
   - Cell Biology & Genetics
   - Microbiology
   - Molecular Biology

2. Chemistry
   - Analytical Chemistry
   - General Chemistry
   - Inorganic Chemistry
   - Organic Chemistry
   - Physical Chemistry

3. Physics
   - General Physics
   - Biophysics

4. Mathematics
   - Algebra & Trigonometry
   - Calculus

5. Statistics
   - General Statistics
   - Biostatistics

2B) Biomedical Sciences

The Biomedical sciences are:

1. Anatomy
2. Biochemistry
   - General Biochemistry
   - Metabolic/Enzymatic Biochemistry
   - Food Analysis
   - Water Analysis
   - Clinical Biochemistry
3. Hematology
4. Histology/Embryology
5. Human Physiology
6. Immunology
7. Parasitology
8. Microbiology

- Bacteriology
- Virology
- General Virology
- Clinical

9. Mycology (Medical Mycology)
10. nformatics
    - Information & Communication Technology
    - Applied Informatics (for Pharmacy)

II.3 - PHARMACEUTICAL SCIENCE COURSES

The Pharmaceutical Sciences are:

1. Biopharmaceutics ǂ
2. Cosmetology
3. Drug Delivery
4. Medicinal Chemistry
5. Pharmaceutical Analysis
6. Pharmaceutical Chemistry
7. Pharmaceutical Microbiology & Biotechnology ψ
8. Pharmaceutics and Pharmaceutical Technology
9. Pharmacognosy
10. Pharmacokinetics
    - Basic Pharmacokinetics
    - Clinical Pharmacokinetics

11. Pharmacology
    - General & Molecular Pharmacology
    - Applied Pharmacology

12. Pharmacy
    - Clinical Pharmacy
    - Community Pharmacy
    - Hospital Pharmacy
    - Industrial Pharmacy
    - Phytopharmacy/Agrochemicals
    - Veterinary Pharmacy

13. Toxicology
    - General Toxicology
    - Emergency Toxicology

II.4 - PROFESSIONAL STUDIES & TRAINING SUBJECTS

The area of professional studies shall include:

1. Nursing
    - Basic Nursing

2. Traditional Medicine
    - Herbal Medicine

3. Pharmacy & Training Sessions
    - Clinical Pharmacy Clerkship:
    - Laboratory-based
    - Hospital Pharmacy-based
    - Clinical Services-based

4. Pharmaceutical Care
5. Pharmacy Law & Ethics
6. Pharmacy Management
7. Pharmacy Practice Experience
8. Pharmacotherapeutics and Clinical Trials
9. Prescription Assessment/Evaluation
10. Drug Information Services
11. Public Health Δ
    - Community Health
    - Public Health
    - Public Health & Development ψ
    - Health Economics (Pharmacoeconomics)
    - Emergency Medical Intervention (First Aid)
    - Pharmacovigilance and Pharmacoepidemiolgy
    - Nutrition & Dietetics

12. Methodology-based
    - Introduction to Research
    - Bibliographical Research
    - Scientific Writing
    - Quality Approach
    - Bio-safety
    - Good Laboratory Practices (GLP)
    - Good Manufacturing Practices (GMP)

II.5 - TRAINING SUPPORT/ ENVIRONMENT-BASED COURSES $^{\phi}$

1. Pathology:
   - Medical & Surgical Pathology
   - Infectious Pathology
2. Pathophysiology
3. Psychology
   - Health Psychology
4. Law
   - Commercial Law

5. Biomedical Analysis
6. Elective Courses
7. Thesis/Dissertation (Project)

ǂ Notwithstanding, placed under other course group-heading on the course credits-listing spreadsheet.
ψ Could be offered/taken as elective.
ϕ Include some courses placed under the heading "Methodology" on the course credits-listing spreadsheet.
[Δ]Itself and others of its aspects could be placed under Biomedical or Pharmaceutical Sciences

PART III: EVALUATION AND ACCREDITATION SYSTEMS

This shall be in terms of evaluation of both the student and the Pharmacy programme.

III.1 STUDENT EVALUATION

Student evaluation shall be comprised of:

- Written/oral examinations (continuous and end-of semester assessments).
- Practical classes evaluation.
- Intern-/Externship (experiential learning) evaluation.

Thus each student shall be evaluated using a combination of continuous and end-of-semester assessment.

- Continuous semester assessment shall consist of term papers, laboratory reports and/or tests (written, oral or practical, tutorial, attendance etc. as deemed fit by institution).
- End-of-semester assessment shall consist of: Written and/ or oral examinations and Practical examinations.
- The minimum pass mark for core courses shall be fifty percent (50%).

III.2 PROGRAM EVALUATION:

In accordance with the existing national accreditation system, each program shall be evaluated and accredited by the relevant national/regional regulatory bodies such as:

- National Education Regulatory Body/authorities.
- Pharmacists Council/Pharmacy Council/ Boards.
- National Quality Assurance for Higher education.
- Scientific Advisory Council.
- Regional Council for Health Professionals Education in the ECOWAS region.
- Others.

The method of evaluation of the program may include review workshops.

III.3 PROGRAM ACCREDITATION

An accreditation system should be in place to assure the quality of learning and the products of the program.

PART IV: HUMAN RESOURCE AND INFRASTRUCTURAL REQUIREMENTS

IV.1 ACADEMIC, TECHNICAL AND ADMINISTRATIVE STAFF

- Based on students' enrolment, the rational academic staff-to-student ratio should be 1:10.
- Academic staff should have a higher degree and/or relevant professional qualification.
- There should be adequate numbers of technical and administrative staff with relevant qualifications.

IV.2 ACADEMIC AND PHYSICAL SPACE

- There should be adequate lecture theatres, seminar rooms, reading rooms, staff offices and Research space.
- For the externship or internship training, there should be accredited hospitals, pharmacies and other relevant institutions to which the student/intern is to be attached.

IV.3 LIBRARY AND INFORMATION RESOURCES

- There should be a Faculty Library with appropriate reference books, journals and periodicals in all areas of Pharmacy. Access to Internet facilities is highly desirable.

IV.4 LABORATORIES AND EQUIPMENT

- There should be adequately equipped laboratories with items of equipment for effective learning as expected in this curriculum.

IV.5 TEACHING AND LEARNING METHODOLOGY

- Problem solving case-studies should be included in order to inculcate into the learner, the attitude of self-study which will promote life-long learning that is required in responding to the changing environment and challenges of the future.

PART V: FORMAT OF DESCRIPTION AND CODING OF COURSES

V.1 - DESCRIPTION OF COURSES

The description of the courses should be of such that it is developed along the following sequence or contains all elements mentioned therein:

1. Code and Title of courses and subject areas as applicable in in-country /institution
2. Objective (s)
3. Topic/s (Content /s)
4. Delivery (Teaching methodology)
5. Evaluation

V.2 - COURSE CODING

Each course should have a code and a descriptive title. Although each in-country Pharmacy training institution has the liberty to devise its own course coding system, the code should have, at least, a literal component and a numerical part following it.

For instance, supposing that the literal part is a four-letter portion which is derived from a "re-arranged" abbreviation of the name of the core subject (e.g. Chemistry, Botany, Zoology, Pharmacology, etc.). One could have, for instance, CHEM, MCHE, CPHA, COPH, etc. to respectively represent Chemistry, Medicinal Chemistry, Clinical Pharmacy and Community Pharmacy.

Also supposing that the numerical part of the course code is a either only a four-digit number or a five digit-number (where the course appearance serial number is respectively a one-digit or a two-digit number) , the following could be obtained: the first digit represents the year in which the course is offered; the second indicates the course area (e.g. Mathematics & Statistics; Physics & Chemistry; Biology; Pharmaceutical Sciences, Methodology, etc.) of a given academic term; the third digit (for a one-digit serial number) or two-digit serial number represents, by semester, the serial number of the course whereas the fourth or fifth digit (in the case of a four or five-digit number) indicates the semester wherein it is offered - 1 and 2 indicating first and second semester respectively.

Thus MATH 1111: indicates that this is a Mathematics course that is taught in first year of the programme under Course Area #1 as course 1 in the first semester.

BOTA 1242: Botany-I (fully described as General Botany), is a course taught in the second semester of year 1, as course number #4, under course area # 2.

BOTA 1252: Botany (fully described as Cryptogamic Botany), is a course taught in the second semester of year 1, as course #5, under Course area #2.

CHEM 2111: Chemistry (fully described as Organic Chemistry-II), is a course taught under course area # 1 and as course #1 in the first semester of the second year.

PHCO 3371: Pharmacology-I (fully described as General & Molecular Pharmacology), is a course taught in the third year under Course area #3 and as course 7 in the first semester.

PHCO 4111: Pharmacology-II (fully described as Applied Pharmacology), is a course taught as course number 1 under course area number 1 in the first semester of year 4.

COMM 6131: Communication Skills (fully described as Oral and Writing Techniques) is a course taught, as course 3 under course area 1, in the first semester of year six.

PHAR 44101: Pharmacy-IV (Fully described as Pharmacy Law & Ethics) indicates that this is the 10th course offered under course area #4 in the first semester of year 4.

ZOOL 1232: Zoology (fully described as Animal Classification/Taxonomy), is a course taught in the first year under Course area #2 and as course 3 in semester two.

NB: *The serial numbers for the courses areas are the respective numbers indicating the chronological sequence of their appearance, per a given semester, as found on the Spread sheet in part VII showing the credits for the courses.*

PART VI: COURSES – CODES AND TITLES

CODE		GENERAL TITLE	FULL DESCRIPTIVE TITLE
Litr.	**Numr. Desgn.**		
ANAT	1381	Anatomy	Human Anatomy-I (General Human Anatomy)
ANAT	2251	Anatomy	Human Anatomy-II (Organs)
BCHE	2261	Biochemistry	Biochemistry-I (General Biochemistry)
BCHE	3251	Biochemistry	Biochemistry-II (Metabolic & Enzymatic Biochemistry)
BCHE	3222	Biochemistry	Biochemistry-III (Food Analysis)
BCHE	4241	Biochemistry	Biochemistry-IV (Hydrology: Water Analysis)
BCHE	4142	Biochemistry	Biochemistry-V (Clinical Biochemistry)
BIOA	55111	Biomedical Analysis	Biomedical Analysis
BIOL	3232	Biology	Bacteriology-I (General Bacteriology)
BIOL	3242	Biology	Virology-I (General Virology : Systemic Virology)
BIOL	4132	Biology	Bacteriology-Virology-II (Clinical Bacteriology - Virology)
BIOL	3221	Biology	Microbiology
BIOL	1371	Biology	Cell Biology & Genetics-I
BIOL	1392	Biology	Cell Biology & Genetics-II
BIOL	1382	Biology	Histology & Embryology
BIOL	2242	Biology	Hematology-I (Biological Hematology)
BIOL	4112	Biology	Hematology-II (Clinical Hematology)
BIOL	3231	Biology	Immunology-I (General Immunology)
BIOL	4122	Biology	Immunology-II (Clinical Immunology)
BIOL	3241	Biology	Mycology-I (General Mycology)
BIOL	4261	Biology	Mycology-II (Medical/Clinical Mycology)
BIOL	2252	Biology	Parasitology-I (General Parasitology)
BIOL	4251	Biology	Parasitology-II (Clinical Parasitology)
BIOL	2262	Biology	Molecular Biology
BIOL	2232	Biology	Plant Biology (Plant Physiology)
BOTA	1372	Botany	Botany-I (General Botany-I)
BOTA	2231	Botany	Botany-II (General Botany-II)
BOTA	2222	Botany	The Cryptogams (Cryptogamic Botany)
CHEM	1241	Chemistry	General Chemistry
CHEM	1261	Chemistry	Inorganic Chemistry
CHEM	1232	Chemistry	Organic Chemistry-I
CHEM	2111	Chemistry	Organic Chemistry-II
CHEM	1242	Chemistry	Physical Chemistry
CHEM	2112	Chemistry	Analytical Chemistry
CLAW	5221	Law	Commercial Law
COMM	6121	Communication	Communication Skills
DINF	53102	Drug Information	Drug Information Services

CODE		GENERAL TITLE	FULL DESCRIPTIVE TITLE
Litr.	**Numr. Desgn.**		
ELEC	6341 Ψ	Elective	Elective (Optional)
		Biology Ψ	Pharmaceutical Microbiology & Biotechnology
		Pharmacy Ψ	Pharmaceutical Care
		Public Health Ψ	Public Health-VII: (Public Health & Development)
		Sociology Ψ	Socio-cultural Factors of Pharmaceutical Healthcare
INFM	1131	Information Technology	Informatics-I (Information & Communication Technology)
INFM	4252	Information Technology	Informatics-II (Applied Informatics-I for Pharmacy Students)
INFM	5111	Information Technology	Informatics-III (Applied Informatics-II for Pharmacy Students)
LANG (ENGL/ FREN/ PORT)	2482	Language	Foreign Language (English/French/Portuguese)-I
LANG (ENGL/ FREN/ PORT)	37102	Language	Foreign Language (English/French/Portuguese)-II
LANG (ENGL/ FREN/ PORT)	4362	Language	Foreign Language (English/French/Portuguese)-III
LANG (ENGL/ FREN/ PORT)	6111	Language	Foreign Language (English/French/Portuguese)-IV
MATH	1111	Mathematics	Mathematics-I (Algebra & Trigonometry)
MATH	1112	Mathematics	Mathematics-II (Calculus)
NURS	3682	Nursing	Nursing (Basic Nursing Care)
PATH	4381	Pathology	Pathology-I (Medical & Surgical Pathology)
PATH	4391	Pathology	Pathology-II (Infectious Pathology)
PHAR	14102	Pharmacy	Pharmacy-I (Introduction to the Pharmacy Profession and Drug Administration)
PHAR	2481	Pharmacy	Introduction to Drug Delivery
PHAR	3481	Pharmacy	Industrial Experience
PHAR	44101	Pharmacy	Pharmacy Law & Ethics
PHAR	44111	Pharmacy	Clinical Pharmacy Clerkship- I
PHAR	46122	Pharmacy	Clinical Pharmacy Clerkship-II
PHAR	54101	Pharmacy	Clinical Pharmacy Clerkship-III

