



Mansoura University  
Faculty of Pharmacy  
Quality Assurance and Accreditation Unit  
Program Specification  
Bachelor in Pharmacy (Pharm D)



**Faculty of Pharmacy**  
**Bachelor in Pharmacy (Pharm D)**  
**Program Specifications**

**Ministry Approval Date: /6/2019**

**Faculty Council Approval Date: 25 /11/2020**



## Program Specifications

### Bachelor in Pharmacy (Pharm D)

**University:** Mansoura

**Faculty:** Pharmacy

#### A- Basic Information

1. **Program title:** Bachelor Pharmacy (Pharm D)
2. **Program type:** Single
3. **Departments:**
  - Department of Medicinal Chemistry (PD)
  - Department of Pharmaceutical Organic Chemistry (PO)
  - Department of Pharmaceutical Analytical Chemistry (PA)
  - Department of Biochemistry (PB)
  - Department of Pharmaceutics (PT)
  - Department of Pharmacognosy (PG)
  - Department of Microbiology and Immunology (PM)
  - Department of Pharmacology & Toxicology (PH)
  - Department of Pharmacy Practice (PP)
4. **Duration of program:** 5 years + one academic year of internship
5. **Language of study:** English
6. **Program Coordinator:** Vice Dean of Education and student affairs
7. **External evaluator:** .....

Date of program specification approval

8. **Program approval date:** / / 2020

Date of program specification approval after external evaluation



## **B- Professional Information**

### **I: Program Aims:**

**The Pharmacy program provides students with the necessary competences in basic, pharmaceutical, medical, behavioural and social, health and environmental, pharmacy practice and management; aiming to graduate competent general practitioner pharmacists; capable of working effectively in different settings, including community pharmacies, hospitals, forensic and biomedical laboratories, governmental health institutions, pharmaceutical industries, academic and research centres, The graduates of Mansoura Faculty of Pharmacy Pharm D program should be able to:**

- 1.1 Utilize in-depth understanding of fundamental knowledge to provide, counselling and drug information services to the community and patients about safe and proper use of medications in all forms.
- 1.2 Participate with other health care professionals in improving health care services using evidence-based data and manage uncommon or highly complex situations.
- 1.3 Show capability of communication, time management, critical thinking, problem-solving, decision-making skills and interprofessional collaboration.
- 1.4 Demonstrate professionalism, responsibility and accountability in compliance with legal and ethical rules in interactions with patients, other healthcare providers, communities and society.
- 1.5 Apply pharmacy expertise to understand health needs and advance health and well-being of individual patients, communities and society.
- 1.6 Serve local and regional pharmacy service and all domains of pharmaceutical industry with highly qualified and trained professionals.
- 1.7 Engage in life-long learning through continuous development with contemporary pharmacy practice knowledge, leadership, innovation and entrepreneurship skills.
- 1.8 Optimize the use of all resources of the health-care system, including safety and efficacy of medication use systems, human resources, administrative affairs and artificial intelligence.
- 1.9 Foster scientific research in clinical, biomedical and pharmaceutical sciences that meets



and responds to the needs of society.

- 1.10 Express motivation, enthusiasm and strengthening the role of the pharmacist within the health system.

## **2 - Program Intended Learning Outcomes:**

**On successful completion of the program, graduates will acquire the following key competencies in the following domains:**

### **Domain 1- Fundamental Knowledge**

#### **1-1- Competency:**

**Apply core knowledge and skills in relation to the evolving basic biomedical, pharmaceutical, clinical, social-behavioral and administrative sciences to evaluate, manufacture products, solve therapeutic problems in communities, advance human health and provide patient-centered care.**

**This competency will be developed via the following key elements:**

#### **➤ Key Elements :**

- 1-1-1- Recognize in-depth and breadth knowledge of pharmaceutical, biomedical, nutritional, social, behavioral, administrative, and clinical sciences.
- 1-1-2- Use appropriate pharmaceutical and medical terminology, abbreviations and symbols in pharmacy practice and recall scientific names of drugs.
- 1-1-3-Combine the principles of fundamental sciences to handle, identify, extract, design, prepare, analyze, and assure quality of synthetic/natural pharmaceutical raw materials and finished products and of biological macromolecules.
- 1-1-4-Explain drugs' mode of action, therapeutic effects and evaluate their appropriateness, effectiveness, and safety in individuals and populations, using knowledge from fundamental sciences.
- 1-1-5- Collect and apply the principles, practice and critical understanding of fundamental sciences to solve problems related to human health and health systems.
- 1-1-6- Access, retrieve, critically analyze and apply relevant scientific literature and other scientific resources including s to make evidence-informed professional decisions.



- 1-1-7-Gather and critically analyze new information, including evidence-based information, that may be applicable to pharmaceutical industry and patient care.
- 1-1-8-Use health informatics to improve the quality of health and nutritional care, manage resources and optimize patient safety and understand metabolic disorders.
- 1-1-9-Perform pharmaceutical, compounding and patient-specific calculations, including pharmacokinetic and other therapeutic calculations.

## **Domain 2: Professional and Ethical Practice**

### **2-1 Competency**

**Collaborate professionally with patients, intra- and inter-professional teams, to provide safe, effective and efficient health care, thus achieving the needs of the community and society at large whilst preserving patients' rights.**

**This competency will be developed via the following key elements:**

#### **➤ Key Elements :**

- 2-1-1-Apply legal professional requirements to practice, including legislation, policies, by-laws, and standards for individuals and healthcare team
- 2-1-2- Apply the principles of professional codes of ethics, preserving patients' rights and respecting population diversity.
- 2-1-3-Establish and maintain appropriate professional boundaries and accept responsibility and accountability within healthcare team.
- 2-1-3-Establish and maintain appropriate professional boundaries and accept responsibility of other healthcare members through consultations and patient referrals.
- 2-1-4-Define the fact that the practice of pharmacy is ethically consistent with good business, and quality of care precedes generating profit.
- 2-1-5-Develop procedures to ensure the return or proper disposal of recalled, expired and unusable products.
- 2-1-6-Prepare and compound non-sterile and sterile products and other extemporaneous preparations according to recognized guidelines and standards of practice.



## 2-2- Competency

**Standardize pharmaceutical raw materials, formulate, manufacture, and develop pharmaceutical products and contribute to the inventory and stewardship of resources of medicines.**

**This competency will be developed via the following key elements:**

➤ **Key Elements:**

- 2-2-1- Identify, design, prepare, purify, standardize and quantify biological macromolecules and, pharmaceutical materials from different origins.
- 2-2-2- Apply GMP guidelines including principles of quality control, inventory, distribution and legal responsibility related to pharmaceutical industry of materials/ products of various origins in addition to possible incompatibilities.
- 2-2-3- Show the ability to use tools, instruments and different software with in-depth knowledge to properly select approaches for synthesis and analysis of raw materials and finished pharmaceutical products.
- 2-2-4- Implement quality control and quality assurance principles including pharmacokinetics ,biopharmaceutics, calculations, biostatistical analysis, bioinformatics and assessment procedures of all the processes of pharmaceutical formulations and their applications for novel drug delivery systems, as per the need of industry and future prospects in pharmacy practice.

## 2-3- Competency

**Apply laws and legislation for safe and successful handling and disposal of biological and synthetic/natural pharmaceutical materials/products.**

**This competency will be developed via the following key Elements:**

➤ **Key Elements:**

- 2-3-1- Select, and apply appropriate methods and procedures and resources for handling and disposal of synthetic/natural materials, biological, radio-active, biotechnology- based items used in pharmacy.



**2-3-2-** Choose best practices and adhere to high ethical, legal and safety standards for management of biological and pharmaceutical materials/products.

#### **2-4- Competency**

**Coordinate actively in decision-making within professional health team to assess patients in emergency situations including poisoning with xenobiotics, and cooperate effectively in forensic area.**

**This competency will be developed via the following key elements:**

➤ **Key Elements:**

- 2-4-1- Select proper procedures for handling and applications of poisons to discard any harm to public.
- 2-4-2- Demonstrate ability to use principles of first aid in the practice of pharmacy.
- 2-4-3- Contribute to decision making processes for recognized drug-related and pharmaceutical care problems.
- 2-4-4-Evaluate toxicity profiles of chemicals and other xenobiotics and investigate poisons in biological samples.
- 2-4-5-Recognize and take appropriate action when signs, symptoms and risk factors that relate to medical or health problems that fall into the scope of practice of other health professionals are encountered.
- 2-4-6-Define knowledge of and ability to use principles of physical assessment and nutritional status needed to save patient's life.

#### **2-5- Competency**

**Contribute in the advancement of pharmaceutical research and phases of clinical trials needed for approval of emerging medicinal agents**

**This competency will be developed via the following key elements:**

➤ **Key Elements :**

- 2-5-1- Integrate regulatory strategy for authorization of emerging medicinal products



according to national and international specifications.

2-5-2 Collect, interpret and assess relevant, necessary evidence-based information about a patient's health-related care needs.

2-5-3 Apply scientific principles of research and scholarly investigation and use systematic approaches in the search for best available evidence.

## **2-6- Competency**

**Conduct pharmaco-economic studies and innovate promotion, sales, marketing, and business administration skills.**

**This competency will be developed via the following key elements:**

### ➤ **Key Elements:**

2-6-1- Implement the basic principles involved in managing financial, human resources and business administration in the pharmacy environment.

2-6-2- Practice guidelines of drug promotion, sales, marketing, accounting and outcomes of pharmaco-economic analysis.

## **Domain 3: Pharmaceutical Care**

### **3-1- Competency**

**Gather evidence -based information from the patients and population's health records for advancement of healthcare system.**

**This competency will be developed via the following key elements:**

### ➤ **Key Elements :**

3-1-1 Modify a dosage regimen for a patient based on knowledge of different cell types and cell components and physiological, genetic, biochemical, metabolic and immunological changes brought about by disease or concomitant drug therapy.

3-1-2 Relate principles of public health and microbiology for monitoring and control of factors contributing in microbial contamination.

3-1-3 Record and regulate microbial growth and conduct laboratory tests for identification of infections/diseases.





3-1-4 Outline the characters, epidemiology, pathogenesis, laboratory diagnosis, and clinical features of infections/diseases and cancers and their treatment, prevention and nutritional care.

3-1-5-Point out the etiology of cancer and characters, epidemiology, pathogenesis, laboratory diagnosis, treatment and prevention of parasitic organisms.

### **3-2- Competency**

**Provide education and counseling to support patients and community in making informed decisions about their care plan.**

**This competency will be developed via the following key elements:**

➤ **Key Elements:**

3-2-1 Integrate principles of medicinal chemistry and pharmacological aspects of drugs, as mode of action, therapeutic uses, proper dosage, unwanted effects and drug interactions.

3-2-2 Rationalize the use of medicines and medical devices by relating principles of clinical pharmacology, clinical nutrition and pharmacovigilance and using the necessary technical skills.

3-2-3 Integrate best available evidence for application of non-conventional therapy into pharmacy practice such as phytotherapy, aromatherapy and nutraceuticals.

3-2-4 Recommend appropriate information about untoward and toxicity of medicinal agents and other xenobiotics including possible sources, signs, symptoms and treatment options.

3-2-5 Provide education and counseling to support the patients, and community in making informed decisions about their care plan including OTC preparations and medical devices.

3-2-6 Establish public awareness on rational use of drugs, vaccination, drug abuse and misuse, and safe handling of hazardous products to minimize personal exposure and reducing environmental contamination.

3-2-7- Consult other healthcare professionals as appropriate and accordingly adjust the



proposed patient care plan.

- 3-2-8- Perform, order and/or retrieve relevant laboratory tests and other diagnostic assessments.
- 3-2-9- Identify the occurrence of a medication incident, adverse drug event and respond effectively to alleviate harm and prevent reoccurrence.
- 3-2-10- Advise patients, doctors, nurses, and other prescribers about safe, effective and cheap medication therapy.