CODE		GENERAL TITLE	FULL DESCRIPTIVE TITLE
Litr.	Numr. Desgn.		
PHAR	3111	Pharmacy	Medicinal Chemistry-I
PHAR	3112	Pharmacy	Medicinal Chemistry-II
PHAR	4121	Pharmacy	Medicinal Chemistry-III (Phytochemistry)
PHAR	2592	Pharmacy	Pharmaceutical Chemistry
PHAR	5331	Pharmacy	Pharmaceutical Analysis-I (Non-Instrumental Analytical Methods)
PHAR	5341	Pharmacy	Pharmaceutical Analysis-II (Instrumental Analytical Methods)
PHAR	5351	Pharmacy	Agrochemicals /Phytopharmacy
PHAR	5361	Pharmacy	Veterinary Pharmacy
PHAR	5371	Pharmacy	Cosmetology (Cosmetic Pharmacy: Dermato-Cosmetology)
PHAR	5392	Pharmacy	Prescription Assessment/Evaluation
PHAR	5491	Pharmacy	Pharmacy Management
PHAR	6451	Pharmacy	Professional Experience I
PHAR	6112	Pharmacy	Professional Experience II
PHCG	3352	Pharmacognosy	Pharmacognosy-I
PHCG	4482	Pharmacognosy	Pharmacognosy-II
PHCO	3371	Pharmacology	Pharmacology-I (General & Molecular Pharmacology)
PHCO	4111	Pharmacology	Pharmacology-II (Applied Pharmacology)
PHCT	2371	Pharmaceutics	Pharmaceutics-I
PHCT	3361	Pharmaceutics	Pharmaceutics-II
PHCT	4472	Pharmaceutics	Pharmaceutics-III
PHCT	53112	Pharmaceutics	Pharmaceutics-IV (Biopharmaceutics)
PHSY	1391	Physiology	Human Physiology-I
PHSY	2241	Physiology	Human Physiology-II
PHSY	3462	Physiology	Pathophysiology/Semiology-I
PHSY	4371	Physiology	Pathophysiology-II (Medical & Surgical)
PHYS	1251	Physics	Physics-I (General Physics)
PHYS	1252	Physics	Physics-II (Biophysics-I)
PHYS	2121	Physics	Physics-III (Biophysics-II)
PKTS	5272	Pharmacokinetics	Pharmacokinetics
PROJ	6222	Project	Thesis/Dissertation
PSYC	2372	Psychology	Health Psychology
PTHE	5282	Pharmacotherapeutics	Pharmacotherapeutics & Clinical Trials
PUBH	3572	Public Health	Public Health-I (Community Health)
PUBH	45121	Public Health	Public Health-II (Public Health Pharmacy)
PUBH	45131	Public Health	Public Health-III (Health Economics:

CODE		GENERAL TITLE	FULL DESCRIPTIVE TITLE
Litr.	**Numr. Desgn.**		
PUBH	4592	Public Health	Public Health -IV (Emergency Medical Intervention/ First Aid)
PUBH	45102	Public Health	Public Health-V (Pharmacovigilance & Pharmacoepidemiology)
PUBH	45112	Public Health	Public Health-VI (Nutrition and Dietetics)
PUBH	6341Ψ	Public Health	Public Health-VII (Public Health and Development)
QMAN	5132	Management	Quality Management-I(Quality Approach)
QMAN	5142	Management	Quality Management-II (Biosafety)
QMAN	5152	Management	Quality Management-III (Good Laboratory Practices, GLP)
QMAN	5162	Management	Quality Management-IV (Good Manufacturing Practices)
RMET	5112	Research	Research Methodology-I (Introduction to Research Methodology)
RMET	5122	Research	Research Methodology-II (Bibliographical Research)
RMET	6231	Research	Research Methodology-III (Scientific Writing and Presentations)
STAT	1121	Statistics	Statistics-I (General Statistics -Descriptive & Inferential Statistics)
STAT	1122	Statistics	Statistics-II (Biostatistics)
TMED	3692	Medicine	Traditional Medicine
TXCL	4131	Toxicology	Toxicology-I (General Toxicology)
TXCL	5381	Toxicology	Toxicology-II (Emergency Toxicology)
ZOOL	1362	Zoology	Zoology (Animal Classification)

PART VII: COURSES - THEIR CREDITS AND OFFERING SEQUENCE BY ACADEMIC TERMS

PHARMACY STUDIES: Undergraduate Training									
First Year (S1)		Teaching Methods				Student	Workload		
		Lectures	Practicum	Tutorial	Sub total	Student's Input	Total hours	Coef.	CR.
Code									
Litr. Desgn.	Numr. Desgn								
AREA 1: MATHEMATICS, STATISTICS & INFORMATICS									
MATH	1111	30	0	10	40	20	60	0	3
STAT	1121	15	0	10	25	15	40	0	2
INFM	1131	15	0	0	15	5	20	0	1
Sub Total		60	0	20	80	40	120	0	6
AREA 2: PHYSICS & CEMISTRY									
CHEM	1241	20	0	20	40	40	80	0	4
PHYS	1251	20	0	10	30	30	60	0	3
CHEM/ICHE	1261	30	0	10	40	40	80	0	4
Sub Total		70	0	40	110	110	220	0	11
AREA 3: BIOLOGY-I									
BIOL	1371	30	0	10	40	40	80	0	4
ANAT	1381	30	20	10	60	20	80	0	4
PHSY	1391	40	0	20	60	40	100	0	5
Sub Total		**100**	**20**	**40**	**160**	**100**	**260**	**0**	**13**
TOTAL HOURS (S1)		**230**	**20**	**100**	**350**	**250**	**600**	**0**	**30**

PHARMACY STUDIES: Undergraduate Training									
First Year (S2)		Teaching Methods				Student	Workload		
	Lectures	Practicum	Tutorial	Sub total	Student's Input	Total hours	Coef.	CR.	CR.
Code									
Litr. Desgn.	Numr. Desgn								
AREA 1: MATHEMATICS, STATISTICS & INFORMATICS									
MATH	1112	30	0	10	40	20	60	0	3
STAT	1122	20	0	10	30	10	40	0	2
Sub Total		**50**	**0**	**20**	**70**	**30**	100	0	5
AREA 2: PHYSICS & CEMISTRY-II									
CHEM/OCHE	1232	25	10	5	40	20	60	0	3
CHEM/PCHE	1242	30	0	10	40	20	60	0	3
PHYS	1252	25	10	5	40	20	60	0	3
Sub Total		**50**	**0**	**20**	**70**	**30**	**100**	**0**	**5**
AREA 3: BIOLOGY-II									
ZOOL	1362	30	0	10	40	20	60	0	3
BOTA	1372	20	0	10	30	30	60	0	3
BIOL	1382	30	10	0	40	20	60	0	3
BIOL	1392	20	0	20	40	20	60	0	3
Sub Total		**100**	**10**	**40**	**150**	**90**	**240**	**0**	**12**
AREA 4: PHARMACEUTICAL SCIENCES-I									
PHAR	14102	30	0	10	40	40	80	0	4
Sub Total		**30**	**0**	**10**	**40**	**40**	**80**	**0**	**4**
TOTAL HOURS (S2)		**260**	**30**	**90**	**380**	**220**	**600**		**30**
TOTAL HOURS First Year (S1+ S2)		**490**	**50**	**190**	**730**	**470**	**1200**		**60**

PHARMACY STUDIES: Undergraduate Training									
First Year (S3)		**Teaching Methods**				**Student**	**Workload**		
	Lectures	**Practicum**	**Tutorial**	**Sub total**	**Student's Input**	**Total hours**	**Coef.**	**CR.**	**CR.**
Code									
Litr. Desgn.	**Numr. Desgn**								
AREA 1: PHYSICS & CHEMISTRY-III									
CHEM/ OCHE	2111	25	10	5	40	20	60	0	3
PHYS	2121	30	10	10	50	10	60	0	3
Sub Total		**55**	**20**	**15**	**90**	**30**	**120**	**0**	**6**
AREA 2: BIOLOGY-III									
BOTA	2231	30	30	20	80	20	100	0	5
PHSY	2241	40	20	0	60	20	80	0	4
ANAT	2251	30	0	10	40	20	60	0	3
BCHE	2261	40	20	10	70	30	100	0	5
Sub Total		**140**	**70**	**40**	**250**	**90**	**340**	**0**	**17**
AREA 3: PHARMACEUTICAL SCIENCES-II									
PHCT	2371	30	0	10	40	20	60	0	3
Sub Total		**30**	**0**	**10**	**40**	**20**	**60**	**0**	**3**
AREA 4: PROFESSIONAL STUDIES & TRAINING-I									
PHAR	2481	0	0	0	0	80	80	0	4
Sub Total		**0**	**0**	**0**	**0**	**80**	**80**	**0**	**4**
TOTAL HOURS (S3)		**225**	**90**	**65**	**380**	**220**	**600**	**0**	**30**

PHARMACY STUDIES: Undergraduate Training									
First Year (S4)		**Teaching Methods**				**Student**	**Workload**		
	Lectures	**Practicum**	**Tutorial**	**Sub total**	**Student's Input**	**Total hours**	**Coef.**	**CR.**	**CR.**
Code									
Litr. Desgn.	**Numr. Desgn**								
AREA 1: PHYSICS & CHEMISTRY-IV									
CHEM	2112	30	20	10	60	20	80	0	4
Sub Total		**30**	**20**	**10**	**60**	**20**	**80**	**0**	**4**
UE/AREA 2: BIOLOGY-IV									
BOTA	2222	30	10	10	50	30	80	0	4
BIOL	2232	20	10	10	40	20	60	0	3
BIOL	2242	30	20	10	60	20	80	0	4
BIOL	2252	30	20	0	50	30	80	0	4
BIOL	2262	20	10	10	40	20	60	0	3
Sub Total		**130**	**70**	**40**	**240**	**120**	**360**	**0**	**18**
AREA 3: SUPPORT & ENVIRONMENT									
PSYC	2372	10	0	5	15	5	20	0	1
Sub Total		**10**	**0**	**5**	**15**	**5**	**20**	**0**	**1**
AREA 4: GENERAL STUDIES-I									
PHAR	2592	30	10	10	50	30	80	0	4
Sub Total		**30**	**10**	**10**	**50**	**30**	**80**	**0**	**4**
TOTAL HOURS S4		**220**	**100**	**85**	**405**	**195**	**600**	**0**	**30**
TOTAL HOURS Second Year (S3 + S4)		**445**	**190**	**150**	**785**	**415**	**1200**	**0**	**60**

PHARMACY STUDIES: Undergraduate Training									
First Year (S5)		Teaching Methods				Student	Workload		
	Lectures	Practicum	Tutorial	Sub total	Student's Input	Total hours	Coef.	CR.	CR.
Code									
Litr. Desgn.	Numr. Desgn								
AREA 1: PHARMACEUTICAL SCIENCES-III									
PHAR	3111	30	0	10	40	20	60	0	3
Sub Total		**30**	**0**	**10**	**40**	**20**	**60**	**0**	**3**
AREA 2: BIOLOGY-V									
MBIO	3221	30	20	10	60	20	80	0	4
BIOL	3231	20	15	5	40	20	60	0	3
BIOL	3241	10	10	5	25	15	40	0	2
BCHE	3251	30	10	5	45	15	60	0	3
Sub Total		**90**	**55**	**25**	**170**	**70**	**240**	**0**	**12**
AREA 3: PHARMACEUTICAL SCIENCES-IV									
PHCT	3361	20	10	10	40	20	60	0	3
PHCO	3371	30	0	10	40	20	60	0	3
Sub Total		**50**	**10**	**20**	**80**	**40**	**120**	**0**	**6**
AREA 4: PROFESSIONAL STUDIES & TRAINING-II									
PHAR	3481	0	0	0	0	180	180	0	9
Sub Total		**0**	**0**	**0**	**0**	**180**	**180**	**0**	**9**
TOTAL HOURS (S5)		**170**	**65**	**55**	**290**	**310**	**600**	**0**	**30**

PHARMACY STUDIES: Undergraduate Training									
First Year (S6)		Teaching Methods				Student	Workload		
	Lectures	Practicum	Tutorial	Sub total	Student's Input	Total hours	Coef.	CR.	CR.
Code									
Litr. Desgn.	Numr. Desgn								
AREA 1: PHARMACEUTICAL SCIENCES-V									
PHAR/MCHE	3112	20	30	30	80	20	100	0	5
Sub Total		**20**	**30**	**30**	**80**	**20**	**100**	**0**	**5**
AREA 2: BIOLOGY-VI									
BCHE	3222	20	20	0	40	20	60	0	3
BIOL	3232	30	10	10	50	10	60	0	3
BIOL	3242	20	0	10	30	10	40	0	2
Sub Total		**70**	**30**	**20**	**120**	**40**	**160**	**0**	**8**
AREA 3: PHARMACEUTICAL SCIENCES-VI									
PHCG	3352	30	10	20	60	20	80	0	4
Sub Total		**30**	**10**	**20**	**60**	**20**	**80**	**0**	**4**
AREA 4:SUPPORT & ENVIRONMENT-II									
PHSY	3462	20	0	10	30	10	40	0	2
Sub Total		20	0	10	30	10	40	0	2
AREA 5: PUBLIC HEALTH-I									
PUBH	3572	20	0	0	20	0	20	0	1
Sub Total		20	0	0	20	0	20	0	1
AREA 6: PROF. STUDIES & TRAIN.III									
NURS	3682	12	8	10	30	10	40	0	2
TMED	3692	60	20	10	90	30	120	0	6
Sub Total		72	28	20	120	40	160	0	8
AREA 7: GENERALSTUDIES-II									
LANG	37102	15	0	15	30	10	40	0	2
Sub Total		**15**	**0**	**15**	**30**	**10**	**40**	**0**	**2**
TOTAL HOURS (S6)		**247**	**98**	**115**	**460**	**140**	**600**	**0**	**30**
TOTAL HOURS First Year (S5+ S6)		**417**	**163**	**170**	**750**	**450**	**1200**	**0**	**60**

PHARMACY STUDIES: Undergraduate Training									
First Year (S7)		Teaching Methods				Student	Workload		
	Lectures	Practicum	Tutorial	Sub total	Student's Input	Total hours	Coef.	CR.	CR.
Code									
Litr. Desgn.	Numr. Desgn								
AREA 1: PHARMACEUTICA SCIENCES-VII									
PHCO	4111	30	0	10	40	20	60	0	3
PHAR/MCHE	4121	40	0	20	60	20	80	0	4
TXCL	4131	30	20	0	50	10	60	0	3
Sub Total		**100**	**20**	**30**	**150**	**50**	**200**	**0**	**10**
AREA 2: BIOLOGY-VI									
BCHE	4241	20	10	0	30	10	40	0	2
BIOL	4251	30	15	0	45	15	60	0	3
BIOL	4261	10	5	0	15	5	20	0	1
Sub Total		**60**	**30**	**0**	**90**	**30**	**120**	**0**	**6**
AREA 3: SUPPORT & ENVIRONMENT-III									
PHSY	4371	30	0	0	30	10	40	0	2
PATH	4381	30	0	0	30	10	40	0	2
PATH	4391	15	0	0	15	5	20	0	1
Sub Total		**75**	**0**	**0**	**75**	**25**	**100**	**0**	**5**
AREA 4: PPROFESSIONAL STUDIES & TRAINING-IV									
PHAR	44101	40	0	0	40	20	60	0	3
PHAR	44111	0	0	0	0	60	60	0	3
Sub Total		40	0	0	40	80	120	0	6
AREA 5: PUBLIC HEALTH-I									
PUBH	45121	30	0	0	30	10	40	0	2
PUBH	45121	30	0	0	30	10	40	0	2
Sub Total		**40**	**0**	**0**	**40**	**20**	**60**	**0**	**3**
TOTAL HOURS (S7)		**315**	**50**	**30**	**395**	**205**	**600**	**0**	**30**