#### **Domain 4: Personal Practice**

##### **4-1- Competency**

**Demonstrate leadership, time management, self-directed learning, self-reflection, team problem-solving, creativity and entrepreneurial skills, appropriate to their role.**

**This competency will be developed via the following key elements:**

➤ **Key Elements :**

- 4-1-1 Share decision-making activities with other with other pharmacy team members and non-pharmacy team members and apply effective time management skills.
- 4-1-2 Collect information and analyze data, identify problems and present solutions, participate independently and collaboratively with other team members in the healthcare system.
- 4-1-3 Participate in development of entrepreneurial, creativity and marketing skills.

##### **4-2- Competency**

**Demonstrate appropriate verbal and non-verbal communication skills, including listening skills and proficiency in writing with individuals and communities.**

**This competency will be developed via the following key elements:**

**Key Elements :**

- 4-2-1 Use clear language, pace, tone and non-verbal communication and writing skills when



dealing with patients, other health team and communities.

4-2-2 Apply advanced technologies and channels whenever possible to present relevant information.

### **4-3- Competency**

**Show self-awareness and commit to life-long learning and continuous professional development.**

**This competency will be developed via the following key elements:**

#### **➤ Key Elements:**

4-3-1 Employ self-evaluation strategies to manage and improve professional of pharmacy.

4-3-2 Promote continuous professional development by practicing self and independent learning.



### **3- Academic Reference Standards:**

**3-a:** External Reference for standards (Benchmarks)

The Faculty of Pharmacy-Mansoura University, adopts the National Academic Reference Standards in Pharmacy education, issued by National Authority for Quality Assurance and Accreditation of Education (NAQAAE) 2<sup>nd</sup> Edition in April 2017 (**Attachment # 1**).

**3-b:** Comparison of Program Aims and the program Learning Outcomes (PLOs) with the National Academic Reference Standards (NARS) (**Attachment # 2**).

### **4- Curriculum Structure and Contents:**

**4-a Program duration: 5 years + one academic year of internship.**

**4-b Program structure:**

4.b. i- No of study hours per 5 year: 181 credit hours

4.b. ii- No. of credit hours:

University Requirements: 6 ; not included in calculating GPA or cGPA

Faculty Requirements: 175 including:

- Compulsory courses: 167
- Elective Courses: 8

4.b. ii- No. of credit hours per week: Lectures: 122; Lab./Exercise: 59; total: 181

Level	Semester	Lectures Credit hour	Practical Credit hour	Total credit hour per semester	Total credit hour per level
1	1	11	4	15	34
	2	13	6	19	
2	3	11	5	16	31
	4	10	5	15	
3	5	12	6	18	35
	6	12	5	17	
4	7	14	8	22	44
	8	14	8	22	
5	9	12	7	19	37
	10	13	5	18	
<b>Total</b>		<b>122</b>	<b>59</b>	<b>181</b>	<b>181</b>

4.b.iv- Primary field training: 100 hours in summer period after third level

4.b.v- Advanced field training: One academic year of internship.

The Faculty of Pharmacy, Mansoura University, prepared its curriculum structure under the guidelines of NARS (2017)



Courses are distributed into basic, pharmaceutical, medical and other sciences guided by NARS. The detailed distribution of the courses into the different sciences is included (**Attachment # 3**).

### **5- Program Courses:**

To obtain a bachelor's degree in pharmacy, the student is required to study 181 credit hours. The Faculty has issued a study plan, where courses are distributed over five levels of 10 regular semesters, in addition to one academic year of internship. A detailed distribution of the courses, along with their credit hours, prerequisites, exam marks and exam time is included (**Attachment # 4**)

Matrix of the courses with the Program ILOs is included (**Attachment # 5**).

### **Curriculum Contents:**

Courses Description is included (**Attachment # 6**); and Course Specification are available at both the Scientific Departments and the Quality Assurance and Accreditation Unit.

### **6- Teaching and Learning method**

1.	Self-learning	التعلم الذاتي
2.	Interactive teaching	استراتيجية التعليم المباشر (الحضور الفعلي للطلاب)
3.	Computer aided learning: 3-a On line learning through my mans "Mansoura university "as recorded – video lectures 3-b Inter active discussion through My Mans	التعلم باستخدام الحاسوب من خلال : • التعليم عن بعد من خلال منصة جامعة المنصورة (محاضرات صوتية / فيديو هات) • المناقشة التفاعلية مع الطلاب على المنصة
4.	Team – based learning ( group discussion)	التعليم التعاوني
5.	Problem – based learning	التعليم بطريقة حل المشكلات
6.	Case study	دراسة الحالة
7.	Presentation	العروض التقديمية
8.	Practical work and tutorials	التجارب العملية والتمارين



9.	Assignments and activities	عمل تكليفات وانشطة
10.	Simulation based learning	التعليم القائم على المحاكاة
11.	Role play	لعاب الادوار
12.	Research projects	المشاريع البحثية
13.	Portfolio	الحقائب التعليمية
14.	Experiential education strategy	التعليم التجريبي " يتضمن التدريب الميداني / الصيدلة الافتراضية

### **7- Student Assessment:**

Different assessment method are used within this program including Summative and formative assessment

#### **1- Summative assessment**

- Written examinations
  - Practical assessments
  - Oral presentation.
  - Course work assessments.
- The final grade of the course consists of the sum of the semester work + practical (if present) + written + oral (if present) examination as shown in the study plan tables.
  - The minimum pass rate in any course is 60% of the total grades of this course.
  - The student will not be successful in any course unless he or she get 30% of the final written exam score.
  - Semesters work exam is held by the end of the 6<sup>th</sup> week of the semester
  - Practical exams are held by the end of the 11<sup>th</sup> week
  - Final written and oral exams are held by the end of the 12<sup>th</sup> week of the semester
  - Each course is assigned a total of 100 points (marks)
  - Performance of a student is measured by the **Grade Point Average (GPA)** value he/she scores in an individual course.



## 2- Formative assessment including:

- |  |                   |                                |
|--|-------------------|--------------------------------|
| • Case study   | • Problem solving | • Evaluation research projects |
| • Evaluation of recent research paper discussion in journal club |                   |                                |



The percentage of final scores and estimates is as shown in the following table.

**Evaluation system**

Percentage	Symbol	Number of Points	Grade
95 and above	A+	4	Excellent
90 for less than 95	A	3.85	
85 for less than 90	A-	3.7	
82.5 for less than 85	B+	3.3	very good
77.5 for less than 82.5	B	3	
75 for less than 77.5	B-	2.7	
72.5 for less than 75	C+	2.3	Good
67.5 for less than 72.5	C	2	
65 for less than 67.5	C-	1.7	
62.5 for less than 65	D+	1.3	Acceptable
60 for less than 62.5	D	1	
Less than 60	F	0.00	Fail
Withdrawal - W	W	-	Withdrawal
Incomplete - I *	I*	-	Incomplete
Absent - Abs E **	Abs E**	-	Absent

The student's GPA and cGPA are calculated as follows:

A - The value of points for each course is multiplied by the number of credit hours for this course to get the number of points for each course in the semester.

B - Points are collected for all the courses in which the student scored in one semester.





C- The total points of all courses shall be divided by the total credit hours registered for the student per semester for the purpose of obtaining the semester rate as follows:

The semester rate (GPA) =

$$\frac{\text{Total points of all courses per semester}}{\text{Total credit hours registered per semester}}$$

The cumulative GPA is calculated as follows:

Cumulative Grade Point Average (cGPA) =

$$\frac{\text{The sum of points for all courses for all semesters}}{\text{Total credit hours registered for all semesters}}$$

### **8- Programme Admission Requirements**

- The Faculty complies with the admission regulations and requirements of the Egyptian Supreme Council of Universities (SCU).
- Nominated students must hold the Egyptian General Secondary Education Certificate (GSEC) (Science Section), or an equivalent certificate accepted by the SCU.
- Foreign students are nominated for admission to the faculty according to the general regulations of the Ministry of Higher Education (MHE).
- Students from other governmental Egyptian Universities or foreign scientific institutes recognized by the Supreme Council of Universities must fulfill the Faculty of Pharmacy admission requirements before being transferred at our Faculty. Courses completed at another Pharmacy Institution are evaluated for equivalency.
- Full-time study is required by all students.

### **9- Regulations for progression and Bachelor of Pharmacy pharm D program completion**

- The Faculty adopts the pharm D credit hour system in this program.
- Student registers the courses in each semester with the guidance of his/her academic advisor, taking into consideration the prerequisite of each course.
- Student is allowed to register a total of 12 - 22 credit hours in each semester; while the academic load during summer semester is 6 – 10 credit hours.



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- Students must attend not less than 75 % of the lectures and laboratory sessions. Otherwise, they would not be able to attend the final exam and complete the course.
- Completion of the program requires that the student must successfully achieve:
  - 175 credit hours (167 Faculty Compulsory Courses; and 8 Elective Courses), and 6 University Requirements,
  - Acquiring 100 hours of field training in a pharmacy (community or hospital pharmacies).
  - Completion of one academic year of internship in pharmaceutical companies, pharmaceutical factories pharmaceutical research centers, hospitals, pharmacies,...
  - Passes the graduation project.
- Student transferred from other institutions must study at our university at least 60% of graduation requirements.
- Grading of the University Requirements courses; (Information technology, Human rights and Corruption Fighting, Psychology, Communication and presentation skills, Entrepreneurship), the field training, or the academic year of internship are not included in the GPA or cumulative GPA (cGPA).
- Minimum cGPA of 1 is a must for successful graduation.



### **10- Evaluation of Program Learning Outcomes**

<b>Evaluator</b>	<b>Tool</b>	<b>Sample</b>
1- Senior students	Questionnaires	Random Sample
2- Graduates	Questionnaires	Random Sample
3- Stakeholders	Interviews	Cluster random sample
4-External Evaluator(s) (External Examiner(s))	Templates and checklists for validation of the specifications	Selected experts
<b>5- Other</b>		

**Program Coordinator:**

**Signature:**

**Faculty Council Approval: / /2020**



**(Attachment # 1).**

**National Academic Reference Standards**

**For Pharmacy education,**

**(2<sup>nd</sup> Edition in April 2017).**

**1- Attributes of the Pharmacy Graduates**

Pharmacy graduates work in a multi-disciplinary profession to improve the quality of life of individuals and communities. Based on multi-national requirements, the pharmacy graduate must develop competencies of a learner, health caregiver and provider, professional, collaborator, manager, promoter, problem solver, educator and communicator, self-aware, leader, and innovator. Pharmacy graduates must acquire the necessary attributes related to various pharmacy aspects including drug-oriented and patient-oriented pharmacy disciplines to actively participate in pharmaceutical care. Pharmacy graduate must be able to:

1. Educate and counsel individuals and communities to participate in optimizing therapeutic outcomes and minimizing the incidence of illness of individuals and populations.
2. Practice and perform responsibilities and authorities legally, professionally, and ethically respecting patients' rights.
3. Utilize evidence-based data to deliver contemporary pharmaceutical products and pharmacy services.
4. Assure the quality of pharmaceutical materials and products.
5. Apply integrated evidence-based pharmaceutical and clinical information in assessing the appropriateness, effectiveness, and safety of medications.
6. Contribute effectively in planning and conducting research using appropriate methodologies.
7. Work collaboratively and share therapeutic decision-making as a member of an inter-professional health care team.
8. Demonstrate effective communication, leadership, business administration, and entrepreneurial skills.



9. Work as a life-long learner for continuous professional improvement and demonstrate capabilities of performance appraisal and self-assessment.

## 2- Competencies of the Pharmacy Graduates

Four **Competency Domains** are included in these competency-based National Academic Reference Standards for Pharmacy Education. These domains are designed to cover all essentials for practicing pharmacy profession including both drug-oriented and patient oriented disciplines. Each domain should be achieved through a number of **Competencies** ranging from one to six, with a total of twelve competencies for all domains. These competencies are overall broad statements that cover various areas of the graduate performance. A number of **Key Elements** ranging from two to seven are included in each competency, with a total of forty two key elements for all competencies. These key elements demonstrate how pharmacy graduate will reflect each competency in practice. The competency domains are the followings:

**Domain 1** : Fundamental Knowledge

**Domain 2**: Professional and Ethical Practice

**Domain 3**: Pharmaceutical Care

**Domain 4**: Personal Practice

### DOMAIN 1 - FUNDAMENTAL KNOWLEDGE

#### 1 -1 – COMPETENCY

**Integrate knowledge from basic and applied pharmaceutical and clinical sciences to standardize materials, formulate and manufacture products, and deliver population and patient-centered care.**

➤ **Key Elements :**

- 1 -1 -1 - Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.
- 1 -1 -2- Utilize the proper pharmaceutical and medical terms, abbreviations and symbols in pharmacy practice.
- 1 -1 -3- Integrate knowledge from fundamental sciences to handle, identify, extract, design,



prepare, analyze, and assure quality of synthetic/natural pharmaceutical materials/products.