PHARMACY STUDIES: Undergraduate Training									
First Year (S8)		Teaching Methods				Student	Workload		
	Lectures	Practicum	Tutorial	Sub total	Student's Input	Total hours	Coef.	CR.	CR.
Code									
Litr. Desgn.	Numr. Desgn								
AREA 1: BIOLOGY-VII									
BIOL	4112	30	20	0	50	10	60	0	3
BIOL	4122	30	0	15	45	15	60	0	3
BIOL	4132	30	20	0	50	10	60	0	3
BCHE	4142	30	20	0	50	10	60	0	3
Sub Total		**120**	**60**	**15**	**195**	**45**	**240**	**0**	**12**
AREA 2: METHODOLOGY-I									
INFM	4252	5	0	10	15	5	20	0	1
Sub Total		**5**	**0**	**10**	**15**	**5**	**20**	**0**	**1**
AREA 3: GENERAL STUDIES-III									
LANG	4362	20	0	10	30	10	40	0	2
Sub Total		**20**	**0**	**10**	**30**	**10**	**40**	**0**	**2**
AREA 4: PHARMACEUTICAL SCIENCES-VIII									
PHCT	4472	30	10	0	40	20	60	0	3
PHCG	4482	30	10	0	40	20	60	0	3
Sub Total		60	20	0	80	40	120	0	6
AREA 5: PUBLIC HEALTH-III									
PUBH	4592	10	20	0	30	10	40	0	2
PUBH	45102	20	0	10	30	10	40	0	2
PUBH	45112	20	0	10	30	10	40	0	2
Sub Total		50	20	20	90	30	120	0	6
AREA 1(6): PROFESSIONAL STUDIES & TRAINING -V									
PHAR	46122	0	0	0	0	60	60	0	3
Sub Total		0	0	0	0	60	60	0	3
TOTAL HOURS (S8)		**255**	**100**	**55**	**410**	**190**	**600**	**0**	**30**
TOTAL HOURS Fourth Year (S7 + S8))		**570**	**150**	**80**	**805**	**395**	**1200**	**0**	**60**

PHARMACY STUDIES: Undergraduate Training									
First Year (S9)		Teaching Methods				Student	Workload		
	Lectures	Practicum	Tutorial	Sub total	Student's Input	Total hours	Coef.	CR.	CR.
Code									
Litr. Desgn.	Numr. Desgn								
AREA 1: MATHEMATICS, STATISTISTICS & INFORMATICS-IV									
INFM	5111	15	10	5	30	10	40	0	2
Sub Total		**15**	**10**	**5**	**30**	**10**	**40**	**0**	**2**
AREA 2: SUPPORT & ENVIRM'NT-IV									
CLAW	5221	20	0	10	30	10	40	0	2
Sub Total		**20**	**0**	**10**	**30**	**10**	**40**	**0**	**2**
AREA 3: PHARMACEUTICAL SCIENCES-IX									
PHAR	5331	20	0	10	30	10	40	0	2
PHAR	5341	20	10	0	30	10	40	0	2
PHAR	5351	10	0	0	10	10	20	0	1
PHAR	5361	15	0	0	15	5	20	0	1
PHAR	5371	20	10	0	30	10	40	0	2
TXCL	5381	20	10	0	30	10	40	0	2
Sub Total		105	30	10	145	55	200	0	10
AREA 4: PROFESSIONAL STUDIES & TRAINING-VI									
PHAR	5491	20	0	10	30	10	40	0	2
PHAR	54101	0	0	0	0	240	240	0	12
Sub Total		20	0	10	30	250	280	0	14
AREA 5: SUPPORT ENVIRM'NT-V									
BIOA	55111	0	0	30	30	10	40	0	2
Sub Total		0	0	30	30	10	40	0	2
TOTAL HOURS (S9)		**160**	**40**	**65**	**265**	**335**	**600**	**0**	**30**

PHARMACY STUDIES: Undergraduate Training									
First Year (S10)		Teaching Methods				Student	Workload		
	Lectures	Practicum	Tutorial	Sub total	Student's Input	Total hours	Coef.	CR.	CR.
Code									
Litr. Desgn.	Numr. Desgn								
AREA 1: METHODOLOGY-III									
RMET	5112	10	0	20	30	10	40	0	2
RMET	5122	30	0	20	50	10	60	0	3
QMAN	5132	30	0	20	50	10	60	0	3
QMAN	5142	30	0	20	50	10	60	0	3
QMAN	5152	20	0	10	30	10	40	0	2
QMAN	5162	20	0	10	30	10	40	0	2
Sub Total		140	0	100	240	60	300	0	15
AREA 2: PHARMACEUTICAL SCIENCES-X									
PKTS	5272	20	0	10	30	10	40	0	2
PTHE	5282	30	0	0	30	10	40	0	2
Sub Total		50	0	10	60	20	80	0	4
AREA 3: PROFESSIONAL STUDIES&TRAINING-VII									
PHAR	5392	20	0	30	50	10	60	0	3
DINF/ PHAR	53102	30	0	40	70	10	80	0	4
PHCT	53112	0	0	0	0	80	80	0	4
Sub Total		50	0	70	120	100	220	0	11
TOTAL HOURS (S10)		**240**	**0**	**180**	**420**	**180**	**600**	**0**	**30**
TOTAL HOURS Fifth Year (S9 + S10)		400	40	245	685	515	1200	0	60

PHARMACY STUDIES: Undergraduate Training									
First Year (S11)		Teaching Methods				Student	Workload		
	Lectures	Practicum	Tutorial	Sub total	Student's Input	Total hours	Coef.	CR.	CR.
Code									
Litr. Desgn.	Numr. Desgn								
AREA 1: GENERAL STUDIES-IV									
LANG	6111	20	15	5	40	20	60	0	3
COMM	6121	30	0	20	50	10	60	0	3
Sub Total		30	25	15	70	30	100	0	5
AREA 2: SUPPORT & ENVIRONMENT/METHODOLOGY-IV									
RMET	6231	10	5	15	30	10	40	0	2
Sub Total		10	5	15	30	10	40	0	2
AREA 3: ELECTIVE									
ELEC	6341ψ	20	0	20	40	20	60	0	3
Sub Total		20	0	20	40	20	60	0	3
AREA 4: PROFESSIONAL STUDIES & TRAINING -VIII									
PHAR	6451	0	100	0	100	300	400	0	20
Sub Total		**0**	**100**	**0**	**100**	**300**	**400**	**0**	**20**
TOTAL HOURS (S11)		60	130	50	240	360	600	0	30

PHARMACY STUDIES: Undergraduate Training									
First Year (S12)		**Teaching Methods**				**Student**	**Workload**		
	Lectures	**Practicum**	**Tutorial**	**Sub total**	**Student's Input**	**Total hours**	**Coef.**	**CR.**	**CR.**
Code									
Litr. Desgn.	**Numr. Desgn**								
AREA 1: PROFESSIONAL STUDIES & TRAINING -IX									
PHAR	6112	0	60	0	60	200	260	0	13
Sub Total		0	60	0	60	200	260	0	13
AREA 2: THESIS/PROJECT									
PROJ	6222	0	120	100	220	120	340	0	17
Sub Total		0	120	100	220	120	340	0	17
TOTAL HOURS (S12)		**0**	**180**	**100**	**280**	**320**	**600**	**0**	**30**
TOTAL HOURS, Sixth Year (S11 + S12)		**60**	**310**	**150**	**520**	**680**	**1300**	**0**	**60**

PART VIII. OBJECTIVES AND CONTENTS OF COURSES PER SUBJECT AREAS

VIII.1 GENERAL EDUCATION SUBJECTS

COMM 6121: Communication Skills

Objectives: This course designed to help students to improve upon their knowledge of English/ French/ Portuguese through various topics on grammar and exercises on error analysis. It will also help the student to acquire technical writing and presentation skills through selected topics (e.g. theses) which are essential to job satisfaction.

Content: Effective communication and writing in English/ French/ Portuguese; Language skills; Writing of essay answers; Comprehension; Sentence construction; Outlines and paragraphs; Collection and organization of materials and logical presentation, Punctuations; Logical presentation of papers; Phonetics; Instruction on lexis; Art of public speaking and oral communication; Figures of speech; Précis; Report writing.

LANG 2482: Foreign Language (English/French/Portuguese) - I

Objectives: The objectives of the course are to facilitate the:

1. Ease of communication in the ECOWAS region.
2. Exploration of academic and professional print and electronic resources.

Content: Countries should choose one foreign language (as applied to the learner's / student's country ; it may be French/ English/Portuguese) and with focus on expression relative to healthcare provision. As such, to be covered are 1) Techniques of communication and writing skills in English / French / Portuguese : (a)techniques of sentence construction including punctuation and paragraphing ; (b) Summaries writing ; (c) Phonetics ; (d) Styles of figurative expressions ; 2) Reading comprehension ; 3) Dissertation writing ; 4) Collecting and organizing documents ; 5) Logical presentation of documents ; 6) Public speaking and oral communication.

LANG 37102: Foreign Language (English/French/Portuguese)-II

It is a continuation of Foreign Language-I.

LANG 4362: Foreign Language (English/French/Portuguese)-III

It is a continuation of Foreign Language-II

LANG 6111: Foreign Language (English/French/Portuguese)-IV

It is a continuation of Foreign Language-III

SOCL 6341[ψ]: Sociology (Socio-cultural Factors of Pharmaceutical Healthcare)

Objectives: This course is designed to, just as does the course in Psychology, provide understanding of Pharmacy within the context of individual and socio-cultural factors that affect medicines use and health.

Content: Health beliefs; Public image of Pharmacy as a profession; Clinical, economic and humanistic outcome of care and Social concepts of Pharmacy Practice.

VIII.2 BASIC AND BIOMEDICAL SCIENCES

ANAT 1381: Human Anatomy-I (General Human Anatomy)

Objective: Students will learn about the organisation of the human structure and provide foundation for the courses in Physiology and Pharmacology and Applied Therapeutics groundwork for the clinical training course.

Content: Basic organization of the human body: A study of human biological structure at various levels of complexity: from sub cellular to gross and microscopic structure of individual organ systems. Structure - function correlations are emphasized: Integumentary system, Circulatory system, Lymphoid system, Alimentary/ Digestive system, Musculoskeletal system, Respiratory system, Urinary system, Genital system, Endocrine system, Organs of special sense.

Basic structural organization of the nervous system: The neuron (Soma and neurites); Centralization and Telencephalization; Neural Circuitry (Receptors, Effectors and the synapse); Spinal cord and brain vesicles; Fate of the Neural Crest. Spinal Cord: General Topography; Grey matter; Ascending and Descending pathways. Brain: General Topography; Brainstem; Cerebellum; Diencephalon; Cerebrum. Meninges and Ventricular system: Pia, Arachnoid & Dura Matera; Secretion and Circulation of Cerebrospinal fluid; Blood-Brain Barrier. Peripheral Nervous System: Basic plan; Afferent and Efferent cerebrospinal peripheral nerve endings; Ganglia. Autonomic Nervous system: Basic plan; Sympathetic system; Parasympathetic system; Autonomic effector endings.

ANAT 2251: Human Anatomy-II (Organs)

Objective: Anatomy-II is the logical continuation of the study of Gross Anatomy. The objective is to prepare the student to understand Physiology and Pharmacology in Applied Therapeutics.

Content: Anatomy of the digestive system; Anatomy of the respiratory system; Anatomy of the circulatory System; Anatomy of the urinary tract.

BCHE 2261: Biochemistry-I (General Biochemistry)

Objectives: Students will be introduced to simple and complex molecules found in biological systems.

Content: Importance of biochemistry to the health sciences (levels of medical care and biochemistry); Water and Buffers; Amino acids and protein structure; Function of normal and abnormal proteins; Nomenclature and Classification of Enzymes; Proteins digestion, absorption and transport across membranes; (Chemical) Structure of carbohydrates, carbohydrates digestion, absorption and biological functions; (Chemical) Structure of lipids, lipids digestion, absorption and biological functions; Structure of membranes and cell structure techniques (used in studies of biochemistry and medicine); Introduction to Molecular Biology; Nucleic acids and Biochemistry of heredity; Introduction to basic techniques in biotechnology; Cloning technology and recombinant DNA; Mutagens and mutation; Biochemistry and biological function of hormones; Intracellular messsagers.

BCHE 3251: Biochemistry-II (Metabolic and Enzymatic Biochemistry)

Objective: To clinically apply the elements and principles of General Biochemistry; and to provide the student with a comprehensive knowledge of the various diseases of themetabolism of carbohydrates, lipids, proteins, uric acid, urea etc. and to prepare the student biochemical diagnosis in the fourth and fifth years.

Contents: Introduction to intermediary metabolism; Metabolism of carbohydrates, lipids and proteins; Metabolism of hormones; Nitrogen metabolism; Nucleic acids metabolism; Mechanisms; Detoxification mechanisms including cytochromeP450 and other isoforms; Degradation of heme and other biochemical transformations that are of medical importance; Congenital anomalies and inborn errors of metabolism / metabolic disorders; Plasmalipoproteins; Enzymology and enzyme kinetics

BCHE 3222: Biochemistry-III (Food & Water Analysis)

Objective: Heavily relying on the study of Analytical Chemistry as a basic tool, this course is designed to introduce the student to the analytical study of foods (milk, fish, cans etc.) to ensure quality control.

Content: Food Classification, Fats and oils, Fish, processed beverages, Cereals and derivatives, Milk and its derivatives, Mechanism of food spoilage, Contaminants, Food Additives, Determination of Pesticide residues.

BCHE 4241: Biochemistry-IV (Hydrology)

Objectives: This course is to help the student to understand the role of water in the quality of life as well as the analytical, toxicological and bacteriological aspects of water.

Content: The water molecule; The natural cycle of water; The water penetration of water in the soil and subsoil; Water supply and water resources; Water chemical analysis; The organoleptic properties of water; Physical determinations of water; Radioactivity, Gaseous water; Alkali metal cations: sodium, potassium, lithium; Hardness of water - Calcium, Magnesium, Detergents in water.

BCHE 4142: Biochemistry-V (Clinical Biochemistry)

Objective: To introduce students to the general principles of Clinical Biochemistry and clinical applications in interpreting results of disease states.

Content: Definition and terminologies; Biological samples; Fluid and electrolyte balance; Acid-base balance and pH of the internal environment; Exploration and pathophysiology of renal function; Digestion and exploration of gastric function; Exploration and pathophysiology of liver function; Exploration of carbohydrate metabolism disorders; Biochemical exploration of protein biological media; Biological and pathophysiological study of enzymes/ enzymatic environments; Study of the biochemistry and pathophysiology of lipids / lipoidal environments; Survey of iron metabolism disorders; Metabolism of haemoglobin, haemoglobin disorders and (other) porphyrias; Exploration of the hypothalamic-pituitary axis and biochemistry of endocrine organs; Study of tumour markers; study of chemical neurotransmitters.