1-1-4-Articulate knowledge from fundamental sciences to explain drugs' actions and evaluate their appropriateness, effectiveness, and safety in individuals and populations.

1 -1-5- Retrieve information from fundamental sciences to solve therapeutic problems.

1-1-6-Utilize scientific literature, and collect and interpret information to enhance professional decision.

1-1-7-Identify and critically analyze newly emerging issues influencing pharmaceutical industry and patient health care.

## **DOMAIN 2: PROFESSIONAL AND ETHICAL PRACTICE**

### **2-1 – COMPETENCY**

**Work collaboratively as a member of an inter-professional health care team to improve the quality of life of individuals and communities, and respect patients' rights.**

#### **➤ Key Elements :**

2-1 -1 Perform responsibilities and authorities in compliance with the legal and professional structure and role of all members of the health care professional team.

2-1 -2 Adopt ethics of health care and pharmacy profession respecting patients' rights and valuing people diversity.

2-1 -3 Recognize own personal and professional limitations and accept the conditions of referral to or guidance from other members of the health care team.

### **2-2- COMPETENCY**

**Standardize pharmaceutical materials, formulate and manufacture pharmaceutical products, and participate in systems for dispensing, storage, and distribution of medicines.**

#### **➤ Key Elements :**

2-2-1 Isolate, design, identify, synthesize, purify, analyze, and standardize synthetic/natural pharmaceutical materials.

2-2-2 Apply the basic requirements of quality management system in developing, manufacturing, analyzing, storing, and distributing pharmaceutical materials/



products considering various incompatibilities.

2-2-3 Recognize the principles of various tools and instruments, and select the proper techniques for synthesis and analysis of different materials and production of pharmaceuticals.

2-2-4 Adopt the principles of pharmaceutical calculations, biostatistical analysis, bioinformatics, pharmacokinetics, and bio-pharmaceutics and their applications in new drug delivery systems, dose modification, bioequivalence studies, and pharmacy practice.

### **2-3- COMPETENCY**

**Handle and dispose biologicals and synthetic/natural pharmaceutical materials/products effectively and safely with respect to relevant laws and legislations.**

➤ **Key Elements :**

2-3-1 Handle, identify, and dispose biologicals, synthetic/natural materials, biotechnology-based and radio-labeled products, and other materials/products used in pharmaceutical field.

2-3-2 Recognize and adopt ethical, legal, and safety guidelines for handling and disposal of biologicals, and pharmaceutical materials/products.

### **2-4- COMPETENCY**

**Actively share professional decisions and proper actions to save patient's life in emergency situations including poisoning with various xenobiotics, and effectively work in forensic fields.**

➤ **Key Elements :**

2-4-1 Ensure safe handling/use of poisons to avoid their harm to individuals and communities.

2-4-2 Demonstrate understanding of the first aid measures needed to save patient's life.

2-4-3 Take actions to solve any identified medicine-related and pharmaceutical care problems.

2-4-4 Assess toxicity profiles of different xenobiotics and detect poisons in biological specimens.



## **2-5- COMPETENCY**

**Contribute in pharmaceutical research studies and clinical trials needed to authorize medicinal products.**

➤ **Key Elements :**

2-5-1 Fulfill the requirements of the regulatory framework to authorize a medicinal product including quality, safety, and efficacy requirements.

2-5-2 Retrieve, interpret, and critically evaluate evidence-based information needed in pharmacy profession.

2-5-3 Contribute in planning and conducting research studies using appropriate methodologies.

## **2-6- COMPETENCY**

**Perform pharmacoeconomic analysis and develop promotion, sales, marketing, and business administration skills.**

➤ **Key Elements :**

2-6-1 Apply the principles of business administration and management to ensure rational use of financial and human resources.

2-6-2 Utilize the principles of drug promotion, sales, marketing, accounting, and pharmacoeconomic analysis.

## **DOMAIN 3: PHARMACEUTICAL CARE**

### **3-1 – COMPETENCY**

**Apply the principles of body functions to participate in improving health care services using evidence-based data.**

➤ **Key Elements :**

3-1 -1 Apply the principles of body function and basis of genomics in health and disease states to manage different diseases.

3-1 -2 Apply the principles of public health and pharmaceutical microbiology to select and assess proper methods of infection control.

3-1 -3 Monitor and control microbial growth and carry out laboratory tests for identification of infections/diseases.





3-1 -4 Relate etiology, epidemiology, pathophysiology, laboratory diagnosis, and clinical features of infections/diseases and their pharmacotherapeutic approaches.

### **3-2- COMPETENCY**

**Provide counseling and education services to patients and communities about safe and rational use of medicines and medical devices.**

➤ **Key Elements :**

3-2-1 Integrate the pharmacological properties of drugs including mechanisms of action, therapeutic uses, dosage, contra-indications, adverse drug reactions and drug interactions.

3-2-2 Apply the principles of clinical pharmacology and pharmacovigilance for the rational use of medicines and medical devices.

3-2-3 Provide evidence-based information about safe use of complementary medicine including phytotherapy, aromatherapy, and nutraceuticals.

3-2-4 Provide information about toxic profiles of drugs and other xenobiotics including sources, identification, symptoms, and management control.

3-2-5 Educate and counsel patients, other health care professionals, and communities about safe and proper use of medicines including OTC preparations and medical devices.

3-2-6 Maintain public awareness on social health hazards of drug misuse and abuse.

### **DOMAIN 4: PERSONAL PRACTICE**

#### **4-1 - COMPETENCY**

**Express leadership, time management, critical thinking, problem solving, independent and team working, creativity and entrepreneurial skills.**

➤ **Key Elements :**

4-1 -1 Demonstrate responsibility for team performance and peer evaluation of other team members, and express time management skills.

4-1 -2 Retrieve and critically analyze information, identify and solve problems, and work autonomously and effectively in a team.

4-1 -3 Demonstrate creativity and apply entrepreneurial skills within a simulated entrepreneurial activity.



#### **4-2- COMPETENCY**

**Effectively communicate verbally, non-verbally and in writing with individuals and communities.**

➤ **Key Elements:**

4-2-1 Demonstrate effective communication skills verbally, non-verbally, and in writing with professional health care team, patients, and communities.

4-2-2 Use contemporary technologies and media to demonstrate effective presentation skills.

#### **4-3- COMPETENCY**

**Express self-awareness and be a life-long learner for continuous professional improvement.**

➤ **Key Elements:**

4-3-1 Perform self-assessment to enhance professional and personal competencies.

4-3-2 Practice independent learning needed for continuous professional development.



## Attachment # 2

### A. Comparison of Program Aims to Graduate Attributes

Program Aims	Graduate Attributes (NARS)
1.1. Utilize in-depth understanding of fundamental knowledge to provide, counselling and drug information services to the community and patients about safe and proper use of medications in all forms	1.1 Educate and counsel individuals and communities to participate in optimizing therapeutic outcomes and minimizing the incidence of illness of individuals and populations.
1.2. Participate with other health care professionals in improving health care services using evidence-based data and manage uncommon or highly complex situations.	1.2 Practice and perform responsibilities and authorities legally, professionally, and ethically respecting patients' rights.
1.3. Show capability of communication, time management, critical thinking, problem-solving, decision-making skills and interprofessional collaboration	1.3 Utilize evidence-based data to deliver contemporary pharmaceutical products and pharmacy services.
1.4. Demonstrate professionalism, responsibility and accountability in compliance with legal and ethical rules in interactions with patients, other healthcare providers, communities and society	1.4 Assure the quality of pharmaceutical materials and products.
1.5. Apply pharmacy expertise to understand health needs and advance health and well-being of individual patients, communities and society.	1.5 Apply integrated evidence-based pharmaceutical and clinical information in assessing the appropriateness, effectiveness, and safety of medications.
1.6. Serve local and regional pharmacy service and all domains of pharmaceutical industry with highly qualified and trained professionals	1.6 Contribute effectively in planning and conducting research using appropriate methodologies.
1.7. Engage in life-long learning through continuous development with contemporary pharmacy practice knowledge, leadership, innovation and entrepreneurship skills	1.7 Work collaboratively and share therapeutic decision-making as a member of an inter-professional health care team.
1.8. Optimize the use of all resources of the health-care System, including safety and efficacy of medication use systems, human resources, administrative affairs and artificial intelligence	1.8 Demonstrate effective communication, leadership, business administration, and entrepreneurial skills.
1.9. Foster scientific research in clinical, biomedical and pharmaceutical sciences that meets and responds to the needs of society.	1.9. Work as a life-long learner for continuous professional improvement and demonstrate capabilities of performance appraisal and self-assessment.
1.10. Express motivation, enthusiasm and strengthening the role of the pharmacist within the health system.	



**B- Comparison of the Program Intended learning outcomes (ILOs) with that of the National Academic Reference Standards (NARS)**

Mansoura Faculty of Pharmacy Program ILOs	NARS
<p><b>DOMAIN 1- FUNDAMENTAL KNOWLEDGE</b>  <b>1-1-COMPETENCY</b>            Apply core knowledge and skills in relation to the evolving basic biomedical, pharmaceutical, clinical, social-behavioral and administrative sciences to evaluate, manufacture products, solve therapeutic problems in communities, advance human health and provide patient-centered care.</p>	<p><b>DOMAIN 1- FUNDAMENTAL KNOWLEDGE</b>  <b>1-1-COMPETENCY</b>            Integrate knowledge from basic and applied pharmaceutical and clinical sciences to standardize materials, formulate and manufacture products, and deliver population and patient-centered care</p>
<p><b>KEY ELEMENTS</b>            1-1-1- Recognize in-depth and breadth knowledge of pharmaceutical, biomedical, nutritional, social, behavioral, administrative, and clinical sciences.</p>	<p><b>KEY ELEMENTS</b>            Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.</p>
<p>1-1-2-Use appropriate pharmaceutical and medical terminology, abbreviations and symbols in pharmacy practice and recall scientific names of drugs.</p>	<p>1-1-2-Utilize the proper pharmaceutical and medical terms, abbreviations and symbols in pharmacy practice.</p>
<p>1-1-3-Combine the principles of fundamental sciences to handle, identify, extract, design, prepare, analyze, and assure quality of synthetic/natural pharmaceutical raw materials and finished products and of biological macromolecules.</p>	<p>1-1-3- Integrate knowledge from fundamental sciences to handle, identify, extract, design, prepare, analyze, and assure quality of synthetic/natural pharmaceutical materials/products.</p>
<p>1-1-4- Explain drugs' mode of action, therapeutic effects and evaluate their appropriateness, effectiveness, and safety in individuals and populations, using knowledge from fundamental sciences.</p>	<p>1-1-4- Articulate knowledge from fundamental sciences to explain drugs' actions and evaluate their appropriateness, effectiveness, and safety in individuals and populations.</p>
<p>1-1-5- Collect and apply the principles, practice and critical understanding of fundamental sciences to solve problems related to human health and health systems</p>	<p>1-1-5- Retrieve information from fundamental sciences to solve therapeutic problems.</p>
<p>1-1-6- Access, retrieve, critically analyze and apply relevant scientific literature and other scientific resources including s to make evidence-informed professional decisions.</p>	<p>1-1-6- Utilize scientific literature, and collect and interpret information to enhance professional decision.</p>
<p>1-1-7-Gather and critically analyze new information, including evidence-based information, that may be applicable to pharmaceutical industry and patient care.</p>	<p>1-1-7- Identify and critically analyze newly emerging issues influencing pharmaceutical industry and patient health care.</p>
<p>1-1-8-Use health informatics to improve the quality of health and nutritional care, manage resources and optimize patient safety and understand metabolic</p>	



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disorders.	
1-1-9-Perform pharmaceutical, compounding and patient-specific calculations, including pharmacokinetic and other therapeutic calculations.	

Mansoura Faculty of Pharmacy Program ILOs	NARS
<b>DOMAIN 2: PROFESSIONAL AND ETHICAL PRACTICE</b>	<b>DOMAIN 2: PROFESSIONAL AND ETHICAL PRACTICE</b>
<b>2-1- COMPETENCY</b>	<b>2-1- COMPETENCY</b>
Collaborate professionally with patients, intra- and inter-professional teams, to provide safe, effective and efficient health care, thus achieving the needs of the community and society at large whilst preserving patients' rights.	Work collaboratively as a member of an inter-professional health care team to improve the quality of life of individuals and communities, and respect patients' rights.
<b>KEY ELEMENTS</b>	<b>KEY ELEMENTS</b>
2-1-1-Apply legal professional requirements to practice, including legislation, policies, by-laws, and standards for individuals and healthcare team	2-1-1 Perform responsibilities and authorities in compliance with the legal and professional structure and role of all members of the health care professional team.
2-1-2- Apply the principles of professional codes of ethics, preserving patients' rights and respecting population diversity.	2-1-2 Adopt ethics of health care and pharmacy profession respecting patients' rights and valuing people diversity.
2-1-3-Establish and maintain appropriate professional boundaries and accept responsibility of other healthcare members through consultations and patient referrals.	2-1-3 Recognize own personal and professional limitations and accept the conditions of referral to or guidance from other members of the health care team.
2-1-4- Define the fact that the practice of pharmacy is ethically consistent with good business, and quality of care precedes generating profit.	
2-1-5-Develop procedures to ensure the return or proper disposal of recalled, expired and unusable products.	
2-1-6-Prepare and compound non-sterile and sterile products and other extemporaneous preparations according to recognized guidelines and standards of practice.	
<b>2-2- COMPETENCY</b>	<b>2-2- COMPETENCY</b>
<b>Standardize pharmaceutical raw materials, formulate, manufacture, and develop pharmaceutical products and contribute to the inventory and stewardship of resources of medicines.</b>	<b>Standardize pharmaceutical materials, formulate and manufacture pharmaceutical products, and participate in systems for dispensing, storage, and distribution of medicines.</b>
2-2-1- Identify, design, prepare, purify, standardize and quantify biological macromolecules and, pharmaceutical materials from different origins.	2-2-1 Isolate, design, identify, synthesize, purify, analyze, and standardize synthetic/natural pharmaceutical materials.





<p>2-2-2- Apply GMP guidelines including principles of quality control, inventory, distribution and legal responsibility related to pharmaceutical industry of materials/ products of various origins in addition to possible incompatibilities.</p>	<p>2-2-2 Apply the basic requirements of quality management system in developing, manufacturing, analyzing, storing, and distributing pharmaceutical materials/ products considering various incompatibilities.</p>
<p>2-2-3- Show the ability to use tools, instruments and different software with in-depth knowledge to properly select approaches for synthesis and analysis of raw materials and finished pharmaceutical products.</p>	<p>2-2-3 Recognize the principles of various tools and instruments, and select the proper techniques for synthesis and analysis of different materials and production of pharmaceuticals.</p>
<p>2-2-4-Implement quality control and quality assurance principles including pharmacokinetics ,biopharmaceutics, calculations, biostatistical analysis, bioinformatics and assessment procedures of all the processes of pharmaceutical formulations and their applications for novel drug delivery systems, as per the need of industry and future prospects in pharmacy practice.</p>	<p>2-2-4 Adopt the principles of pharmaceutical calculations, biostatistical analysis, bioinformatics, pharmacokinetics, and biopharmaceutics and their applications in new drug delivery systems, dose modification, bioequivalence studies, and pharmacy practice.</p>
<p><b>2-3- COMPETENCY</b>  <b>Apply laws and legislation for safe and successful handling and disposal of biological and synthetic/natural pharmaceutical materials/products.</b></p>	<p><b>2-3- COMPETENCY</b>  <b>Handle and dispose biological and synthetic/natural pharmaceutical materials/products effectively and safely with respect to relevant laws and legislations.</b></p>
<p><b>KEY ELEMENTS</b>          2-3-1- Select, and apply appropriate methods and procedures and resources for handling and disposal of synthetic/natural materials, biological, radioactive. biotechnology-based items used in pharmacy.</p>	<p><b>KEY ELEMENTS</b>          2-3-1 Handle, identify, and dispose biologicals, synthetic/natural materials, biotechnology-based and radio-labeled products, and other materials/products used in pharmaceutical field.</p>
<p>2-3-2- Choose best practices and adhere to high ethical, legal and safety standards for management of biological and pharmaceutical materials/products.</p>	<p>2-3-2 Recognize and adopt ethical, legal, and safety guidelines for handling and disposal of biologicals, and pharmaceutical materials /products</p>
<p><b>2-4- COMPETENCY</b>  <b>Coordinate actively in decision-making within professional health team to assess patients in emergency situations including poisoning with xenobiotics, and cooperate effectively in forensic area.</b></p>	<p><b>2-4- COMPETENCY</b>  <b>Actively share professional decisions and proper actions to save patient's life in emergency situations including poisoning with various xenobiotics, and effectively work in forensic fields.</b></p>
<p><b>KEY ELEMENTS</b>          2-4-1- Select proper procedures for handling and applications of poisons to discard any harm to public.</p>	<p><b>KEY ELEMENTS</b>          2-4-1 Ensure safe handling/use of poisons to avoid their harm to individuals and communities.</p>
<p>2-4-2-Demonstrate ability to use principles of first</p>	<p>2-4-2 Demonstrate understanding of the first</p>



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aid in the practice of pharmacy	aid measures needed to save patient's life
2-4-3-Contribute to decision making processes for recognized drug-related and pharmaceutical care problems.	2-4-3 Take actions to solve any identified medicine-related and pharmaceutical care problems.
2-4-4-Evaluate toxicity profiles of chemicals and other xenobiotics and investigate poisons in biological samples.	2-4-4 Assess toxicity profiles of different xenobiotics and detect poisons in biological specimens.
2-4-5-Recognize and take appropriate action when signs, symptoms and risk factors that relate to medical or health problems that fall into the scope of practice of other health professionals are encountered.	
2-4-6-Define knowledge of and ability to use principles of physical assessment and nutritional status needed to save patient's life.	
<b>2-5- COMPETENCY</b> Contribute in the advancement of pharmaceutical research and phases of clinical trials needed for approval of emerging medicinal agents	<b>2-5- COMPETENCY</b> Contribute in pharmaceutical research studies and clinical trials needed to authorize medicinal products.
<b>KEY ELEMENTS</b> 2-5-1 Integrate regulatory strategy for authorization of emerging medicinal products according to national and international specifications.	<b>KEY ELEMENTS</b> 2-5-1 Fulfill the requirements of the regulatory framework to authorize a medicinal product including quality, safety, and efficacy requirements.
2-5-2 Collect, interpret and assess relevant, necessary evidence-based information about a patient's health-related care needs.	2-5-2 Retrieve, interpret, and critically evaluate evidence-based information needed in pharmacy profession.
2-5-3 Apply scientific principles of research and scholarly investigation and use systematic approaches in the search for best available evidence.	2-5-3 Contribute in planning and conducting research studies using appropriate methodologies.
<b>2-6- COMPETENCY</b> Conduct pharmaco-economic studies and innovate promotion, sales, marketing, and business administration skills.	<b>2-6- COMPETENCY</b> Perform pharmaco-economic analysis and develop promotion, sales, marketing, and business administration skills.
<b>KEY ELEMENTS</b> 2-6-1 Implement the basic principles involved in managing financial, human resources and business administration in the pharmacy environment.	<b>KEY ELEMENTS</b> 2-6-1 Apply the principles of business administration and management to ensure rational use of financial and human resources
2-6-2 Practice guidelines of drug promotion, sales, marketing, accounting and outcomes of pharmaco-economic analysis.	2-6-2 Utilize the principles of drug promotion, sales, marketing, accounting, and pharmaco-economic analysis.



Mansoura Faculty of Pharmacy Program ILOs	NARS
<p><b>DOMAIN 3: PHARMACEUTICAL CARE</b>  <b>3-1- COMPETENCY</b>  <b>Gather evidence -based information from the patients and population’s health records for advancement of healthcare system.</b></p>	<p><b>DOMAIN 3: PHARMACEUTICAL CARE</b>  <b>3-1- COMPETENCY</b>  <b>Apply the principles of body functions to participate in improving health care services using evidence-based data.</b></p>
<p><b>KEY ELEMENTS</b>            3-1-1 Modify a dosage regimen for a patient based on knowledge of different cell types and cell components and physiological, genetic, biochemical, metabolic and immunological changes brought about by disease or concomitant drug therapy.</p>	<p><b>KEY ELEMENTS</b>            3-1-1 Apply the principles of body function and basis of genomics in health and disease states to manage different diseases.</p>
<p>3-1-2 Relate principles of public health and microbiology for monitoring and control of factors contributing in microbial contamination.</p>	<p>3-1-2 Apply the principles of public health and pharmaceutical microbiology to select and assess proper methods of infection control.</p>
<p>3-1-3 Record and regulate microbial growth and conduct laboratory tests for identification of infections/diseases.</p>	<p>3-1-3 Monitor and control microbial growth and carry out laboratory tests for identification of infections/diseases.</p>
<p>3-1-4 Outline the characters, epidemiology, pathogenesis, laboratory diagnosis, and clinical features of infections/diseases and cancers and their treatment, prevention and nutritional care.</p>	<p>3-1-4- Relate etiology, epidemiology, pathophysiology, laboratory diagnosis and clinical features of infections/diseases and their pharmacotherapeutic approaches</p>
<p>3-1-5-Point out the etiology of cancer and characters, epidemiology, pathogenesis, laboratory diagnosis, treatment and prevention of parasitic organisms.</p>	
<p><b>3-2- COMPETENCY</b>  <b>Provide education and counselling to support patients and community in making informed decisions about their care plan.</b></p>	<p><b>3-2- COMPETENCY</b>  <b>Provide counseling and education services to patients and communities about safe and rational use of medicines and medical devices.</b></p>
<p><b>KEY ELEMENTS</b>            3-2-1 Integrate principles of medicinal chemistry and pharmacological aspects of drugs, as mode of action, therapeutic uses, proper dosage, unwanted effects and drug interactions.</p>	<p><b>KEY ELEMENTS</b>            3-2-1 Integrate the pharmacological properties of drugs including mechanisms of action, therapeutic uses, dosage, contra-indications, adverse drug reactions and drug interactions.</p>
<p>3-2-2 Rationalize the use of medicines and medical devices by relating principles of clinical pharmacology, clinical nutrition and pharmacovigilance and using the necessary technical skills.</p>	<p>3-2-2 Apply the principles of clinical pharmacology and pharmacovigilance for the rational use of medicines and medical devices.</p>
<p>3-2-3 Integrate best available evidence for application of non-conventional therapy into pharmacy practice such as phytotherapy,</p>	<p>3-2-3 Provide evidence-based information about safe use of complementary medicine including phytotherapy, aromatherapy, and</p>





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aromatherapy and nutraceuticals.	nutraceuticals.
3-2-4 Recommend appropriate information about untoward and toxicity of medicinal agents and other xenobiotics including possible sources, signs, symptoms and treatment options.	3-2-4 Provide information about toxic profiles of drugs and other xenobiotics including sources, identification, symptoms, and management control.
3-2-5 Provide education and counseling to support the patients, and community in making informed decisions about their care plan including OTC preparations and medical devices.	3-2-5 Educate and counsel patients, other health care professionals, and communities about safe and proper use of medicines including OTC preparations and medical devices.
3-2-6 Establish public awareness on rational use of drugs, vaccination, drug abuse and misuse, and safe handling of hazardous products to minimize personal exposure and reducing environmental contamination.	3-2-6 Maintain public awareness on social health hazards of drug misuse and abuse.
3-2-7-Consult other healthcare professionals as appropriate and accordingly adjust the proposed patient care plan.	
3-2-8-Perform, order and/or retrieve relevant laboratory tests and other diagnostic assessments.	
3-2-9-Identify the occurrence of a medication incident, adverse drug event and respond effectively to alleviate harm and prevent reoccurrence.	
3-2-10-Advise patients, doctors, nurses, and other prescribers about safe , effective and cheap medication therapy	