BIOL 3232: Bacteriology-I (General Bacteriology)

Objective: This course is to provide the student with general knowledge about the biology of bacterial and viral pathogens in human beings. The teaching of monographs of the families of microbes (bacteria, viruses) will also be discussed. It will also provide the student with practical knowledge in microbiological diagnosis.

Content: Anaerobes, Corynebacteria: Introduction, Corynebacteria, Brucella, Chlamydia, Enterobacteriaceae, The Haemophilus organisms, , Staphylococcus infections, Mycobacteria, The spirochetes, Streptococci, Vibrios , Neisseria, Antibiotics and their modes of action, Roles of laboratories in antimicrobial therapy.

BIOL 3242: Virology-I (General Virology: Systemic Virology)

Objective: This is course is designed to give the student the basic knowledge of viruses and the main virus families of clinical interest.

Content: Enteroviruses; Filoviruses; Hepatitis A, B, C viruses; Herpes virus; Myxoviruses; Poxviruses and Rabbies viruses.

BIOL 4132: Bacteriology – Virology-II (Clinical Bacteriology - Virology)

Objective: The course focuses on the cytology and pathological analysis of bacterial and Viral serology products.

Content: CBU (Cyto-bacteriological Urinalysis); CB-ECF (Cyto-bacteriological examination of cerebrospinal fluid); Blood culture; Stool; EC-Suppuration; EC-liquid effusion (ascites, pleural fluid, synovial fluid); Pap specimens; Genito-urethral samples; Serology of viral hepatitis, syphilis, etc.

BIOL 1371: Cell Biology & Genetics-I

Objective: This is the study of the cell. It focuses on cell physiology, mechanism for protein synthesis and development of body tissues. The cell nucleus and its genetic material are also considered in this discipline.

Contents: General organization of eukaryotic and prokaryotic cells; The main organelles and cellular machineries: Structures, Properties and Functions; the cell cycle, mitosis and meiosis; Introduction to and terminologies in Genetics.

BIOL 1392: Cell Biology & Genetics-II

Objective: A continuation of Cell Biology and Genetic-I, this course focuses on genetics.

Content: Genetics. Mendelism; Exceptions to Mendel's laws: Liaison and spanning gonosomal heredity; Genetic polymorphism in human beings; The chromatin tests chromatiniers; Chromosomal analysis; Chromosomal abnormalities: classification, mechanism of formation, general and specific consequences. Genetic engineering, genetic counseling.

BIOL 2242: Haematology-I (Biological Haematology)

Objectives: To familiarize students with the basics of Hematology and to prepare the students for biological laboratory-based diagnosis.

Content: Introduction to Hematology; The ABO system, Rhesus System and other blood group systems; Monocytes and macrophages, Megakaryocytes and platelets; Hemoglobin: Structure and physiology; Erythropoiesis and its regulation; Role of iron in hematology; granulopoiesis and its regulation; physiology of homeostasis; Exploration of homeostasis; biological diagnosis of pregnancy.

BIOL 4112: Haematology – II (Clinical Haematology)

Objective: This course is designed to provide the student with knowledge of the techniques used in medical laboratory-use diagnosis of diseases and that to correctly interpret results of the lab analysis for the determination of biological parameters that may help diagnose the disease. The course focuses on sampling techniques, diagnostic methods, analysis and interpretation of results.

Content: Haemostasis; Blood Count; Cytology; Rh factor and Blood Group; and Serological diagnosis.

BIOL 1382: Histology & Embryology

Objective: The teaching of historical embryology allows the student to understand the different stages of embryonic development, physiological interactions of mother-child. The study of histo-embryology is of

great importance to the pharmacist since some medicine can affect embryonic development. Moreover, Histology offers students a theoretical basis for teaching of the mechanisms of drug action within the various body tissues.

Content: Histology (General Histology, Epithelial Tissues, Connective Tissues, Nervous Tissues); Embryology (General Embryology, Gametogenesis, Male genital organs, Female genital organs, Early stages of embryonic development, Morphogenesis, General Organogenesis)

BIOL 3231: Immunology-I (General Immunology)

Objective: This course seeks to introduce students to the basic principles of the mammalian immune system and the common immunological disorders which are seen particularly in humans.

Content: Immunity; definition and classification, general principles of natural immunity, phagocytosis, acquired immunity (active and passive), antigens, chemical nature of antigens, structure and formation of antibodies, antigen-antibody reactions, bacterial exotoxins and endotoxins, significance of toxoids in active immunity; Immunological disorders: introduction to T and B cells; HIV/AIDS and the immune system; MHC proteins or (transplantation antigens), immune tolerance, hypersensitivity reactions, autoimmunity, immunization.

BIOL 4122: Immunology-II (Clinical Immunology)

Objective: The course is intended to provide students with the knowledge of the pathophysiology, signs and symptoms of immune system diseases and their diagnoses together with guiding techniques for their management.

Content: A brief review of the basic structural and functional components of the mammalian (particularly human) immune system; Infection; Anaphylaxis and Allergy; Autoimmunity and autoimmune diseases; Immunodeficiency and responsible factors; Transplantation and the Immune System; Manipulation of the Immune System; Organ system (e.g. Kidney, Liver, Eye, Joint and Muscle, Skin, etc.) disease and the immune system; Other diseases (e.g. gastrointestinal tract/system diseases, lymphoproliferative dysfunctions, endocrine disorders including diabetes, etc.); Immunological disease and pregnancy; Diagnostic Immunology: techniques of clinical diagnosis of immune system disease and/or disease affecting the system: - Immune System Proteins, Neutrophil Function, Human Allergy and Functional Immune Responses Assessments; Flow cytometry; Molecular methods of diagnosis; Immunopharmacology (Use of: Immunoglobulin [e.g. replacement and immunomodulation]; Glucocorticoids and NSAIDs; Allergy immunotherapeutic agents including antihistamines; Monoclonal antibodies and fusion proteins and immunomodulating drug agents; Therapeutic Cytokines; Protein kinase antagonist-type immune system disease and inflammatory disease therapeutic agents; Vaccines; etc.).

BIOL 3221: Microbiology

Objective: This course is designed to provide the student with general knowledge about the biology of bacteria, fungi and viruses, and their significance.

Content: Introduction to the science of microbiology: Major divisions of the microbial world; Methods of classification of microbes (Bacteria, Fungi, Viruses, Rickettsiae, Spirochetes); Bacteriology (Classification including nomenclature; Structure and Function; Nutritional Requirements; Growth and Cultivation of Bacteria; Mode of Reproduction; Maintenance of Laboratory Cultures; Simple Identification Procedures; Gram Staining and Important Biochemical Methods; Study of Different Methods of Sterilization including their merits and demerits); Mycology (Basic Principles in Mycology; Yeast and Molds; Morphological Characteristics; Growth Requirements; Reproduction, Isolation and Cultivation (culture media); Microsco-

pic Examination and Economic Importance); Virology (Structure of Virus; Classification); Bacteriophage (Cultivation Techniques; Assay; Mode of Replication of Bacteriophages and Animal Viruses); Comparative study of viruses with other submicroscopic infective agents, oncogenic viruses and tumours.

BIOL 2262: Molecular Biology

Objective: The course will provide the student with the knowledge of the basic chemical processes of life with emphasis on human health which are vital to understanding the molecular mechanism underlying disease state and drug action.

Content: Information transfer and molecular biology; The Gene: Genome structure and function; RNA processing: rRNA, tRNA and mRNA processing; Protein synthesis: Mechanisms of protein synthesis, initiation in eukaryotes, translation; Control and post-translation events; Introduction to gene therapy and targeting; Organization, Expression and Regulation of the Human Genome; DNA Manipulations; Tissue Culture and Cell Biology; the Human Genome and Disease.

BIOL 3241: Mycology-I (General Mycology)

Objective: It is the study of fungi of medical interest, in particular, their morphological characteristics, life cycles, especially their interaction with the host.

Content: Part I: General information about mushrooms: Place of mushrooms in Systematics, General characteristics of mushrooms, Ecology and life of mushrooms, Mycotoxicoses and mycotoxinology. Part II: Morphology, Cytology and Biochemistry: Fungi Morphology, Characters and Biochemical Cytology. Part III: Reproduction and Nutrition: Nutrition and Life Cycle of Mushrooms. PART IV: Classification and Monographs: Gymnomycota (Animal Mushroom), Mastigomycota, Amastigomycota, Deuteromycota, Actinomycetes.

BIOL 4261: Mycology-II (Medical / Clinical Mycology)

Objective: Clinical Mycology is designed to study fungi that are parasitic to man.

Content: Definitions; General classification of fungi, focusing on parasitic fungi; Morphological characteristics (of parasitic fungi) at the microscopic level; Biology and identification of fungi; Treatment of infections/infestations caused by fungi (e.g. study of candidiasis, etc. and of dermatophytes); Dermatophytes; Superficial fungal infections of the skin and mucous membranes: Candidiasis; Dermatophytis, Tinea versicolor; Subcutaneous mycoses: Sporothricoses, Chromomycosis, Mycetoma; Subcutaneous phycomycosis; Visceral mycosis: Cryptoccosis or toruloses, Histoplasmosis, Aspergillosis, Blastomycosis; Paracoccioidomycoses: coccidioidomycosis.

BIOL 2252: Parasitology-I (General Parasitology)

Objective: This is to equip students in courses in diagnosis taught in the fourth or fifth year. The emphasis is particularly laid on the identification of the parasite, and its life cycle in humans, the pathophysiology of infections.

Content: General Parasitology; Systematic study of parasites and parasitic diseases: A) Protozoan parasites (Rhizopods, Flagellates, Ciliates, Sporozoa); B) (Metazoan parasites); Helminthes (Trematoda, Cestoda, Nematoda); Molluscs; Anthropods: arachnids (spiders), crustaceans, insects.

BIOL 4251: Parasitology-II (Clinical Parasitology)

Objective: It is the study of the biological diagnosis of Medical Biology lab analysis for the determination

of biological parameters that may help diagnose the disease. This teaching focuses on sampling techniques, diagnostic methods, analysis and interpretation of results.

Content: General methods of diagnosis: General techniques of detecting parasites in the blood, Lymph nodes and bone marrow, Techniques for detecting parasites in various samples: CSF, urine, stool, skin and appendages, pus, sputum and abscesses, ulcerations, etc. In vitro Culture of protozoa of the digestive tract and urogenital tract. In Vitro Culture of blood stream and endocellular protozoa. Helminthes cultures. In vivo parasites Cultures. General methods of sero-immunological diagnosis. General methods for the diagnosis of mycosis. Diagnosis of Parasitic Diseases (Laboratory diagnosis of various parasitic and fungal infections).

BIOL 2232: Plant Biology (Plant Physiology)

Objective: As Plant Biology is a useful aid for the understanding of the study of Pharmacognosy and Phytopharmacy which are respectively offered in the third and fifth years, this course is designed to introduce students to the knowledge of plant Physiology and the place of useful plants in the ecosystem in general.

Content:
A) Theory: Introduction, Photosynthesis (basic knowledge), Plant and water (basic knowledge), Components (basic knowledge), Complementary study on ecology'
B) Practicals: Planting, Germination, Study of plant growth, Study on the role of fertilizers.

BOTA 1372: Botany-I (General Botany-I)

Objective: This course is designed to introduce the student to the study of General Botany and Systematic Botany. Specifically aiming at preparing the student to appreciate the courses Plant Biology and Pharmacognosy which are respectively offered in the second and third and fourth years, it focuses specifically on plants of interest in therapy/of medicinal value.

Content: General Botany: Definitions. The different classification systems. The species and the different taxa. Nomenclature. Algae and fungi in the plant kingdom. Fundamental characteristics of higher plants. Plant formations. Flora and vegetation. Phenology (the case of spermatophytes). Fundamentals of Ecology. Pteridophyta: General characteristics; Development cycles. Bryophyta: General characteristics; Phylogenesis; Development cycle. Prespermaphytes: Difference between pseudograin and true seed.

BOTA 2231: Botany-II (General Botany-II)

Objective: This is designed to prepare the student to appreciate the courses Plant Biology and Pharmacognosy. It focuses specifically on plants of medicinal value.

Content: Systematic Botany: Spermatophytes Gymnosperms: General characteristics; Development cycle of Spermatophytes. Chlamydosperms: Phylogenetic interest or importance. Spermatophytes angiosperms: General characteristics; Development cycle. Overview of the members of families of the following four taxonomic (classification) orders: Apetalous, Dialypetales and Gamopetalous Dicotyledons and the Monocots.

Families studied: Apetalous dicotyledons: Cannabinaceae, Chenopodiaceae.

Dialypetalous Dicotyledons: Renonculaceae, Papaveraceae, Brassicaceae (= Cruciferae) Malvaceae, Bombacaceae, Euphorbiaceae, Erythroxylaceae, Rutaceae, Rosaceae, Mimosaceae, Cesalpiniaceae, Fabaceae (= Papilionaceae), Daucaceae (= Umbelliferae).

Gamopetalous Dicotyledons: Apocynaceae, Asclepiadaceae, Solanaceae, Convolvulaceae, Borraginaceae, Scrofulariaceae, Lamiaceae (= Labiatae), Cucurbitaceae, Rubiaceae, Asteraceae (= Compositae).

Monocotyledons: Arecaceae (= Phoenicaceae; = Palm), Poaceae (Gramineae), Bambusaceae, Cyperaceae, Liliaceae, Orchidaceae

Special study of three plants (with addiction properties) Introduction: The criteria for addiction.
1. Indian hemp = (Yamba), Cannabis sativa, belonging to the family Cannabinaceae.
2. The Poppy plant, Papaver somniferum, belonging to the family Papaveraceae.
3. The Coca plant, Erythroxylon coca, belonging to the family Erythroxylaceae.

BOTA 2222: The Cryptogams (Cryptogamic Botany)

Objective: To have a thorough overview of non-flowering plants and their medicinal importance including use in drug research and development.

Content: The classification of spore-producing plants, in general. Algae (both lower and advanced algae including fresh-water and marine algae) and Fungi. Particularly mention will be made of representatives of the various sub-divisions or phyla: Chlorophyta; Euglenophyta; Pyrrophyta; Chrysophyta; Phaeophyta; Cyanophyta; Rhodophyta; Myxothallophyta; (Introduction to the true fungi (Eumycetae); Phycomycetae; Ascomycetae; Basidiomycetae; Fungi Imperfecti; and Lichens. Also to be done is a detailed study of the Bryophyta and Pteridophyta. As such, there will be an introduction to the Bryophyta and then a study will be done in particular on the Hepaticae; Anthocerotae and Musci. Same will be done for introduction to the Pteridophytaes with detailed study of the respective representative classes: Psilophyta; Lepidophyta; Calamophyta; and Pterophyta. Their economic importance with stress on use of some in drug discovery, development and research will be highlighted.

CHEM 2112: Analytical Chemistry

Objective: To introduce the student to the understanding of the mechanisms of redox-reactions, electrochemistry and acid-base reactions. The course is intended to equip the student with skills in the area of titrimetric analysis. The course is designed to prepare the students for the understanding of the course in Food Analysis which is offered in the third year.