Mansoura Faculty of Pharmacy Program ILOs	NARS
<p><b>DOMAIN 4: PERSONAL PRACTICE</b>  <b>4-1- COMPETENCY</b>            Demonstrate leadership, time management, self-directed learning, self-reflection, team problem-solving, creativity and entrepreneurial skills, appropriate to their role.</p>	<p><b>DOMAIN 4: PERSONAL PRACTICE</b>  <b>4-1- COMPETENCY</b>            Express leadership, time management, critical thinking, problem solving, independent and team working, creativity and entrepreneurial skills.</p>
<p><b>KEY ELEMENTS</b>            4-1-1 Share decision-making activities with other with other pharmacy team members and non-pharmacy team members and apply effective time management skills.</p>	<p><b>KEY ELEMENTS</b>            4-1-1 Demonstrate responsibility for team performance and peer evaluation of other team members, and express time management skills.</p>
<p>4-1-2-Collect information and analyze data, identify problems and present solutions, participate independently and collaboratively with other team members in the healthcare system.</p>	<p>4-1-2 Retrieve and critically analyze information, identify and solve problems, and work autonomously and effectively in a team.</p>
<p>4-1-3 Participate in development of entrepreneurial, creativity and marketing skills.</p>	<p>4-1-3 Demonstrate creativity and apply entrepreneurial skills within a simulated entrepreneurial activity.</p>
<p><b>4-2- COMPETENCY</b>            Demonstrate appropriate verbal and non-verbal communication skills, including listening skills and proficiency in writing with individuals and communities.</p>	<p><b>4-2- COMPETENCY</b>            Effectively communicate verbally, non-verbally and in writing with individuals and communities.</p>
<p><b>KEY ELEMENTS</b>            4-2-1 Use clear language, pace, tone and non-verbal communication and writing skills when dealing with patients, other health team and communities.</p>	<p><b>KEY ELEMENTS</b>            4-2-1 Demonstrate effective communication skills verbally, non-verbally, and in writing with professional health care team, patients, and communities.</p>
<p>4-2-2 Apply advanced technologies and channels whenever possible to present relevant information.</p>	<p>4-2-2 Use contemporary technologies and media to demonstrate effective presentation skills.</p>
<p><b>4-3- COMPETENCY</b>            Show self-awareness and commit to life-long learning and continuous professional development.</p>	<p><b>4-3- COMPETENCY</b>            Express self-awareness and be a life-long learner for continuous profession improvement</p>
<p><b>KEY ELEMENTS</b>            4-3-1 Employ self-evaluation strategies to manage and improve professional of pharmacy.</p>	<p><b>KEY ELEMENTS</b>            4-3-1 Perform self-assessment to enhance professional and personal competencies.</p>
<p>4-3-2 Promote continuous professional development by practicing self and independent learning.</p>	<p>4-3-2 Practice independent learning needed for continuous professional development.</p>



**Attachment # 3**

**Categories Courses Distribution**

Course Category	Total Hours %	Course Code	Course Title	L	P/T	Total		
1- Basic Course	29 16.0%	PA 111	Pharmaceutical Analytical Chemistry I	2	1	3		
		PO 111	Pharmaceutical Organic Chemistry I	2	1	3		
		PG 111	Medicinal plants	2	1	3		
		NP 111	Mathematics	1		1		
		UR 111	Information Technology	1	1	2		
		PA 122	Pharmaceutical Analytical Chemistry II	2	1	3		
		PO 122	Pharmaceutical Organic Chemistry II	2	1	3		
		PA 213	Pharmaceutical Analytical Chemistry III	2	1	3		
		PO 213	Pharmaceutical Organic Chemistry III	2	1	3		
		PB 121	Cell Biology	1	1	2		
		PO 314	Spectroscopic Identification	2	1	3		
		<b>Total</b>				<b>19</b>	<b>10</b>	<b>29</b>
		2-Pharmaceutical Courses	71 39.22%	PT 111	Pharmacy Orientation	1		1
PP 111	Medical Terminology			1		1		
PT 122	Physical Pharmacy			2	1	3		
PG 122	Pharmacognosy I			2	1	3		
PG 213	Pharmacognosy II			2	1	3		
PT 213	Pharmaceutics I			2	1	3		
PA 224	Instrumental Analysis			2	1	3		
PT 224	Pharmaceutics II			2	1	3		
PG 314	Phytochemistry I			2	1	3		
PT 315	Pharmaceutics III			2	1	3		
PM 323	Pharmaceutical Microbiology			2	1	3		
PT 326	Biopharmaceutics and Pharmacokinetics			2	1	3		
PG 325	Phytochemistry II			2	1	3		
PT 327	Pharmaceutics IV			2	1	3		
PM 414	Biotechnology			2	1	3		
PG416	Applied & Forensic Pharmacognosy			1	1	2		
PT 418	Pharmaceutical Technology I			2	1	3		
PD411	Medicinal Chemistry I			2	1	3		
PA425	Quality Control and pharmaceutical Analysis			2	1	3		
PT 429	Pharmaceutical Technology II			2	1	3		
PD 422	Medicinal Chemistry II			2	1	3		
PD 513	Medicinal Chemistry III			2	1	3		
PG 427	Phytotherapy and Aromatherapy			2	1	3		
PT 5110	Good Manufacture Practice			1	1	2		
PD 524	Drug Design			2	1	3		
PT5211	Advanced Drug Delivery Systems 2			1	1	2		
<b>Total</b>				<b>47</b>	<b>24</b>	<b>71</b>		



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Course Category	Total Hours %	Course Code	Course Title	L	P/T	Total
3-Medical Courses	39 21.54%	MD 121	Anatomy & Histology	2	1	3
		PH 211	Physiology	2	1	3
		PM 221	General microbiology and immunology	2	1	3
		PB 222	Biochemistry I	2	1	3
		PH 223	Pathophysiology	1	1	2
		PB 313	Biochemistry II	2	1	3
		PM 312	Parasitology and Virology	2	1	3
		PH 314	Pharmacology I	2	1	3
		PH325	Pharmacology II	2	1	3
		PH 416	Pharmacology III	2	1	3
		PB 414	Clinical Biochemistry	2	1	3
		PH427	Therapeutics 2	1	1	2
		PM 515	Medical Microbiology	2	1	3
		MD 512	Pathology	1	1	2
		<b>Total</b>		<b>25</b>	<b>14</b>	<b>39</b>
4-Pharmacy Practice Course	18 9.94%	PP 322	Hospital Pharmacy	2	-	2
		PP 413	Drug Information	1	1	2
		PP 426	Community Pharmacy Practice	2	1	3
		PP 517	Clinical pharmacy I	2	1	3
		PP 425	Clinical Pharmacokinetics	2	1	3
		PP 414	Pharmaceutical Legislations and Regulatory Affairs	1		1
		PP 518	Clinical Research, Pharmacoepidemiology and Pharmacovigilance	1	1	2
		PP 529	Clinical Pharmacy II & Pharmacotherapeutics	1	1	2
		<b>Total</b>	<b>12</b>	<b>6</b>	<b>18</b>	
5-Health and Environmental courses	7 3.86%	PH 529	First Aid	1	-	1
		PH 222	Biostatistics	1		1
		PH 528	Toxicology and Forensic Chemistry	2	1	3
		PM 526	Public Health	2	-	2
				<b>Total</b>	<b>6</b>	<b>1</b>
6-Behavioral and Social Courses	4 2.2%	UR 123	Psychology	1		1
		NP 525	Professional Ethics	1		1
		UR 124	Communication and Presentation Skills	1		1
		UR 112	Human rights and Corruption Fighting	1		1
				<b>Total</b>	<b>4</b>	
7-Pharmacy Management Courses	3 1.65%	NP 513	Drug Marketing & Pharmacoeconomics	2		2
		UR 525	Entrepreneurship	1		1
			<b>Total</b>	<b>5</b>		<b>5</b>



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Course Category	Total Hours %	Course Code	Course Title	L	P/T	Total
8 – Discretionary	10 5.5%	NP 524	Research Methodology	1		1
		NP212	Scientific Writing	1		1
		PAE 01	Advanced Pharmaceutical Analysis - Spectroscopy	1	1	2
		PAE 02	Therapeutic Drug Monitoring	1	1	2
		POE 03	Combinatorial Chemistry and Quantum Mechanics	1	1	2
		POE 04	Modern Trends in Drug Synthesis	1	1	2
		PDE 05	Drug Targeting	1	1	2
		PDE 06	Advanced Medicinal Chemistry	1	1	2
		PBE 07	Clinical Nutrition	1	1	2
		PBE 08	Cancer Biology	1	1	2
		PHE 09	Geriatrics	1	1	2
		PHE 010	Advanced Therapeutics	1	1	2
		PME 011	Infection control and antimicrobial stewardship	1	1	2
		PME 012	Microbiological control of pharmaceutical products:	1	1	2
		PTE 013	Nano & Radiopharmaceuticals	1	1	2
		PTE 014	Cosmetic Preparations	1	1	2
		PGE 015	Complementary & alternative medicine	1	1	2
PGE 016	Production and Manufacture of Medicinal plants	1	1	2		



**Attachment # 4**

**Detailed Courses distribution into 10 semesters**

**Level 1**

**Semester (1)**

Course Title	Course Code	Credit Hours			Prerequisite	Examination Marks				Total Marks	Final Exam. Hours
		Lect.	Pract./Tut	Total		Period. Activity/CW	Pract./Tut.	Wr.	Oral		
Pharmaceutical Analytical Chemistry I	PA 111	2	1	3	Registration	15	25	50	10	100	2
Pharmaceutical Organic Chemistry I	PO 111	2	1	3	Registration	15	25	50	10	100	2
Pharmacy Orientation	PT 111	1	-	1	Registration	25	--	75	--	100	1
Medicinal Plants	PG 111	2	1	3	Registration	15	25	50	10	100	2
Medical Terminology	PP 111	1	-	1	Registration	25	--	75	--	100	1
Information Technology	UR 111	1	1	2	Registration	15	25	60	---	100	1
Mathematics	NP 111	1	---	1	Registration	25	--	75	--	100	1
Human Rights and Corruption Fighting	UR 112	1	---	1	Registration	25	--	75	--	100	1
<b>Total</b>		<b>11</b>	<b>4</b>	<b>15</b>						<b>800</b>	

**Semester (2)**

Course Title	Course Code	Credit Hours			Prerequisite	Examination Marks				Total Marks	Final Exam. Hours
		Lect.	Pract./Tut	Total		Period. Activity/CW	Pract./Tut.	Wr.	Oral		
Pharmaceutical Analytical Chemistry II	PA 122	2	1	3	Registration	15	25	50	10	100	2
Pharmaceutical Organic Chemistry II	PO 122	2	1	3	Registration	15	25	50	10	100	2
Cell Biology	PB 121	1	1	2	Registration	15	25	50	10	100	1
Anatomy & Histology	MD 121	2	1	3	Registration	15	25	50	10	100	2
Physical Pharmacy	PT 122	2	1	3	Registration	15	25	50	10	100	2
Pharmacognosy I	PG 122	2	1	3	Registration	15	25	50	10	100	2
Psychology	UR 123	1	-	1	Registration	25	--	75	--	100	1
Communication and Presentation Skills	UR 124	1	-	1	Registration	25	-	75	-	100	1
<b>Total</b>		<b>13</b>	<b>6</b>	<b>19</b>						<b>800</b>	



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## Level 2

### Semester (3)

Course Title	Course Code	Credit Hours			Prerequisite	Examination Marks				Total Marks	Final Exam Hours
		Lect.	Pract./Tut	Total		Period. Activity/CW	Pract./Tut.	Wr.	Oral		
Pharmaceutical Analytical Chemistry III	PA 213	2	1	3	Registration	15	25	50	10	100	2
Pharmaceutical Organic Chemistry III	PO 213	2	1	3	Registration	15	25	50	10	100	2
Scientific Writing	NP 212	1	-	1	Registration	25	--	75	---	100	1
Pharmacognosy II	PG 213	2	1	3	Registration	15	25	50	10	100	2
Physiology	PH 211	2	1	3	Registration	15	25	50	10	100	2
Pharmaceutics I	PT 213	2	1	3	Registration	15	25	50	10	100	2
<b>Total</b>		<b>11</b>	<b>5</b>	<b>16</b>						<b>600</b>	