Content: Classical Methods of analysis; Titrimetric methods of analysis; Conductimetric methods; Potentiometric methods; Electrochemical methods. Solvents and Solutions: Acid-Base Phenomenon in aqueous solutions; Acid-Base Neutralization; Solubility and Precipitation; Complexation Reactions; Redox-reactions; Spectral Methods and Organic compounds analysis

CHEM 1241: General Chemistry

Objective: This will give the student, a foundation in the field of Atomic Chemistry and Quantum Physics.

Content: Basic Principles of Chemistry: An introduction to atomic structure and electronic configuration of the elements; Electronic theory of valency; The Periodic classification of the elements; General study of hydrogen, nitrogen, oxygen, phosphorus, sulphur, chlorine, bromine, iodine, sodium, calcium, aluminium, iron, manganese, copper and zinc, with emphasis on similarities and differences based on position of the elements in the Periodic Table; Radioactivity and its applications.

CHEM / ICHE 1261: Inorganic Chemistry

Objective: This course will involve a comparative study of the physico-chemical properties, preparation and uses of the elements of the periodic table and their compounds of pharmaceutical importance. The chemical basis for the pharmaceutical uses will also be emphasized.

Content: Crystallized Solid States; Non-stoichiometric Defects in Metals; Atomic Phase Equilibria; Rutherford's Model of the Atom; Quantum Model of the Atom; Electronic Organisation/Configuration of Atoms; Periodic Classification; Chemical Bonding between the Lewis's Model-type atoms; Undulatory/ Kinetic Model of the Atom; Models of Bonding between Coordination Entities/ Coordination Complexes; Ligand Field/Bonding Theory.

CHEM / OCHE 1232: Organic Chemistry-I

Objective: This is for the students to understand the conformational structure of molecules in the plane, in space and the general patterns of reaction mechanisms. It prepares students for understanding of organic chemistry in the second year and Medicinal Chemistry in the third year.

Content: Introduction to Organic chemistry: IUPAC nomenclature, elemental analysis, molecular formula and structural isomerism. Isolation and purification methods. The concept of functional groups, resonance and aromaticity. A brief study of saturated and unsaturated hydrocarbons, cyclic hydrocarbons, alcohols, alkyl halides; ethers, aldehydes, ketones, carboxylic acids, amines and aromatic compounds. Comparisons of phenols, alkyl halides and aromatic amines with their aliphatic analogues. Common synthetic polymers and their uses. Introduction to carbohydrates, proteins, oils and fats and optical isomerism.

CHEM / OCHE 2111: Organic Chemistry-II

Objective: To serve as the continuation of Organic Chemistry, after Organic Chemistry-I.

Content: Dicarboxylic Acids: reactions, condensation, polymerisation, and malonic ester synthesis. Hyroxy Acids: Reformatsky reaction, lactides, lactones. Keto Acids and Esters: Claisen's condensation, keto-enol tautomerism, acetoaectic ester synthesis. Heterocyclic Compounds: Thiophene, pyrrole, furan, pyridine – aromatic and other chemical properties. Fused ring heterocyclics (e.g.) Quinoline, isoquinoline, purine, etc. Examples of drugs containing above ring systems. Aliclylic compounds: preparations. Diels-Alder reaction; ring stability. Bayer's theory, conformations of cyclohexane and derivatives and cyclopentane, fused rings: reactions, effect of conformation, ring expansion and contractions. Biologically important macromolecules and their interactions: Amino acids, Peptides, Proteins, Nucleosides, Nucleotides, RNA, and DNA; Structure of proteins, i.e. Primary, Secondary andTertiary structure, structure determination, sequence analysis, bio- synthesis and importance in pharmacy. Glycols: preparation, properties, periodic acid oxidation and pinacol rearrangement. Stereochemistry: Optical Isomerism compounds with more than one chiral centre, diastereomers. Meso compounds, resolution of racemates, asymmetric synthesis. Carbohydrates: nomenclature, glucose structure. configurational and stereochemical, absolute configuration: aldose reactions, oxidations, additions, Keller-Kiliani Fischer synthesis, cyclic structure of D-glucose, mutarotation, pyranose, furanose and configurations, rings size determination: disaccharides, structure and structure determination.

CHEM / PCHE 1242: Physical Chemistry

Objective: This course is intended to provide understanding to the student, for the comprehensive knowledge of the physico-chemical properties of matter in its solid, liquid and gaseous states and the transformation of the states; factors (e.g. pressure and forms of heat) that may affect any of these states as well as to provide a solid foundation for understanding the courses in Inorganic Chemistry, Organic Chemistry (e.g. organic chemical reactions), Medicinal Chemistry and Biochemistry.

Content: Introduction (Aspect I) - Study of the physico-chemical properties of matter in its gaseous, solid and liquid states. Gaseous State of matter: The Laws of Gases (e.g. ideal gas laws); Solubility of gases in liquids; Measurement of gas up-take or out-put by biological systems; Solid state of matter: Study of both electrolytic and non-electrolytic solids: especially their solutions (e.g. solubility and other colligative

properties of solutions of salts in water) and osmosis. Other closely related solution systems such as colloids together with properties or factors such as surface phenomena, phase rule, etc. Liquid state of matter: Solutions of acids, bases and their buffers (in aqueous solutions) including study of PHs of said solutions especially of those in biological systems as well as properties such as vapor pressure of aqueous solutions.

Part II: Thermodynamics: Enthalpy, Free energy, Entropy; Applications of Thermodynamics to Biochemistry; Study of kinetics of chemical reactions including chemical equilibria in both homogeneous and heterogeneous systems and, more particularly, the kinetics of enzyme catalyzed reactions (i.e. kinetics of reactions driven by biological catalysts); Oxidation and reduction reactions with emphasis on those including enzyme-catalyzed reaction systems. Electrochemistry: Electrode potentials, Conductance and electromotive force and their applications, Potentiometric titrations. Thermochemistry.

INFM 1131: Informatics-I (Information and Communication Technology)

Objectives: 1. This course is designed to equip students to become Computer literate (i.e. to introduce the student to Computer Basics - the main Windows application and any other relevant contemporary computer programme and its interface, tools and features) such that s/he will be able to know or do what is indicated by the course content. 2. To introduce the student to the application of Information Technology to the practice of -Pharmacy, in particular, and health delivery in general.

Content: Overview of Information and Communication Technology and their applications in contemporary society; Computer types; Computer Hardware; Components affecting the performance of a computer; Computer software and their operation; Networking and the Internet.

INFM 4252: Informatics II (Applied Informatics-I for Pharmacy Students)

Objective: This course is to acquaint pharmacy students with the applications of computers and information and communication technologies (ICT) to pharmacy and medicine.

Content: Computer-mediated communication and collaboration: Personal and group communication - (E-mail, Mailing lists, newsgroups and Pharmacy-related discussion forums).
Collaboration of health care providers using network technologies – Intranets, Telemedicine
Robotics and automation in pharmacy - pharmacy automation, automated medication dosage, filling, and packaging, coding of information, bar-codes, medication distribution and management, inventory control, computerized narcotic and iv systems.

INFM 5111: Informatics III (Applied Informatics-II for Pharmacy Students)

Objective: A continuation of Applied Informatics I, this course is to assist Pharmacy students to apply the knowledge acquired earlier in the applications of computers and information and communication technologies to pharmacy practice.

Content: Integrated health care information systems - point-of-care information systems, electronic patient record, computerized medical record system, health care financial systems, health care management and planning systems. Legal and ethical aspects of information technologies - health information confidentiality rules, security and privacy in medical information systems, biometrics, accountability and liability of information users and providers, intellectual property protection and copyright, regulation of the information infrastructure.
Commercial applications of information technologies – pharmaceutical marketing and advertising, financial and trade transactions (electronic data interchange)
Information technologies in pharmaceutical error prevention

MATH 1111: Mathematics-I (Algebra and Trigonometry)

Objective: This course aims at strengthening the capacity of the students in the field of mathematical analysis.

Content: Review of Algebra of real numbers (Linear functions including quadratic equations, indices, surds including vectors, logarithms and logarithmic functions, Binomial theorem for positive integral index, solution of inequalities, polynomials and their factorization. rational function and partial fractions); Trigonometry (definitions and elementary properties of trigonometric functions, radian measure, periodicity of circular functions, addition formulae and other basic identities).

MATH 1112: Mathematics-II (Calculus)

Objective: This course aims at strengthening the capacity of the students in the field of mathematical analysis.

Content: Calculus: Definitions, Use of theΔ - process, Formulae for sum, product and quotient, the chain rule; Differentiation of derivatives including simple algebraic, trigonometric, exponential and application of first-degree equations (e.g. as applied in Pharmacokinetics).
Integration: Definite and indefinite integrals of simple algebraic, trigonometric, exponential and logarithmic functions; Fundamental theory of integral calculus and its application to areas and volumes, methods of integration.

PHSY 1391: Human Physiology-I

Objective: Physiology, an introductory course, will enable students to understand how the human body works and provide the foundation for the study of other biomedical sciences.

Content: Autonomic Nervous System physiology: Parasympathetic and sympathetic neuro-effectors, Cholinergic mechanisms, Adrenergic mechanisms, Autonomic reflexes, Adrenal medulla, autonomic drugs.
Neurophysiology: Organisation of the CNS and CNS control systems, Spinal reflexes, Excitation, Inhibition. Localization of functions in the cortex, Motor system, Pyramidal and Extra pyramidal Sensory systems, Reticular formation, Cerebellum, Control of posture, Neurobiology rhythms, Sleep and unconscious states, Memory, Learning.
Special Senses: Eyeball, retina, sight, accommodation, photochemical mechanism, receptor potential, light reflexes, adaptation, Ear, Sound waves, Hearing, Taste, Smell.

PHYS 2241: Human Physiology-II

Objectives: Continuation of Physiology-I, this focuses on systems and provides the basis for understanding Applied Pharmacology in Therapeutics.

Content: Respiratory System Physiology; Respiratory System Physiology; Renal System Physiology; Gastrointestinal System Physiology; Endocrinology and Reproductive system physiology; The circulatory system; Cardiovascular System Physiology.

PHYS 1251: Physics-I (General Physics)

Objective: This course is intended to help the student understand the various theories and concepts in Physics that that may be encountered during his/ her training and practice.

Content: Mechanics and Properties of Matter; Thermal Physics, Sound and Optics; Electromagnetism and Modern Physics

PHYS 1252: Physics-II (Biophysics-I)

Objective: The objective of this course is to familiarize students with the knowledge of optics, mechanics of fluids, radioactive decay and dimension equations etc. This course is especially oriented toward the physiology of the human organism, as is the case of fluid mechanics which concerns the dynamics of blood flow.

Contents: Measuring systems; Dynamics; Concepts of Quantum Physics; Spectroscopy of emission; Radioactivity; Optics; Electrostatics; The laser.

PHYS 2121: Physics-III (Biophysics-II)

Objective: This is designed to provide the students with the theoretical basis on physical identification methods applied to medical biology (zone electrophoresis, flame photometry, radioactive methods, etc.) and also conservation (drying, freeze drying, etc.).

Content: Water; Solutions; Light Absorption by Solutions; Polarization of Light. Rotary Polarization; Liquid Diffusion; Colligative Properties of Solutions; Osmotic Pressure; Raoult's Law; Surface Tension; Ultracentrifugation; Electrical Properties of Solutions; Electrophoresis.

BIOPHYSICS-II

PRACTICALS: No. 1

Molecular spectroscopy of absorption; Radioactivity; Pan balance

PRACTICALS: No. 2

PH measurement; Surface tension; Stalagtometry; Conductometry

PRACTICALS: No. 3

Refractometry; Photometer emission; Polarimetry

PRACTICALS: N° 4

Spectroscopy; Microscope; Optical glasses.

PRACTICALS: N° 5

Electrophoresis; Electropherogram analyzer; Viscosimeter.

STAT 1121: STATISTICS-I (General Statistics: Descriptive & Inferential Statistics)

Objective: This course aims at strengthening the capacity of the students in the field of descriptive Statistics and Statistical Analysis thereby preparing the students for other courses (e.g. those involving inference/ decision-making based on data of scientific and technological investigations) which require application of statistical tools.

Content: Review of basic Statistics (description of a statistical series including graphical representation of a series; statistical characteristic parameters such as mean, standard deviation, and their examples; measure of central tendency to paired samples) Hypothesizing; Inference hypothesis; two-factor analysis of variance, data transformations, multi-way factorial analysis of variance; linear regression and comparing linear regression equations; simple linear correlation and multiple regressions; Testing for randomness; Data analysis, using statistical computer packages (MS Excel, SPSS, Graph Pad, etc.); Statistical probabilities;

Law of whole Numbers; Law of Probability: Distribution functions; Law of binomials including binomial distribution; Poisson Law; Moments; Law of Normal Distribution: Importance, Properties and Examples; Comparison of Percentages; Comparison of Means ; Test of an experimental to a theoretical distribution: K2 Test; Relationship between quantitative characteristics: Statistical correlation.

STAT 1122: STATISTICS-II (Biostatistics)

Objectives: The objective of this course is to ensure that the student is able to use and evaluate biostatistics in Pharmacy practice and academic research. At the end of the course, the student will be able to answer a research question or to test a hypothesis, select an appropriate statistical test, analysing data using a statistical computer package, explain and evaluate the results, and apply the results to decisions about research and practice.

Content: A review of types of data, categorization of data and basic statistics from measures of central tendency to paired sample hypothesis: parametric and non-parametric analysis, multi-sample hypotheses and multiple comparisons, two-factor analysis of variance, data transformations, multi-way factorial analysis of variance; linear regression and comparing linear regression equations; simple linear correlation and multiple regressions; binomial distribution, testing for randomness; and analysing data using statistical computer packages. Students will gain knowledge of various health-education problems and the statistics used to monitor and measure health.

ZOOL 1352: Zoology (Animal Classification)

Objective: This course is designed give to the student knowledge about the organization of the animal kingdom especially that of protozoans and metazoans and also insect vectors of parasitic diseases. Biology of these parasites and their vectors and their relationship with intermediate hosts and definitive hosts are also studied in this discipline.

Content: Animal Kingdom (general classification); protozoa (general classification) ; metazoans (general classification).

VIII.3 - PHARMACEUTICAL SCIENCES

PHAR 2592: Pharmaceutical Chemistry

Objective: This course is designed to provide an introduction of chemical principles to Pharmacy students in order to facilitate understanding of the physicochemical properties of drug molecules and knowledge about the nomenclature and structure including stereochemistry of drug molecules. It is intended to also provide understanding of drug development and design as well as those principles that relate to Pharmacology and drug metabolism.

Content: Acids and bases and their properties including uses; Partition coefficient and biopharmacy; Physicochemical properties of drugs; Isomerism with focus on Stereochemistry and isosterism; Drug analysis (Volumetric and spectroscopic analyses of drugs); Drug stability studies.

PHAR 5331: Pharmaceutical Analysis-I (Non-instrumental Analytical Methods)

Objective: The course is designed to help students understand the use of monographs for (pharmaceutical/drug) analysis.

Content: Drug quality assurance system; Monographs and specifications for drug products; Application of chemical and physicochemical analytical methods in purity determination, identification of pharmaceuticals including radiopharmaceuticals and other medicinal products; Basic methodologies for test of essential

drugs; Equivalence and bioequivalence of drug products; Biopharmaceutical methods in purity determination; Analysis of biological samples.

PHAR 5341: Pharmaceutical Analysis-II (Instrumental Analytical Methods)

Objective: This course is designed to introduce students to the use of analytical instruments in the identification, structure elucidation and quantification of drugs and food. As such, it aims to provide students with knowledge of the study of the various measuring devices, separation and identification of molecules and biological parameters which may be used in Clinical Chemistry and in the pharmaceutical industry. It places particular emphasis on the principle of operation and the equipment - the sensitivity, specificity and limitations of each instrument.

Content: Instrumental methods of analysis of pharmaceuticals and related substances -particularly principles of spectroscopy and other physico-chemical analytical methods that are practically employed in the routine analysis of pharmaceuticals and related health substances / products: Principles of Spectroscopy: Principles of Spectrometry; Other physico-chemical analytical methods (of analysis).

PHAR / MCHE 3111: Medicinal Chemistry-I

Objective: The course is designed to make the student understand the process of drug interaction at the receptor sites.

Content: Drug Design (Physico-chemical approaches to drug design. Theories and Principles of Drug Design. Free-Wilson and Hansch approaches. The concept of isosterism. Bioisoterism as a tool in drug design. SAR/ QSAR in drug design. Anti-metabolite and pro-drug approach to design of new drugs.); Medicinal chemistry of some selected compounds (A study of the following classes of drugs in respect of their nomenclature, physical and chemical properties, structure-activity, relationship, synthesis (where necessary), assay, metabolism, where applicable and uses.); General and Local anaesthetics; Sedative, hypnotics ,benzodiazepines, Antipsychotics-phenothiazines; Anticonvulsants - phenytoin, carbamazepines; Analgesics; Antidepressants - imipramine. Chemistry of drug metabolism.

PHAR / MCHE 3112: Medicinal Chemistry-II

Objective: The course is designed to enable the students relate molecular structures to biological activities.

Content: Chemistry of pharmacodynamic agents (Therapeutic classification, Chemical classification, Physico-chemical properties and storage, Structure activity-relationship and Synthesis). Chemistry of chemotherapeutic agents (Advanced stereochemistry Therapeutic classification, Chemical classification, Physico-chemical properties and storage, Structure activity-relationship and synthesis).

PHAR / MCHE 4121: Medicinal Chemistry-III (Phytochemistry)

Objective: The course will cover the various classes of plant secondary metabolites including alkaloids, glycosides, tannins, flavonoids, coumarins, terpenoids, lipids and essential oil products. Emphasis will be placed on their physical and chemical properties that will facilitate their extraction and detection in practical terms.

Content: Chromatographic techniques that may be used in the fractionation and isolation of these metabolites. The techniques will include paper chromatography, thin layer chromatography, gas chromatography, high performance liquid chromatography. Alkaloids: Alkaloids of the pyridine groups such as nicotine, arecoline, etc. Tropine group: - atropine, Steroidal Alkaloids: - Veratum: alkamines, glycosidic and ester alkaloids such as ephedrine. Glycosides and terpenes and terpenoids.

PHAR 14102: Pharmacy-I (Introduction to the Pharmacy Profession and Drug Administration)

Objective: It provides the student with basic concepts in the field of Pharmacy and the Pharmacy profession.

Contents: General information on pharmacy and drugs: Pharmacy Orientation; History of Pharmacy; Literature of Pharmacy; Relationships between food, drug and poison; The Code of Public Health; Notion of responsibility of the pharmacist; Medical Prescription and the Various Classes of Drugs; Pharmaceutical Profession; Pharmacy Practice and its Obligations; Galenical concepts of Pharmacy (Composition, origin and nature of drugs; Routes of Drug Administration; Fate of Drugs in the Body, Dosage and Toxicity; Excipients and Packaging Elements); The Packaging Materials; Conservation and Control of Medicines; Pharmaceutical Operations; Drug Dosage Forms (Forms for the Rectal and Vaginal Route; Various Drug Forms; Objects of Dressings, Ligatures, Surgical Sutures).

PHAR 5351: Agrochemicals / Phytopharmacy

Objective: The course is designed to provide students with the understanding, use and the dangers of agrochemicals.

Content: Pesticides; Insecticides; herbicides - Introduction and Definition. Classification of Insecticides, Pyrethroids and Neem based. Integrated pest management, Organo chlorine Insecticides, Organo Phosphorus Insecticides, Carbamates and Sulphur-Containing Compounds, Synthetic Pyrethroids. Fumigants. Fungicides; Introduction and definition. Classification of Fungicides. Formulation methods Sulphur Fungicides. Copper Fungicides Mercury Fungicides, Antibiotics; Precautions taken during handling and storage of Fungicides

PHAR 5361: Veterinary Pharmacy

Objective: The course is designed to provide students with the knowledge of drugs that are used to treat common diseases in animals.
Content: Introduction to Veterinary Pharmacy; Formulation and Storage of Veterinary Drugs; Administration of Veterinary Drugs; Growth promoters; Common animals diseases; Therapy of common animal diseases.

PHAR 5371: Cosmetology (Cosmetic Pharmacy: Dermato-Cosmetology)

Objective: This course is designed to enable students have knowledge, including the benefits, dangers and the rational mode of application of chemicals and drugs used in cosmetics/aesthetics and beautification procedures. It is tailored to also enable students discuss the benefits and disadvantages of different cosmetic products with clients during salon services and in different disease conditions.

Content: Analyze pH of various hair, nails, body and other beauty products. Identify disorders of the scalp, pediculosis capitis, pityriasis, scabies, tinea etc. and appropriate drugs use. Research various treatments of scalp disorders.
The students will evaluate hands and feet for cosmetic procedures. Identify the parts and composition of the nail. Identify nail and skin disorders and diseases commonly encountered by nail technicians. Properly applies various types of silk, linen, or fiberglass overlays. Properly applies UV gel products to natural and artificial nails.

PHCG 3352: Pharmacognosy-I

Objective: This course will enable the student to: give account of the plant kingdom as repositories of pharmacologically active molecules; explain the structural diversity of natural products; describe the physical

and chemical properties of the different classes of natural products; plan and carry out laboratory procedures for basic extraction and identification of various classes of natural products; identify a selection of the most important medicinal plants;
explain the uses of a selection of the most important medicinal plants; describe the pharmaceutically active compounds in these selected plants.

Content: General introduction (Physical and chemical properties, the occurrence, extraction and isolation of the various classes of chemical constituents); Carbohydrates; Tannins; Glycosides; Benzopyrans; Volatile oils, resins and resinous substances; Fixed oils, fats & waxes; Enzymes; Alkaloids

PHCG 4482: Pharmacognosy-II

Objectives: The course will enable students to eexplain the factors that affect crude drug production and development and be able to describe the basic principles involved in their evaluation. It will also enable them to understand and detect adulteration of commonly used medicinal plants. It will also enable the student to explain the basic principles underlying various chromatographic techniques. Also the student will be able to describe and use techniques in the quality control of crude drugs.

Content: Crude drug production; Crude drug adulteration; Crude drug evaluation; Separation techniques; Poisonous plants.

PHCO 3371: Pharmacology-I (General & Molecular Pharmacology)

Objective: This course will enable the student to: 1. Focus on the behaviour of the drug from its administration until its removal from the body and 2. Introduce the student to General and Molecular Pharmacology and its application to therapy.

Content: Introduction to Pharmacology; Autonomic nervous system (The cholinergic system; the adrenergic system; the skeletal-neuromuscular transmission; Non adrenergic-non cholinergic transmission [NAC]); Drug interactions.

PHCO 4111: Pharmacology-II (Applied Pharmacology)

Objective: This course will enable the student to: 1.Focus on the behaviour of the drug from its administration until its removal from the body. 2. Introduce the student to systemic Pharmacology and its application to therapy.

Content: Central Nervous System (CNS) Pharmacology; Endocrine and Autacoid Systems Pharmacology & Toxicology and Drug Interactions; Cardiovascular (System Pharmacology); Renal System Pharmacology; Gastrointestinal System Pharmacology; Respiratory System Pharmacology; Hemopoietic System Pharmacology.

PHCT 2371: Pharmaceutics-I

Objective: The objective of this course is to prepare the student to the art of making drugs. It introduces the student to the basic industrial technology for the manufacture of drugs. In addition to the industrial processing, compendia pharmaceutical preparations are also discussed.

Content: Introduction to dosage forms - classification and definitions; Classification of Pharmaceutical Dosage Forms; Pharmaceutical Dosage Forms; Prescription: definition, parts and handling; Posology: Definition, Factors affecting dose selection. Calculation of children and infant doses; Weights and measures, Calculations involving percentage solutions, allegation, proof spirit, isotonic solutions etc.

PHCT 3361: Pharmaceutics-II

Objective: This course is to introduce the student to the processes in the manufacture of drugs. It will also introduce students to various formulation techniques including colouring and flavouring.

Content: Comminution process; Extraction; Materials for plant construction, corrosion and corrosion control; Evaporation; Drying; Filtration; Mixing; Distillation; Micromeritics; Powders and powder Technology; Solid Oral Dosage Forms; Pharmaceutical Packaging; Aerosols; Dispersed Systems

PHCT 4472: Pharmaceutics-III

Objective: This course is designed to help students acquire knowledge in specific manufacturing techniques. It also covers the control procedures during manufacture of drugs and good practice.

Content: Solubilization; Preformulation and Formulation of Pharmaceuticals; Decomposition of Pharmaceuticals. Incompatibilities. (PH and solvent effects), Diffusion and Dialysis, Dissolution.,, Good Practice in Production and Quality Control., Microbiological Aspects of Good Manufacturing, Microbiological Aspects of Good Manufacturing Practice., Sterile pharmaceutical products. General Manufacture of sterile Preparations, Drug Distribution, Post marketing surveillance/Pharmacovigilance, New Trends in Pharmaceutics. Environmental Health., Drug delivery system and drug product design. Multiple and microemulsion, Biopharmaceutics. Pharmacokinetics. Nonlinear Pharmacokinetics. Bioavailability and Bioequivalence., Nanotechnology.

PHCT 53112: Pharmaceutics-IV (Biopharmaceutics)

Objective: This course is designed to introduce students to the issues associated with the pre-formulation of drugs and the design of their dosage forms from an industrial perspective, with regards to their physicochemical properties, composition, the actions of the body on them (i.e. drugs undergoing pharmacokinetic phase) and activities in living organisms and with the knowledge of how to address same.

Content: General overview of the processes (i.e. phases – three in number) that occur between the administration of a drug and the production of its effects: Pharmaceutical phase, Pharmacokinetic phase, Pharmacodynamic phase. Required physicochemical nature of a drug. Some aspects of the relationship between the pharmacokinetic parameters.

PKTS 5272: Pharmacokinetics

Objectives: This course is designed to assist the student to be able to: 1. Define
Pharmacokinetics (PK) and pharmacodynamics (PD). 2. Describe absorption, distribution, metabolism and excretion as it applies to medicines (ADME) and transport. 3. Recognize medicines for which pharmacokinetic and dynamics are significant. 4. Recognize the half-life of the common medicines (e.g. digoxin) for which pharmacokinetic (PK) parameters are significant. 5. Clinically dose and monitor drug therapy for those drugs with narrow therapeutic indices, using knowledge of age, disease, renal function and drug interactions on drug disposition.

Content: Definitions, terminology and symbols used in Pharmacokinetics. Derivation and calculation of pharmacokinetic parameters. Fate of drug after administration. Clinical significance of drug concentrations in the blood. Biological and physicochemical factors in drug absorption, disposition and transport.

BIOL / PMBI 6341[ψ]: Pharmaceutical Microbiology & Biotechnology

Objective: The course is designed to introduce the student to Pharmaceutical Microbiology and the techniques of genetic engineering and fermentation as used in the pharmaceutical industry for the production of active ingredients and drug manufacturing.

Content: Historical development of Microbiology and the effects on health., General structure of the bacterial cell; the bacterial spore, its structure and resistance to inactivating agents., Systematic classification of bacteria and characteristics of major groups; Bacterial culture media and evolution of pure culture technique; Enumeration of microorganisms. Fungi and moulds; their importance in pharmacy, and medicine;

The Richettstia, Chlamydia, Viruses (including HIV/AIDS) and viral replication; Introductory Parasitology. Protozoal parasites of Public; Production and storage of water; Basic techniques in biotechnology; Engineering antibodies for therapy – production of monoclonal antibodies, recombinant antibodies and antibody fragment; Biotechnology in vaccines development; Microbial Chemotherapy and Bacterial Genetics; Introduction to Bacterial Genetics and Genetic engineering; -Preservation and Fermentation Biotechnology, General principles of spoilage and preservation against biodegradation; Fundamentals of Industrial Fermentation. Fermentation and product recovery; Primary and Secondary Metabolites. Infectious Diseases and their Pathogenesis

PTHE 5282: Pharmacotherapeutics & Clinical Trials

Objective: This course will emphasize on the application of the knowledge of the pathophysiology, clinical manifestations, epidemiology, diagnosis, biopharmaceutics and pharmaceutical care to develop skills in planning the rational therapeutic and non-drug therapy of selected diseases. Case studies and WHO/other standard indicators/prescribing guidelines are employed as approaches to developing the ideas of rational drug therapy, monitoring drug therapy and drug interactions.

Content: Cardiovascular systems, nephrology, psychiatry/neurology, haematology / oncology, infectious diseases (including HIV/AIDS and STDs), common eye and ear disorders, paediatric and geriatric drug therapeutics, drug therapy in pregnancy and clinical toxicology, fluid and electrolyte balance, pulmonary systems, gastroenterology, rheumatology, endocrinology, medical emergencies and critical care therapeutics including treatment of poisoning and adverse drug reactions.

TXCL 4131: Toxicology-I (General Toxicology)

Objective: The course is designed to assist the students acquire knowledge of poisons and other common toxicants. It will also introduce students to monographic study of some poisons.

Content: General knowledge of poisoning; Treatment of poisoning; Mechanism of drug toxicity; Management of acute drug poisoning; Selected plants, bacteria and animal poisoning; Solvent toxicity; Pesticide and herbicides and elementary treatment of radiation toxicology; Airborne poisoning; Heavy metal chelating agents; The concepts of teratogenicity and carcinogenicity

TXCL 5381: Toxicology-II (Emergency Toxicology)

Objective: This course focuses on the concepts of care in emergency toxicology and the causes of toxicity. Monographic aspects are also discussed.