### Semester (4)

Course Title	Course Code	Credit Hours			Prerequisite	Examination Marks				Total Marks	Final Exam Hours
		Lect.	Pract./Tut	Total		Period. Activity/CW	Pract./Tut.	Wr.	Oral		
Biochemistry I	PB 222	2	1	3	Registration	15	25	50	10	100	2
General Microbiology and Immunology	PM 221	2	1	3	Registration	15	25	50	10	100	2
Instrumental Analysis	PA 224	2	1	3	Registration	15	25	50	10	100	2
Pathophysiology	PH 223	1	1	2	Registration	15	25	50	10	100	1
Pharmaceutics II	PT 224	2	1	3	Registration	15	25	50	10	100	2
Biostatistics	PH 222	1	-	1	Registration	15	--	75	10	100	1
<b>Total</b>		<b>10</b>	<b>5</b>	<b>15</b>						<b>600</b>	

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### Level 3 Semester (5)

Course Title	Course Code	Credit Hours			Prerequisite	Examination Marks				Total Marks	Final Exam. Hours
		Lect.	Pract./Tut	Total		Period. Activity/CW	Pract./Tut.	Wr.	Oral		
Biochemistry II	PB 313	2	1	3	Registration	15	25	50	10	100	2
Parasitology and Virology	PM 312	2	1	3	Registration	15	25	50	10	100	2
Phytochemistry I	PG 314	2	1	3	Registration	15	25	50	10	100	2
Pharmaceutics III	PT 315	2	1	3	Registration	15	25	50	10	100	2
Spectroscopic Identification	PO 314	2	1	3	Registration	15	25	50	10	100	2
Pharmacology I	PH 314	2	1	3	Physiology	15	25	50	10	100	2
<b>Total</b>		<b>12</b>	<b>6</b>	<b>18</b>						<b>600</b>	

### Semester (6)

Course Title	Course Code	Credit Hours			Prerequisite	Examination Marks				Total Marks	Final Exam. Hours
		Lect.	Pract./Tut	Total		Period. Activity/CW	Pract./Tut.	Wr.	Oral		
Pharmaceutical Microbiology	PM 323	2	1	3	Registration	15	25	50	10	100	2
Biopharmaceutics and Pharmacokinetics	PT 326	2	1	3	Physical Pharmacy	15	25	50	10	100	2
Phytochemistry II	PG 325	2	1	3	Registration	15	25	50	10	100	2
Pharmaceutics IV	PT 327	2	1	3	Registration	15	25	50	10	100	2
Pharmacology II	PH 325	2	1	3	Physiology	15	25	50	10	100	2
Hospital Pharmacy	PP 322	2	0	2	Registration	15	-	75	10	100	2
<b>Total</b>		<b>12</b>	<b>5</b>	<b>17</b>						<b>600</b>	

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## Level 4

### Semester (7)

Course Title	Course Code	Credit Hours			Prerequisite	Examination Marks				Total Marks	Final Exam. Hours
		Lect	Pract./Tut	Total		Period. Activity/CW	Pract./Tut.	Wr	Oral		
Biotechnology	PM 414	2	1	3	Registration	15	25	50	10	100	2
Pharmacology III	PH 416	2	1	3	Physiology	15	25	50	10	100	2
Applied & Forensic Pharmacognosy	PG 416	1	1	2	Registration	15	25	50	10	100	1
Drug Information	PP 413	1	1	2	Registration	15	25	50	10	100	1
Clinical Biochemistry	PB 414	2	1	3	Registration	15	25	50	10	100	2
Pharmaceutical Technology I	PT 418	2	1	3	Pharmaceutics I	15	25	50	10	100	2
Medicinal Chemistry I	PD 411	2	1	3	Organic Chemistry III	15	25	50	10	100	2
Pharmaceutical Legislations and Regulatory Affairs	PP 414	1	-	1	Registration	25	--	75	--	100	1
Elective	PE---	1	1	2	Registration	15	25	50	10	100	1
<b>Total</b>		<b>14</b>	<b>8</b>	<b>22</b>						<b>900</b>	

### Semester (8)

Course Title	Course Code	Credit Hours			Prerequisite	Examination Marks				Total Marks	Final Exam. Hours
		Lect	Pract./Tut	Total		Period. Activity/CW	Pract./Tut.	Wr	Oral		
Clinical Pharmacokinetics	PP 425	2	1	3	Registration	15	25	50	10	100	2
Quality Control and pharmaceutical Analysis	PA 425	2	1	3	Pharmaceutics I Analytical Chemistry II	15	25	50	10	100	2
Phytotherapy and Aromatherapy	PG 427	2	1	3	Pharmacognosy I	15	25	50	10	100	2
Therapeutics	PH 427	1	1	2	Pharmacology I	15	25	50	10	100	1
Pharmaceutical Technology II	PT 429	2	1	3	Pharmaceutics I	15	25	50	10	100	2
Community Pharmacy Practice	PP 426	2	1	3	Registration	15	25	50	10	100	2
Medicinal Chemistry II	PD 422	2	1	3	Organic Chemistry III	15	25	50	10	100	2
Elective	PE ---	1	1	2	Registration	15	25	50	10	100	1





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Professional Ethics	NP 525	1	--	1	Registration	٢٥	--	75	--	100	1
Elective	PE ---	1	1	2	Registration	15	25	50	10	100	1
<b>Total</b>		13	5	18						1000	

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## Attachment # 6

### Courses Description

#### PA 111 Pharmaceutical Analytical Chemistry I (2+1)

Chemical Kinetics, rate of reaction, first Order reaction, rate law , Second order and third order of reaction, molecularity , Chemical equilibrium, Theories of reaction rate, activation energy and catalysis , Photochemistry, absorbed energy, quantum yield and chemical equilibrium.

Introduction to general chemistry, Types of chemical reactions – calculations of concentrations of substances. Analysis of anions – Analysis of cations – Analysis of mixture of anions and cations.

#### PA 122 Pharmaceutical Analytical Chemistry II (2+1)

Acid-Base theory, titration curves, indicators, applications. Titrations in non aqueous media, classification of solvents, theory, applications. Precipitometric titrations: solubility product principle, titration curves, Mohr's method. volhard's method, Fajans' method, pharmaceutical application. Complexometric reactions, theory, reaction with EDTA, indicators, applications.

#### PA 213 Pharmaceutical Analytical Chemistry III (2+1)

Redox titrations, theory, oxidation potentials, Nernst equation, titration curves, redox indicators, selected oxidants and reductants, applications of redox titrations . The course also covers applied pharmaceutical analysis such as water analysis (water hardness, analysis of chloride, chlorine, iron, oxidizable matter, ... in water.

Electrochemical methods, electrode potential, reference electrodes, indicator electrode, applications. Conductometric titration : ionic conductance, definition of cell constant, conductance, applications. polarography: Ilkovic equation, dropping mercury electrodes, diffusion current, applications, derivatization polarography.

#### PA 224 Instrumental Analysis (2+1)

Spectroscopic methods of analysis which include uv/vis spectroscopy, principal, instrumentation, factors affecting absorption and applications in pharmaceutical analysis. Fluorimetric methods, principal instrumentation, factors affecting fluorescence intensity and applications in pharmaceutical analysis. Atomic spectroscopy; principal and instrumentation. Chromatographic methods for analytical chemistry which includes: TLC, gel chromatography, column chromatography, HPLC, UPLC, TLC, gas chromatography, capillary electrophoresis.

#### PA 425 Quality Control and Pharmaceutical analysis (2+1)

This course will cover the following points

I- Good Analytical Practice and Sampling: Introduction, Sampling of pharmaceuticals and related materials, Type of sampling tools, Sampling plans.



## II-Documentation

III- Validation of analytical methods according to ICH Guidelines Q2 R1. Compendial testing , Validation of analytical methods, Data elements required for assay validation.

IV- Drug stability, stability studies and stability indicating methods for drugs, Stability testing , Forced degradation studies , stability indicating assay methods for drugs according to ICH Q1 R2 Guidelines. Stress conditions for drug degradation according to ICH Q1 R2 Guidelines. Factors affecting drug degradation, Drug expiration, Drug withdrawal from the market. Pharmaceutical regulations according to FDA & EMA (European medicine agency) and ISO and BSI. Drug-excipient interactions and adduct formation; analytical techniques used to detect drug-excipient compatibility, mechanism of drug-excipient interactions, examples.

V- Official methods of analysis applied to raw materials and end products.

### **PO 111 Pharmaceutical Organic Chemistry I (2+1)**

The objective of this course is to provide students with the basic knowledge in pharmaceutical organic chemistry, which will serve as fundamentals for other courses offered during subsequent semesters. This course involves :Introduction : Atomic Structure, Electronegativity, chemical bonding , Hybridization aspect , Dipole moments , Molecular Orbital theory , Factors Affecting Electron Availability in bonds and individual atoms , Concept of acidity and basicity and Nucleophilicity . Classes of organic compounds1) Saturated hydrocarbons: Alkane and cycloalkane, Conformational isomers. 2) Alkyl halides: Synthesis and nomenclature, Substitution reactions, Elimination reactions.3) Unsaturated hydrocarbons: Alkenes , Alkyne, polyenes . Stereochemistry.

### **PO 122 Pharmaceutical Organic Chemistry II (2+1)**

This course involves different classes of organic compounds:Aromaticity: Aromatic Hydrocarbons, polynuclear Hydrocarbons. Functional groups, Alcohols, phenol, ether and Thioether . Carbonyl containing compounds: Aldehydes & ketones, Acids and its derivatives, Sulphonic acid derivatives. Nitrogen containing compounds: Nitro compounds , Amines, Amino acids and dipeptides .

### **PO 213 Pharmaceutical Organic Chemistry III (2+1)**

This course involves:Nomenclature and Chemistry of organic heterocyclic compounds, five-membered heterocycles, and its fused derivatives (pyrrole, thiopheneFuran and its derivatives, indole, six-membered heterocycles and its Fused derivatives pyridine, quinolines and isoquinolines, Six-membered rings with one or two heteroatoms, and Seven Membered Heterocycles, in addition to Carbohydrate chemistry.

### **PO 314 Spectroscopic Identification (2+1)**

It provides an introduction about the use of different spectroscopic tools, including UV, infrared (IR), nuclear magnetic resonance (NMR) and mass spectrometry (MS) for the structural elucidation of organic compounds.Raman spectroscopy, Mass Spectrometry and  $^1\text{H}$ ,  $^{13}\text{C}$  NMR ,Interpretation and conclusions, 2D NMR , 3D NMR in protein Binding , Introduction to NMR based technique in Drug Design



### **PD 411 Medicinal Chemistry I (2+1)**

This course is tailored to assist the students to focus on the chemistry of drugs, particularly an introductory part illustrating the effect of physicochemical properties on drug action, drug-receptor interaction, the molecular aspects governing drugs' pharmacokinetics (ADME) and pharmacodynamics in addition to the in vivo biotransformation of drugs (Drug metabolism). The course also reviews structure activity relationships, mechanisms of action, medicinal uses and syntheses the drugs acting on the autonomic nervous system, cardiovascular drugs, besides the diuretic, antihistamines drugs (H1, H2 blockers and anti-ulcer PPIs) and local anesthetic drugs.

### **PD 422 Medicinal Chemistry II (2+1)**

The course is tailored to assist the students to gain the drugs affecting neurodegenerative disorders, the drug members acting on the central nervous system including CNS depressants and CNS stimulants, drugs controlling pain and inflammation (NSAIDs, prostaglandins, narcotic analgesics and anti-rheumatoid drugs) are also handled. Moreover, steroidal hormones and related drugs are also covered with special emphasis on the structure-activity relationships and modes of action in addition to medicinal uses and side effects of the mentioned classes of drugs.