Content: Concepts of Emergency and Clinical Toxicology; Emergency Care Toxicology; Causes of Toxicity (Methodology); Management of Poisoning; Special Case Studies; Toxicological Profile; IEC for prevention

VIII.4 PROFESSIONAL STUDIES AND EXTERNSHIP / TRAINING COURSES

NURS/PHAR 3682: Nursing (Basic Nursing Care)

Objective: This is course is designed to: 1. Introduce the student to methods of correct noting of vital signs and interpretation of their recorded results. 2. Introduce to the student techniques of proper administration of injections employed in medical routines.

Content: Techniques of blood pressure, pulse and body temperature measurement and urine collection; Techniques of plotting results of collected clinical vital signs; Analysis and interpretation of plot of the data on the noted vital signs; Techniques of proper administration of injections.

PHAR 6341[ψ]: Pharmaceutical Care

Objective: This course, (elective), will enable the student to understand the concepts and philosophy of pharmaceutical care and their applications.

Content: History and evolution of pharmaceutical care; Principles of pharmaceutical care, health promotion, health defeating behaviours, proper nutrition, age-related changes affecting medication selection and effects; Pharmaceutical care skills; Developing pharmaceutical care plans; Patient data collection and evaluation; Drug therapy problems; Documentation of pharmaceutical care; Pharmaceutical care in chronic disease states (asthma, hypertension, diabetes, HIV/ AIDS, malaria, tuberculosis, etc.).

PHAR 2481: Introduction to Drug Delivery

Objective: This course is intended to expose students to the training sessions in drug dispensing in Pharmacy settings, with focus on knowing and using or handling contemporaneous pharmaceutical including biotechnology made products.

Content: General Review of Drug Delivery-type Pharmaceutics; A drill or overview of contemporary marketed and investigational medicinal products including drugs and non-drug anciliary health products and how they are to be dispensed and administered; Updated information about research and development on new drugs including their delivery systems; Regulatory considerations and general overview of the above products being marketed, prescribed and dispensed:

PHAR 3481: Industrial Experience

Objective: This course is intended to introduce students to Industrial Pharmacy and Pharmaceutical Technology.
Content: Phases or key components of cycle including forms of production, manufacturing and release of drugs: principles of Triangle of Managerial Responsibilities including the importance of the role of qualified person (QP), relative to product release and others; the drug production master file and concepts of set limits (e.g. of contamination/sterilization); etc.

PHAR 44101: Pharmacy Laws & Ethics

Objectives: (concerned with the legislations and the code of ethics that govern Pharmacy practice). This course is designed to: 1. Provide knowledge about the legal and ethical frameworks and tools to the students so as to be able to resolve ethical/ legal questions, dilemmas and challenges that are encountered in conducting professional services. 2. Define the roles of Ethics, the conditions of Pharmacy practice and to provide for knowledge about penalty in the illegal practice of Pharmacy.

Content: Definition of Ethics; Theories of Ethics; Ethical Principles; Ethical problem solving; Code of Ethics (International and National); Model Code of Ethics for Pharmacy Profession; Case Studies; National medicines regulatory laws , Pharmacy laws and professional association of home country; The scheduling of medicines; The United Nations Narcotics Commission; International treaties on Narcotics and Psychotropic substances and precursors; The environmental protection laws; The national medicines policy; Consumer protection laws; Other laws relevant to the practice of Pharmacy

PHAR 44111: Clinical Pharmacy Clerkship-I

Objective: This course is designed to provide the opportunity for the student to have direct contact with patients in clinical settings (hospital wards) and participate in associated Pharmacy experiences. The course is constructed to enable the student to assimilate and apply her/his previously acquired pharmaceutical knowledge in a patient care environment.

Content: Drugs dispensing to patients, Internal Medicine, Paediatrics, Intensive Care, Hematologic/oncologic care, Psychiatry, Community Pharmacy practice and drug information service. Activities will cover history taking, medication records review, identification of drug-related problems, drug therapy monitoring, interventions and counter prescribing, health promotion, disease prevention and responding to symptoms. The students will be rotated through health facilities including tertiary, secondary and primary care health facilities and community pharmacies. Each student will make an oral case presentation and submit a written report at the end of each rotation.

PHAR 46122: Clinical Pharmacy Clerkship-II

Objective: The course is designed to serve as Phase-II of Clinical Pharmacy Clerkship (hospital wards and Community Pharmacy) and hence is to reinforce coverage of the first
clerkship phase.

Content: Same as for Clinical Pharmacy Clerkship-I.

PHAR 54101: Clinical Pharmacy Clerkship-III

Objective: The course is designed to serve as re-enforcement of coverage of Phase-II of Clinical Pharmacy Clerkship (hospital wards and Community Pharmacy).

Content: Same as for Clinical Pharmacy Clerkship-I and more of Clinical Pharmacy Clerkship-II.

PHAR/DINF 53102: Drug Information Services

Objectives: This course is designed to enable students acquire competences of designing and utilizing evidence-based drug information for rational use of medicines.

Content: Building and enabling drug information data base within the healthcare delivery unit; Common journals and electronic abstracting and indexing programmes (e.g. PubMed,
WHO, Uppsala Monitoring Centre, Coordinated Informed Buying Website of WHO, etc.); Guidelines, formularies and protocols; Programme Medicines; Management Information Systems and professional communication; Health literacy.

PHAR 5392: Prescription Assessment/Evaluation

Objective: This course is intended to enable the student to verify the authenticity and evaluate prescriptions.

Content: Chronology of the prescription order; Rules for prescribing and dispensing; Pharmacology of the drugs prescribed; Nature of drugs; Dosages and doses; Drug interactions; Lifestyles and dietary advice; Prescription-related diagnosed.

PHAR 5491: Pharmacy Management

Objective: The course is to ensure the understanding and application of management knowledge and skills in pharmacy practice.

Content: Management theories; Managerial concepts and applications; Marketing concepts, functions and processes; Entrepreneurial skills; Overview of Business Laws (in home country); Human resources management; Financial Management; Basic Accounting; Pharmaceutical Supply Management:

PUBH 3572: Public Health-I (Community Health)

Objective: This course is designed to facilitate, for the student, the implementation and evaluation of the community's local, national and/or international health project. It is intended to also help the student understand the basics of a multidisciplinary and multi-professional approach to health promotion in general and community health in particular.

Content: Basics of Public Health; Systems and Health Networks; Foundations of Health Promotion and Community Health; Planning, Management and Evaluation Project; Primary Health Care. Measures of population health (sanitary and epidemiological statistics); Issues of national public health from a local and/or international perspective; Communication and Social Marketing; Social inequality and health in a global perspective.

PUBH 45121: Public Health-II (Public Health Pharmacy)

Objective: This course, (which may be offered as either a required course or elective), is designed to enable students appreciate the place and role of Pharmacy and those of the Pharmacy professional in healthcare system and, in particular, Public health.

Content: Introduction to Health Care; Healthcare Delivery Systems; Disease Prevention Strategies (in general); Introduction to Pharmacy Systems (Various career options and organizations in Pharmacy); The Role of the Pharmacist in Public Health; Principles and Concept of Primary Health Care: including the essential drugs/medicines concept; Drugs Use and Management in Primary Health Care (Commonly used drugs, drugs selection and distribution/essential drug list concept and drug information and education in Primary Health Care); Drugs Use in Infertility and Family Planning Management; Nutrition (i.e. good nutrition, nutritional status of the community and drug management/prevention of malnutrition); Discussion of provision of preventative, curative, promotive and rehabilitative services; Public education/enlightenment in Primary Health Care with special emphases on the importance of the role of pharmaceutical care in promoting Public Health.

PUBH 45131: Public Health III (Health Economics: Pharmacoeconomics)

Objective: This course will enable students understand and apply pharmacoeconomic concepts in Pharmacy practice.

Content: Definition, history, needs of pharmacoeconomic evaluations: role in formulary management decisions; Pharmacoeconomic evaluation (Outcome assessment and types of evaluation, Theoretical aspects of the various methods and practical study of said methods with the help of case studies for individual methods; Application of Pharmacoeconomics in patient care.

PUBH 4592: Public Health-IV (Emergency Medical Intervention/First Aid)

Objective: This course is a practical education that aims to introduce students to the various standard procedures used to rescue a person who is in danger. Students are introduced to the technique of external cardiac massage, washing techniques to chemical exposure and the provision of care for the survival of the patient prior to transport to the hospital.

Content: Behaviour in the presence of a traffic accident; Methods for collection of an injured person; Asphyxia: methods of artificial respiration; Bleeding; Fractures, dislocations and sprains (Immobilization); Wounds (Burns, Infections); Bandages (Scarves); Fires (Fight against fire); Poison gas.

PUBH 45102: Public Health-V (Pharmacovigilance & Pharmacoepidemiology)

Objective: This course is designed to provide understanding of the concepts of Pharmacovigilance and Pharmacoepidemiology and their application.

Content: Definition and scope (Origin and evaluation of pharmacoepidemiology need for pharmacoepidemiology, aims and applications); Measurement of outcomes in pharmacoepidemiology; Concept of risk in pharmacoepidemiology (Measurement of risk, attributable risk and relative risk, time-risk relationship and odds ratio); Pharmacoepidemiological methods; Sources of data for pharmacoepidemiological studies: *Ad hoc* data sources and automated data systems; Selected special applications of pharmacoepidemiology (Studies of vaccine safety, hospital pharmacoepidemiology, etc.); Phamacovigilance.

PUBH 45112: Public Health-VI (Nutrition and Dietetics)

Objective: This course provides the basis and role of nutrition in the maintenance of good health.

Content: Definition of terms; The basic nutrients; Malnutrition, Nutrition Deficiencies and Deficiency Symptoms; Tools for designing a healthful diet; Digestion disorders; Nutrients, Fluid and Electrolyte Balance; Nutrients Involved in Antioxidant Function; Nutrients for Bone Health; Nutrients, Blood Health and Immunity; How to achieve and Maintain a Healthy Body Weight; Nutrition and Physical Activity; Eating Disorders; Nutrition, pregnancy and lactation; Nutrition in children, adolescence and the aged; Popularity of health foods and supplements, their sources (both local and foreign) and uses (neutraceuticals); Nutrition and good health; Interactions between foods and medicines; Interactions between disease and foods; Dietetics.

PUBH 6341[w]: Public Health-VII (Public Health and Development)

Objective: This course is designed to provide understanding of the role of pharmacists in public health.

Content: The role of the pharmacist in public health; Disease prevention strategies; Health promotion; Principles and concept of primary health care including the essential drugs concept; Drug use and management in PHC (commonly used drugs, drug selection and distribution/essential drug list concept and drug information/education in primary health care); Drug use in infertility and family planning management; Nutrition (good nutrition, nutritional status of the community and drug management/prevention of malnutrition; Provision of preventative, curative, promotive and rehabilitative services; Public education/enlightenment in primary health care will be discussed with special emphasis on the role of pharmaceutical care in promoting public health.

TMED 3692: Traditional Medicine

Objectives: The course is designed to help students understand the concepts of African Traditional Medicine and other major complementary and alternative medicines (CAM), and enable them to: 1. Explain the role of traditional medical practice in healthcare delivery in developing countries and 2. Advocate for the use of quality, safe and efficacious herbal medicines.

Content: Definition of terms used in the practice of complementary and alternative medicine (CAM); The major CAM practices including chiropractic, massage, aromatherapy, Ayurveda, acupuncture, homeopathy, naturopathy, reiki and Traditional Chinese medicine (TCM); African Traditional Medicine (Historical development; role of psychism, fetishism, spiritism and herbalism); Diagnosis (Concepts of diseases, causes of diseases, diagnosis and diagnostic tools); Medicinal Preparations (Collection, preparation, preservation and

production of dosage forms, standardisation techniques); Phytotherapy (Selected medicinal plants and preparations used in the treatment of specific disease states); Comparative Medicine (Comparison of Orthodox and Traditional Medicine, advantages and disadvantages of both systems; role of Traditional Medicine in Primary Health Care); Medicinal Plant Research; Phytopharmacology and Phytotoxicology (Pharmacological screening of herbal preparations; Potential sources of toxicity; Limitations on the use of herbs).

PHAR 6451: Professional Experience-I

Objective: This is Phase I of the course(s) designed to place students to acquire the necessary skills that will enable them carry out research projects.

Content: Appropriately designated areas of rotation, per routine placement, based on requirements of in-country Pharmacy training institution and/or Pharmacy practice regulatory authority but under the superintendence of a licensed practicing pharmacist at either an institution or a centre recognized by the national Pharmacy accreditation authority.

PHAR 6112: Professional Experience-II

Objective: This is the second part of the course(s) is designed to place students to acquire the necessary skills that will enable them carry out research projects.

Content: Appropriately designated areas of rotation, per routine placement, based on requirements of in-country Pharmacy training institution and/or Pharmacy practice regulatory authority but under the superintendence of a licensed practicing pharmacist at either an institution or a centre recognized by the national Pharmacy accreditation authority.

PROJ 6222: THESIS/DISSERTATION

Objective: 1.To respectively enhance and reinforce the student's knowledge and skills in conducting research. 2.To help the student add to the existing body of (e.g. scientific/clinical) knowledge as well as produce new evidence-based and unbiased scientific findings that will improve the quality of service delivery including clinical care.

Content: Original write-up consisting of or minced into, at least, five chapters or parts along the sequence: Introduction including Literature Review, Methods (used), Results, Discussion, and Conclusion. Chapters preceded by a one-page abstract which will concisely highlight the key elements of the various components of the write-up covering the candidate's project/research work and that is structured into: Objectives, Methods, Results, and Conclusion.
The details as to the choosing of one's (research) dissertation topic, its format including length and pagination features will be left with the choice of the Faculty and specifically with the guidance of the candidate's supervisor assigned to her/him for the work.

VIII.5 TRAINING SUPPORT/ ENVIRONMENT-BASED REQUIRED COURSES

BIOA 55111: Biomedical Analysis

Objectives: The course is designed to give to the student the opportunity to develop adequate laboratory skills with reference to biomedical applications. It also aims at providing the student with knowledge and skills in the conduct of analysis, good laboratory practices and the validation of results.

Content: General laboratory procedures; General laboratory safety; Biological sample collection; Data handling and management.

CLAW 5221: Commercial Law

Objective: The purpose of this course is to introduce students to the general provisions of Commercial Law.

Content: Business Bond / Agreements (Definition, Obligations: Advertising in the commercial register, books, business and accounting); Partnerships (Capital companies); the goodwill / note; the merchant, the balance sheet); Cost Accounting (including Commercial paper: checque, bill of exchange, promissory note, bill).

PATH 4381: Pathology-I (Medical and Surgical Pathology)

Objective: The course will provide the student with pathological basis of diseases that are commonly seen in clinical practice.

Content: The normal cell and the adopted cell; Cell injury and cell death; Inflammation and repair; Neoplasia and its clinical aspects; Diseases of immunity; Systemic diseases (Diabetes mellitus, Iron storage disorders, Gout and urate deposits in the kidneys); Fluid and haemodynamic derangements; Infectious disease; Deficiency diseases (protein-calorie malnutrition, vitamins and minerals deficiency; Blood vessels and the heart; lymph nodes and spleen; All systems, skin, liver, gastrointestinal tract, pancreas, breast and biliary tract.

PATH 4391: Pathology-II (Infectious Pathology)

Objective: The course is intended to provide the student with pathological basis of infectious diseases that are commonly seen in clinical practice.

Content: General information on infectious diseases: 1) Tuberculosis; 2) Typhoid fever; 3) Cholera; 4) HIV / AIDS; 5) Other STDs; 6) Infectious diarrhoea; 7) Urinary Tract Infections; 8) Malaria; 9) Flu: Avian influenza.

PHSY 3462: Pathophysiology / Semiology-I

Objective: This course is designed to provide understanding of mechanisms of disease processes.

Content: HIV/AIDS; Tuberculosis; Malaria; Worm Infestations; River blindness; Varicella; Thyroid disorders; COPD; Hyperlipidemia; Congestive heart failure; Myocardial infarction; Hypertension; Renal failure; Diabetes and diabetic complications; Allergies; Influenza; Asthma; Prostate cancer; Cervical cancer; Other cancers prevalent in student's home country of study; Depression.

PHSY 4371: Pathophysiology / Semiology-II (Medical and Surgical Pathophysiology)

Objective: This course is designed to introduce the student to the techniques of clinical investigation of body disorders with use of their associated signs and symptoms so as to make appropriate diagnosis of said dysfunctions.

Content: Arterial hypertension; Cardiac insufficiency; Angina pectoris; Arthymias; Diabetes; Gastroduodenal ulcer; Asthma.

PSYC 2372: Health Psychology

Objective: This course aims to familiarize students with the impact of psychological factors in the development and management of diseases.

Content: General principles of Psychology; Medical sociology; Role of Psychology in healthcare delivery; Patient behaviour to health, disease and medication; Management of aggression, anger and stress; Psychological factors in anxiety; Depression and psychosomatic illness, etc.

QMAN 5132: Quality Management-I (Quality Approach)

Objective: This course is designed to assist students acquire knowledge of the tools required for the development of quality within an analytical laboratory or manufacturing company.

Content: 1. Development of quality assessment procedures. 2. Evaluation of the quality approach.

QMAN 5142: Quality Management-II (Biosafety)

Objective: The course is designed to teach students about the principles of prevention and management of laboratory-based risk.

Content: Health Education; General Prevention and Risk Management; Radiological risk management; Chemical risk management; Biological Risk Management; Fire risk management.

QMAN 5152: Quality Management-III (Good Laboratory Practices, GLP)

Objective: The course is designed to allow the student to have knowledge of good practices in a laboratory.

Content: Management and organization, Materials, equipment, instruments and devices, Working procedures and documents, and safety in the laboratory. Sampling and testing processes e.g. Incoming samples (Sampling plan and procedures), Sample size sufficient for the tests to be performed replicate tests retained / retention sample, sampling plan and internal procedure for sampling.

QMAN 5162: Quality Management-IV (Good Manufacturing Practices)

Objectives: This course is designed to: 1. Introduce the students to the concepts of conditions of hygiene and safety in the pharmaceutical industry. 2. Allow the students to have good knowledge of the steps involved in designing, manufacturing, packaging, storage and quality assurance in the pharmaceutical industry.

Content: General introduction with glossary of terms (general inspection, quality assurance and quality control procedures and sampling); Personnel and training, building and environmental hygiene, planning formula and manufacturing instructions. Handling of starting materials, packaging materials, intermediate products, finished products, standard and batch packaging and labelling instruction, control of packaging materials and packing operations, supervision of production, storage, transport and distribution; Manufacture and control of sterile medicinal products including premises processing environment, aseptic area and equipment. Cross contamination etc.

RMET 5112: Research Methodology-I (Introduction to Research Methodology)

Objective: This course is designed to introduce students to research methodology.

Content: Definition of Research; Typology; Internal validity of a study; External validity of a study; Components of an operational research project (Background and rationale, methodology, expected results, timeline, budget estimate).

RMET 5122: Research Methodology-II (Bibliographical Research)

Objective: This course is designed to introduce students to research information useful in writing (or exercise) of her/his thesis /dissertation work. The student will be trained on online research journals related to the topic as well as to the different techniques of presentation of references.

Content: Overview of the literature search; Finding articles and books in the library; Electronic search of articles (Medline, Google, other search engines).

RMET 6231: Research Methodology-III (Scientific Writing and Presentations)

Objective: This course is designed to enable the student make scientific report both in writing and orally.

Content: Format for thesis writing, scientific reports, abstracts and oral presentations will be discussed. This will include slide and poster presentations, etc.

APPENDIX: List of Persons that Participated in the PharmD Curriculum Harmonisation Process

BENIN	
M. AÏNADOU Henri Charles:	Président de l'Ordre National des Pharmaciens du Bénin,
M. DANSOU Alfred:	Directeur des Pharmacies et du Médicament au Ministère de la Santé
Prof. BIGOT André:	Vice-Doyen de l'UFR Pharmacie – F.S.S
Prof. Dorothée KINDE-GAZARD:	Prof. ag. de Parasitologie -Mycologie UFR Pharmacie - F. S. S BP 188 Benin
BURKINA FASO	
Prof. Mamadou SAWADOGO*: **Succeeded by Prof. A. OUEDRAOGO*	Doyen UFR Sciences de la Santé UFR /SDS
Prof. Arouna OUEDRAOGO:	Directeur de l'UFR des Sciences de la Santé, Université d'Ouagadougou
Prof. Jean SAKANDE:	Prof. ag. de Biochimie UFR /SDS
Pr. KABRE Eli:	Directeur Adjoint UFR des Sciences de la Santé Université d'Ouagadougou
CAPE VERDE	
Ass. Prof. André Guimarães Lemos Antunes:	Universidade Jean Piaget de Cabo Verde
Dr, Carla Daniela Resende VAZ:	Inspectora Farmaceutic
Dr. LUCIA Pires Barros:	Directrice do DCM DGF Ministère de la Santé du Cap Vert, PRAIA
Master Hélio Rocha Daniel Ribeiro Rocha:	Universidade Jean Piaget de Cabo Verde
CÔTE D'IVOIRE	
Dr. Parfait KOUASSI	Ex-Président, L'Ordre National des Pharmaciens de Côte d'Ivoire
Mme Kozolo SORHO-SILUE	Chargé d'Etudes à la Direction Générale de la Santé (DGS) WAHO Former Liaison Officer
Prof. André INWOLEY	Vice-Doyen charge de la Pédagogie, UFR Sciences Pharmaceutiques et Biologiques, Université FHB de Cocody
Prof. ATINDEHOU Eugene:	Doyen, UFR Sciences Pharmaceutiques et Biologiques, Université FHB de Cocody, Abidjan
Prof. Michèle AKE:	Directeur, Direction de la Pharmacie et du Médicament, Abidjan
Prof. Moussa KONE*: **Late*	Doyen, UFR des Sciences Pharmaceutiques et Biologiques, Université FHB de Cocody
Prof. N'DRI-YOMAN Thérèse:	Directeur Général de la Santé Ministère de la Santé et de l'Hygiène Publique
GAMBIA	
Mme. Fatoumata Jah SOWE:	The Deputy Registrar of the Medicine Board & Deputy Chief Pharmacist of the Gambia

GHANA	
M. Joseph Kodjo Nsiah NYOAGBE:	Registrar, Ghana Pharmacy Council
M. Felix D. YELLU	Chief Pharmacist , Pharmacy Department, Ministry of Health
Prof. Mahama DUWIEJUA:* **Succeeded by Prof. FLEISCHER*	Former Dean, Faculty of Pharmaceutical Sciences, Kwame Nkrumah Univ. of Science & Technology
Prof. T. C. FLEISCHER:	Former Dean, Faculty of Pharmaceutical Sciences, Kwame Nkrumah Univ. of Science & Technology, Kumasi and Vice Pro Chancellor, Univ. of Allied & Health Sciences
GUINÉE	
Prof. Fodé Mohamed SYLLA:	Vice-Doyen Recherche, Faculté de Médecine/Pharmacie-Odonto-Stomatologie, Conakry
As. Prof. Fode Bangaly MAGASSOUBA:	Département de Pharmacie, Université de Conakry
LIBERIA	
Dr. Vudu Kanda GOLAKAI:	Vice-President for School of Health, Sciences, Univ. of Liberia
Pharm. Osbert Kwaku NEWLANDS:	Ex-Acting Dean, School of Pharmacy, University of LIBERIA
Assoc. Prof. Alpha A. DIALLO*: *Late	Ex-Acting Dean, Univ. of Liberia School of Pharmacy
Rev. Tijli Tarty TYEE:	Chief Pharmacist, Ministry of Health & Social Welfare
MALI	
Col. Elimane MARIKO:	Prof. de Pharmacologie
Prof. Ousmane DOUMBIA:	FMPOS, Bamako
NIGER	
Dr. Absi MOUMOUNI:	Président, L'Ordre National des Médecins, Pharmaciens, Chirurgiens Dentistes
Dr. ELHADJ MAMAN NATY:	Directeur de la Pharmacie, Laboratoires – Pharmacien, Ministère de la Santé Publique
Prof. MAMADOU Saidou:	Professeur de Bactério-Virologie, Doyen
NIGERIA	
Dr. Ahmed T. MORA:	Former Registrar, Pharmacists Council of Nigeria & Dean, Faculty of Pharmaceutical Sciences, Kaduna State University. Kaduna
Dr. IferiIbangIferi	Faculty of Pharmacy, Univ. of Uyo, AkwaIbom State
Dr. Paul Ukaa Kuma GAR:	Deputy Director, Pharmacists Council of Nigeria (PCN), Industrial Area Abuja
Mrs. Gloria O. ABUMERE:	Former Deputy Director /Divisional Head, Pharmaceutical Services Division, Department of Food & Drug Services, Federal Ministry of Health, ABUJA
N. D. IFUDU	Dean, Faculty of Pharmacy, University of Lagos
Prof. Adebayo A. GBOLADE	Dean, Faculty of Pharmacy, Olabisi Onabanjo University, Sagamu Campus

Prof. Amarauche CHUKWU	Dean, Department of Pharmaceutical Technology and Industrial Pharmacy, Faculty of Pharmaceutical Sciences, University of Nigeria Nsukka
Prof. Cyril O. USIFOH	Former Dean, Faculty of Pharmacy University of Benin
Prof. Haruna A. KAITA	Dean, Faculty of Pharmaceutical Sciences, Ahmadu Bello University
Prof. Jacob A. KOLAWOLE	Department of Pharmaceutical Chemistry, Faculty of Pharmaceutical Sciences, University of Jos
Prof. Kolawole T. JAIYEOBA	Dean, Faculty of Pharmacy, University of Ibadan
Prof. (Mrs.) Omolara Olajumoke ORAFIDIYA	Dean, Faculty of Pharmacy Obafemi Awolowo University
Prof. Patrich O. ERAH	Professor of Clinical Pharmacy & Pharmacy Practice, Faculty of Pharmacy, University of Benin
Prof. T. A. OLUGBADE	Faculty of Pharmacy, Obafemi Awolowo University
SENEGAL	
M. Cheikhou Oumar DIA	Trésorier du Conseil National, Ordre des Pharmaciens
Papa Amadou DIOP	Directeur - Ministère de la Santé, Doyen École de Pharmacie, Université Ibrahila Niass
Prof. Cheikh BOYE	Doyen, Faculté de Médecine, de Pharmacie et d'Odontostomatologie de Dakar, Université Cheick Anta Diop
Prof. Guata Yoro SY	Prof. Pharmacologie Université Cheick Anta Diop, Sénégal
SENEGAL	
Prof. Amadou DIOUF	Doyen, Faculté de Médecine, de Pharmacie et d'Odontostomatologie de Dakar, Université Cheick Anta Diop
SIERRA LEONE	
Pharm. (Mr.) Hudson Hubert LAWSON:	Director of Drugs and Medical Supplies, Ministry of Health and Sanitation
Pharm. James Peter KOMEH	Lecturer, Faculty of Pharmaceutical Sciences, College of Medicine & Allied Health Sciences, Univ. of Sierra Leone & Head of the Dept. of Inspection and Enforcement, Pharmacy Board of Sierra Leone
Prof. Ade J.P. JOHNSON* *Late	Faculty of Pharmaceutical Sciences, College of Medicine & Allied Health Sciences, Freetown
TOGO	
Atany A.T. NYANSA	Directeur des Pharmacies, Laboratoires et Equipements Techniques, Ministère de la Santé
Dr. Sakariyaou TIDJANI	Président de l'Ordre National des Pharmaciens du Togo
Prof. Gado NAPO-KOURA	Vice-Doyen (Chargé de la Filière Pharmacie), Faculté Mixte de Médecine et Pharmacie, Université de Lomé
ACAME	
M. Gérard MILLOT,	Conseiller du Secrétaire Permanent de l'ACAME, Ambassade de France - Ouagadougou

CAMES	
Prof. Mamadou SAWADOGO	Président des Comités Techniques Spécialisées de CAMES IRSP/Benin
M. PARAISO Moussiliou Noël	Epidémiologiste (Ass Pédagogique) IRSP Ouidah (Bénin) PHARMACTION
Dr. TOUKOUROU Moutiatou	Présidente de PARMACTION
PRSAO/BENIN	
Dr. DICKO Mohamed	COTONOU
UEMOA	
Dr. Corneille TRAORE	Directeur de la Santé de la Protection Sociale et de la Mutualité Département du Développement Social et Culturel, Commission de l'UEMOA
WEST AFRICAN HEALTH ORGANISATION	
Assoc. Prof. P.Tarpowah KEAR, JR.:	PO/Pharmacy, Dept. of Human Resources for Health Development
M. Antonio Paulo GOMES	Exécutive Assistant Office of the Director-General
M. J. Jacques Effossou KABLAN	PO/Nursing & Midwifery, Dept. of Human Resources for Health Development
Mrs. Sybil Nana Ama OSSEI-AGYEMAN-YEBOAH	PO/ Essential Medicines and Vaccines
Prof. Abdoulaye DIALLO	Director a.i., Dept. of Human Resources for Health Development & PO/Medicine, Ex- Officer in charge of Pharmacy Programme
Prof. Kayode ODUSOTE*: *Retired	Former Director of Dept. of Human Resources for Health Development
Tomé CÁ:	Professionnel Chargé du Système d`Information Sanitaire

WEST AFRICAN POSTGRADUATE COLLEGE OF PHARMACISTS (WAPCP)	
Prof. Wilson O. ERHUN:	Sec-General
Dr. Azuka C. OPARAH* *Succeeded by Prof. W.O. ERHUN	Former Secretary General, WAPCP
Prof. Fola TAYO* *Succeeded by Dr. A.C. OPARAH	Pro-Chancellor & Chairperson of the Governing Council, Caleb University, Lagos & Former Secretary General, WAPCP
Pharm. (Mrs.) Adebisi Omolola BRIGHT*: *Succeeded by Prof. F. TAYO	Former Secretary General , WAPCP