### **PD 513 Medicinal Chemistry III (2+1)**

The course handles different classes of antibiotics and antimicrobials (natural and synthetic), beside other synthetic chemotherapeutic agents (including antivirals, antifungals, antiprotozoal, anthelmintic and antiparasitics). Additionally, various anticancer therapies and related drugs are also covered. Moreover the course also reviews endocrine-related drugs (Diabetes, thyroid and calcium-regulating agents). The course emphasizes on the chemistry and modes of action, properties, reactivity of drugs and auxiliary substances. Major syntheses, structure-activity relationships, metabolic pathways of the referred classes of drugs will be reviewed.

### **PD 524 Drug Design (2+1)**

The prime objective of this course is to prepare the students for professional practice by understanding the essentials of drug design and how the drugs biological and toxicological activities are strongly correlated to their chemical structures (Structure-activity relationship; SAR), physicochemical properties and metabolic pathways. Focusing on the molecular aspects governing drugs' pharmacokinetics (ADME), pharmacodynamics, optimization of drug action and possible side effects. Additionally, understanding drug interactions are targeted. The course is also designed to familiarize the students with drug design and molecular modelling covering structure-based and ligand-based drug design.

This also includes the process of drug discovery and development from target identification until approval of a new drug. Much concern is given to lead structure identification, optimization and targeting certain receptors and enzymes active sites. Additionally, the course addresses the study of molecular docking, pharmacophore generation, and molecular modifications including prodrug design, stereochemistry alterations, isosteric replacement, drug metabolism and Quantitative Structure-activity relationship (QSAR).



### **PB 121 Cell Biology ( 1+1 )**

The cell theory and cell structure (membranous and non-membranous organelles – cell inclusions and the nucleus). Macromolecules of the cell – DNA and RNA structure and genetic code – From gene to protein (Central dogma) – Cell cycle and control of cell number –Transport of biomolecules across membranes – Ions and voltages – Intercellular communication – cell signaling.

### **PB 222 Biochemistry I (2+1)**

Proteins (structure, biologically important peptides – fate of proteins – folding of peptides) –Amino acids as precursors for biosynthesis of biomolecules (e.g. neurotransmitters, nucleotides,...) – Carbohydrates (glycoproteins and proteoglycans – glucose transporters) – Lipids (physiologically important lipid molecules – cholesterol and steroids – lipoprotein metabolism) – Enzymology (enzyme kinetics – regulation – enzyme inhibitors as drugs) – Hemoglobin and porphyrins (Hb derivatives and types) – Vitamins– Oxidative Stress – Porphyrins.

### **PB 313 Biochemistry II (2+1)**

Energy production from dietary fuels (carbohydrates, lipids and proteins) –Integration of metabolism (Feed/fast cycle) – Nitrogen metabolism and nitrogen balance – Hormonal regulation of metabolism – Inborn errors of metabolism – Biological oxidation.

### **PB 414 Clinical Biochemistry (2+1)**

Biochemical/pathophysiological changes and laboratory diagnostic markers for disorders of (Endocrine glands – Diabetes Mellitus– renal function – hepatic function – gastric function – bone and mineral metabolism – plasma proteins and lipoproteins) – Clinical enzymology and myocardial infarction – Electrolytes, blood gases and acid-base balance – Handling, preservation, storage and analysis of biological samples – Homeostasis and biochemical aspects of hematology and blood analysis – Urine analysis – Tumor markers – Recent diagnostic biomarkers.

### **PG 111 Medicinal Plants (2+1)**

The aim of the course is to provide students with knowledge necessary to identify and prepare a crude drug from the farm to the firm. Students should acquire knowledge concerning dusting powders, plant cytology, physiology and medicinal leafy plants and their taxonomy. In this course, the student will study: importance of natural products, preparation of natural products-derived drugs including collection, storage, preservation and adulteration. The course will introduce the students to the different classes of secondary metabolites.

In addition, the course will discuss and address the variability in occurrence of pharmacologically active substances in certain official medicinal leafy plants according to their WHO monographs.

### **PG 122 Pharmacognosy I (2+1)**

Based on the Egyptian flora and other floras of wild and cultivated medicinal plants that are used in the pharmaceutical, cosmetic and food industries in the global & Egyptian market. The course introduces students to some botanical drugs of leaves, flower, seeds, bark and wood origin. During the lectures and practical sessions, students learn to identify examples of these drugs in their entire and powdered forms. Student will learn about the major constituents, folk uses, clinically proven uses, benefits, precautions of





those medicinal plants. Possible herbal-drug interactions of selected examples of these drugs and to have an overview over their phytopharmaceuticals available on the market specially the Egyptian market.

### **PG 213 Pharmacognosy II (2+1)**

After completion of the course the student should have the knowledge and skills that enable the student to differentiate between different organs through their monographs. The course comprises the study of identification of different organs through their monographs. (fruits, herbs, Subterranean organs, unorganized drugs in addition to drugs of animal origin) , including identify their active constituents and adulterants describe micro- and macro-morphological characteristics, benefits and precautions of their medicinal uses, side effects and contraindications and to have an overview over their phytopharmaceuticals available on the market specially the Egyptian market.

### **PG 314 Phytochemistry I (2+1)**

Based on complementary medicine and Egyptian medicinal plants that can be used as natural extracts, bioactive raw materials and phytochemical standards to serve the pharmaceuticals, cosmetics and food industries in Egypt. The course aims to gain students the knowledge and skills that enable them to understand, describe and deal with the chemistry of tannins, miscellaneous terpenoids, carbohydrates and glycosides of plant or animal origin and different techniques used for their preparation, identification and determination. Also, the students should become aware of different chromatographic methods used for isolation and analysis of different plant constituents and their pharmacological actions and medicinal uses.

### **PG 325 Phytochemistry II (2+1)**

In continuation with Pharmacognosy I, this course aims to enable students to demonstrate the knowledge and experience that enables them to understand, describe and deal with the chemistry of alkaloids, bitters of plant or animal origin, volatile oils and antioxidants of plant, fungi or animal origin as well as techniques for their isolation, identification and determination in their respective sources. Finally, the course focuses on the structure activity relationships (SAR) of these natural products derived compounds and their pharmacophoric features.

### **PG 416 Applied & Forensic Pharmacognosy ( 1+1 )**

The course aims to provide pharmacy students with sufficient knowledge concerning quality control from herbal aspects, Sampling, structural, physical and analytical standards, purity, safety and adulteration of drugs and their detection. It also covers the modern chromatographic techniques employed for the evaluation of natural product and their products. It also provides the student with basic knowledge about the application of plant biotechnology for the production of pharmaceutically active materials. The course also include an overview on forensic pharmacognosy including plants and their natural products that constitute health hazards, or intended for criminal uses to produce abortion, loss of mental control, hallucination, heart arrest.. Also it includes the study of drug dependents, narcotics, analgesics psych energetics, euphoric. Mycotoxin as a serious threat to general health and safety of community, contamination of food material with poisonous fungi.



### **PG 427 Phytotherapy & Aromatherapy (2+1)**

Upon successful completion of this course, the students should be able to know guidelines for prescribing herbal medicinal drugs on the basis of the pharmacological properties of these drugs including therapeutic uses, mechanism of action, dosage, adverse reactions, contraindications & drug interactions. The course also allows students understand pharmacotherapeutic principles applied to the treatment of different diseases, pharmacovigilance and rational use of drugs. Also the student should understand the basis of complementary and alternative medicine with emphasis on herbal remedies, nutritional supplements, homeopathies, aromatherapy & their effect on maintaining optimum health and prevention of chronic diseases. It includes studying of medicinal plants portfolios in relation to Phytopharmaceuticals in the Egyptian Market.

### **PT 111 Pharmacy Orientation (1+0)**

This is a course to acquaint the beginning pharmacy student with the multiple aspects of the profession of pharmacy, including the mission of pharmacy, role of pharmacist in society and pharmacy careers, classification of medications, interpretation of prescriptions and medication orders, general dispensing procedure and factors affecting drug dosage, sources of drugs, different dosage forms and various routes of administration. In addition to the history of pharmacy practice in various civilizations

### **PT 122 Physical Pharmacy (2+1)**

This course provides students with knowledge of physiochemical principles essential for the design and formulation of pharmaceutical products. Students are introduced to the fundamental concepts of states of matter, Phase equilibrium, colligative properties, isotonicity solubility, dissolution, partition coefficient, surface and interfacial phenomena, surface active agents, adsorption and its application in pharmacy and rheological behaviour of dosage forms

### **PT 213 Pharmaceutics I (2+1)**

This course is a study of the system of weights, measures, mathematical expertise and pharmaceutical calculations requisite to the compounding, dispensing, and utilization of drugs in pharmacy practice. It is also concerned with all manufacturing formulations aspects, packaging, storage and stability of liquid dosage forms including solutions (aqueous and non-aqueous), suspensions, emulsions and colloids with emphasis on the technology and pharmaceutical rationale fundamental to their design and development. The incompatibilities occurring during dispensing are also considered

### **PT 224 Pharmaceutics II (2+1)**

This course covers the structure and function of the skin, target area of treatment after topical application to skin, basic principles of diffusion through membranes and factors affecting percutaneous absorption, enhancement of skin penetration, transdermal drug delivery systems (TDDS). It also describes the principles and techniques involved in the formulation and manufacturing of traditional dermatological semisolid dosage forms (creams, ointments, gels and pastes) and cosmetic products

### **PT 315 Pharmaceutics III (2+1)**

The course introduces the students to the kinetics of drug decomposition including rate and order of the reaction, determination of the half-life, expiry date and shelf-life by different methods, stability testing, and



in-vitro possible drug/excipients interactions . It also describes the principles and techniques involved in the formulation, and manufacturing of solid dosage forms including powders, granules, tablets, capsules and suppositories.

#### **PT 326 Biopharmaceutics and Pharmacokinetics (2+1)**

This course aims to provide students with an understanding of the relation between the physicochemical properties of the drug and its fate in the body. The course explores the principles of biopharmaceutics and strategies for enhancing drug delivery and bioavailability. Integration of knowledge gained from other courses is emphasized to design and assure the quality of drug products. Students will also be introduced to the principles of pharmacokinetics (absorption, distribution, metabolism and elimination). The concepts of bioequivalence, biowaivers and *in vitro-in vivo* correlations (IVIVC's) will be discussed along with different models of drug disposition. The course prepares students for their evolving role in utilizing pharmacokinetics to guide formulation, dosage-regimen design and optimizing drug usage.

#### **PT 327 Pharmaceutics IV ( 2+1)**

This course involves principles of formulation, development, sterilization, packaging and quality control testing of pharmaceutical sterile drug products. Principles for calculation and manipulation of parenterals, ophthalmic preparations, vaccines and blood products are emphasized. The course also covers the basic principles of formulation, sterilization, packaging and applications of radiopharmaceuticals in pharmacy and medicine. An in depth study on the formulation, manufacturing, quality control testing and applications of aerosols and other inhalation products is also accentuated.

#### **PT 418 Pharmaceutical Technology I (2+1)**

The course provides students with an introduction to industrial pharmacy. It deals with the principles of various unit operations such as heat transfer, evaporation, drying, distillation, filtration, centrifugation, crystallization and extraction. It focuses on the application of these unit operations in pharmaceutical industry with emphasis on the equipment and machines used during the production of different dosage forms.

#### **PT 429 Pharmaceutical Technology II (2+1)**

This course is a continuation of the study of the various unit operations in pharmaceutical industry with **emphasis** on size reduction, size separation, size analysis and size enlargement involved in the process development, scale-up and manufacturing of pharmaceutical drug products in industry (conventional / advanced nanotechnology based). In addition to the container/closure systems, some of the packaging processing methods are covered. Moreover, the vision about designing a quality product and its manufacturing process to consistently deliver the intended performance of the product to meet patient needs is discussed by applying Quality-by-Design principles.

#### **PT 5110 Good Manufacturing Practice (1+1)**

This course involves the principles of the Current Good Manufacturing Practices (cGMP). It exposes students to all aspects of validation, calibration, inspection and the requirements for manufacturing facilities. It also provides students with a review of the process engineering, technology transfer, personnel



management, training and hygiene, premises and contamination control, documentation and auditing, process deviation with emphasis on risk management, complaint handling and product recall theory.

### **PT 5211 Advanced Drug Delivery Systems (1+1)**

The course aims to provide students with insights and competencies related to the principles of pharmaceutical pre-formulation as a gateway to dosage forms design and formulation. Emphasis is placed on developing formulations based on the physical and chemical properties of the drug substance and the intended use of the drug product. The course also introduces the students to the formulation principles and applications of novel and targeted drug delivery systems by transforming proteins, genes, and other biotechnology driven compounds into therapeutic products. In addition to formulation aspects of biotechnology derived pharmaceuticals, it also covers the application of polymers and excipients to solve problems/issues concerning the optimization of absorption, selective transport, and targeting.

### **PM 221 General Microbiology and Immunology (2+1)**

The course provides students with a combination of laboratory and theoretical experience exploring the general aspects of microbiology. It includes knowledge of microorganisms, their morphology, diversity, cell structure and function, cultural characteristics, identification of microorganisms, microbial nutrition. It also explores the basic concepts microbial growth, cultivation and reproduction. It also clarifies different mechanisms of transport across bacterial cell membrane. The course also covers the principles of genetic characters including DNA and RNA structures, replication, different forms of mutation and mutagenic agents. Moreover, it introduces the modern concepts of medical immunology, with an emphasis on host parasite relationship, Non-specific and specific immunity, Mechanism of protective immunity. Molecular and cellular immunology, including antigen and antibody structure, function and reaction between them, effect or mechanisms, complement, and cell mediated immunity and in vitro antigen antibody reactions

### **PM 312 Parasitology and Virology (2 +1)**

Part of this course will focus on parasitic infections of humans with knowledge concerning biological, epidemiological and ecological aspects of parasites causing diseases to humans with special attention to different parasitological related diseases in Egypt causing serious health problems. This part of the course will discuss medical helminthology, protozoology and entomology concerning their morphological features, life cycle, pathogenesis, clinical manifestations, different diagnostic techniques, the most recent lines of treatment and prevention with control strategy for each parasitic infection. Moreover, it also cover laboratory diagnosis of human parasitic infections. The other part of the course provides students with the essential knowledge to recognize the epidemiology, mechanisms of pathogenesis, clinical picture, methods of laboratory diagnosis, treatment, prevention and control measures of RNA and DNA viral infections in humans.

### **PM 323 Pharmaceutical Microbiology (2+1)**

This course describes in detail the physical and chemical methods of bacterial eradication and how to effectively control microbial growth in the field of pharmaceutical industry / hospitals. It further describes the means of preservation of pharmaceutical products, as well as cosmetics. Sterilization, sterilization indicators, sterility testing and aseptic area. Validation of sterilization process. Moreover, it explains the different groups of antimicrobials, their mechanism of action and resistance of microbes to biocides.



Microbiological evaluation of antiseptics, disinfectants and preservatives. Antibiotics, classification and mechanism of action including the new categories and new approaches to overcome bacterial resistance & antibiotics clinical abuse. Antiviral and antifungal agents. Assay of antimicrobial activity

#### **PM 414 Biotechnology (2+1)**

Introduction to biotechnology, fermentation technology, fermentation process and fermenters, Fermented products (Antibiotics, vitamins, amino acids, interferons, interleukins, monoclonal antibodies, vaccines and etc.... Bioremediation, N<sub>2</sub> fixation, detection and monitoring of genetically engineered microorganisms. Genetic Engineering, PCR, Recombinant DNA Technology and Applications of recombinant DNA in the pharmaceutical and medical fields. Basics of Gene therapy and its applications in monogenic and polygenic disorders. Other modern techniques of environmental microbiology.

#### **PM 515 Medical Microbiology (2+1)**

The course aims at studying microorganisms causing infectious disease in human beings. The infectious diseases, their etiology, pathogenesis and clinical manifestation, routes of transmission, treatment and techniques in detection and identification of pathogenic bacteria and fungi of major significance to public health will be studied. The course also focuses on immunological diseases and disorders in immunity including hypersensitivity, immuno-deficiency disorders, autoimmunity and auto-immune diseases and organ transplantation.

#### **MD 512 Pathology (1+1)**

The main aim of Pathology course is to provide students with knowledge and skills for common diseases affecting body organs and system. It helps the student to understand the causes (etiology) of disease, the mechanisms of its development (pathogenesis) and the associated alterations of structure (morphologic changes) and function (clinical manifestations and complications) to be able to determine the most likely diagnosis of the disease.

#### **PM 526 Public Health (2+0)**

This course aims at understanding all scientific disciplines required for health education and promotion directed to the community health. How epidemiology acts as the bases of public health actions will be taught. Detailed scientific information and practices programs will be provided for nosocomial infections, control of communicable, non-communicable diseases including **active and passive immunization**, improving mental, social, environmental, occupational, geriatric and family health, use of sufficient and balanced food and nutrition, supplying safe drinking water, treating and disposing wastes and proper intervention during disasters

#### **MD 121 Anatomy & Histology (2+1)**

Histology: Cytology, various tissues (epithelial, connective, muscular, and nervous), heart, blood vessels, lymphatic organs, skin and its appendages, systems (digestive and associated glands, respiratory, urinary, reproductive, and central nervous system), endocrine glands, and eye.

Anatomy : Introduction to skeletal, muscular, and articular systems, fascia, nervous, cardiovascular, and lymphatic systems, digestive, respiratory, and urogenital systems, endocrine glands. Cytology: blood, liver, spleen, lung, kidney, lymph node, cardiac muscle, aorta, stomach, and intestine.





### **PH 211 Physiology (2+1)**

Physiology: Introduction to body water, homeostasis, transport of materials, nervous systems, neuron structure and function (reflex arc), cardiovascular system, blood, respiratory cycle, gastrointestinal, reproductive, and renal systems, endocrine glands and body temperature regulation.

### **PH 222 Biostatistics (1+0)**

This course provides basic concepts of biostatistics and data analysis. It includes introduction to descriptive and inferential statistics, interpretation of estimates, confidence intervals and significance tests, elementary concepts of probability and sampling; binomial and normal distribution, basic concepts of hypothesis testing, estimation and confidence intervals, t-test and chi-square test, linear regression theory and the analysis of variance.

### **PH 223 Pathophysiology (1+1)**

Pathophysiology: Introduction to pathophysiology, cell injury, inflammation and immune response, autonomic nervous system in health and disease, endocrine disorders, pancreatic disorders, fluid and electrolyte imbalance, vascular and haematological disorders, disease of urinary, pulmonary and digestive systems.

### **PH 314 Pharmacology-I (2+1)**

The general principles of pharmacology are presented; such as pharmacokinetics, pharmacodynamics, receptor theory, drug interaction and principle of therapeutics. This course integrates principles of pharmacology with conceptual knowledge of physiology and pathophysiology to disease processes regarding the autonomic, neuromuscular and autacoids.

### **PH 325 Pharmacology-II (2+1)**

This course integrates principles of pharmacology with conceptual knowledge of physiology and pathophysiology disease processes regarding drugs acting on cardiovascular systems, gastro-intestinal tract, pulmonary systems and hematologic disorders. Anti-hyperlipidemic drugs are also included. Chemotherapeutic drugs including antimicrobials & anticancer are also included

### **PH 416 Pharmacology-III (2+1)**

This course integrates principles of pharmacology with conceptual knowledge of physiology and pathophysiology disease processes regarding drugs acting on endocrine system and central nervous system. Immunosuppressant are within the scope of the course. Stem cell therapy is also included. The anti-inflammatory, analgesics as well as gout treatments are also included.

### **PH 427 Therapeutics (1+1)**

The course provides the classification, symptoms, principles of therapy & treatment of certain common diseases: Cardiovascular diseases, gastro-intestinal tract disease, pulmonary disease & endocrine abnormalities.

### **PH 528 Toxicology & Forensic Chemistry (2+1)**

This course provides basics and concepts of toxicology including the mechanism of toxicity, target organ and treatment of toxicity. Toxic groups including heavy metals, toxic gases, animal, plant and marine



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poisons, pesticides and radiation hazards are covered. Environmental, occupational, reproductive and genetic toxicology as well as drug abuse are included. Postmortem sampling for detection of poisons, methods of detection, interpretation of results and writing of a report are also covered.

#### **PH 529 First Aid (1+0)**

The course covers topics of basic life support and medical emergency of different situations including bleeding, shock, poisoning, bone fractures, soft tissue injuries, rescue and transportation. It includes: introduction to first aid ABCs, medical emergencies, effect of temperature, transportation of an injured casualty & first aid kit, respiratory emergencies, fractures and dislocations, bleeding and surgical emergencies, burns and scalds, animal bites or stings and poisoning.

#### **PP 111 Medical Terminology (1+0)**

Introduction to medical and pharmaceutical terminologies, medical abbreviations, medical idioms, suffixes and prefixes, medical terms pertaining to major body systems.

#### **PP 322 Hospital Pharmacy (2 +0)**

The course aims to introduce students to hospital pharmacy organization, structure, management and related activities on both technical and administrative levels in accordance with national and international established guidelines. Administrative services include: the pharmacy, the pharmacy and therapeutic committee and policy making, the hospital formulary, medication purchasing, distribution and dispensing systems. The pharmaceutical (technical) services include: preparation of Intravenous (IV) admixtures, total parenteral nutrition (TPN) fluids, renal dialysis fluids, dispensing and safe handling of radiopharmaceuticals, cytotoxic drugs, and medical gases.

#### **PP 413 Drug Information (1+1)**

This course introduces the student to the concept and need of drug information, types of drug information resources (primary, secondary and tertiary literature), computerized and online drug information, literature evaluation and critical appraisal, retrieval of information. It also aims at providing the students with the professional skills required to effectively and accurately answer medication-related questions in a systematic and evidence based approach.

#### **PP 414 Pharmaceutical Legislations and Regulatory Affairs (1+0)**

A detailed presentation of law that governs and affects the practice of pharmacy, legal principles for non-controlled and controlled prescriptions, OTC drug requirements, opening new pharmacies, opening medical stores, opening factories, opening scientific offices, medicine registration, pharmacies and medicine stores management. Pharmacist duties and responsibilities, pharmacist-patient relationship, patient's rights and ethical principles and moral rules.

#### **PP 425 Clinical Pharmacokinetics (2+1)**

This course provides basic principles of pharmacokinetics and their application to the clinical setting. Single Intravenous bolus and oral kinetics, IV infusion, multiple IV bolus, short infusion & oral dosing, non-linear pharmacokinetics, pharmacokinetic models. Sources of variability in pharmacokinetics, dosage regimen and dosage adjustment in children, obese, elderly patients and chronic disease states. Therapeutic drug monitoring and pharmacogenomics approaches.





### **PP 426 Community Pharmacy Practice (2+1)**

The course provides students with competencies and knowledge for the provision of quality pharmaceutical care in a community pharmacy setting aiming at improving use of medicines and therapeutic outcomes. The course covers differentiation between minor and major ailments and responding to minor ailments with over-the-counter products. It also provides concepts of patient assessment, counseling, and monitoring in community pharmacy and in outpatient care settings and introduces students to pharmaceutical care services for chronic-diseased outpatients and to psychosocial aspects in patient care. In addition, the course provides the students with competencies to promote the public health role of pharmacist including health promotion and disease prevention activities

### **PP 517 Clinical Pharmacy I (2+1)**

Definition and concepts of clinical pharmacy and pharmaceutical care, and qualification to become a clinical pharmacy. Patient history, medication reconciliation, therapeutic planning and drug-related problems. Interpretation of clinical laboratory data and physical examination. Providing Medication Therapy management services. Principles of special care populations (geriatric, pediatric, renal and hepatic patients, obesity & pregnancy & lactation). The course also introduces the student to the principles of management and supportive care of oncological diseases, blood disorders and nutritional deficiencies.

### **PP 518 Clinical research, Pharmacoepidemiology and Pharmacovigilance (1+1)**

This course introduces the student to the basic principles of clinical research, design of research studies, types of research studies, clinical trials, statistical presentation of research data and ethical guidelines in drug research. This course addresses a range of study designs and analytic techniques for observational studies on the utilization, safety, and effectiveness of pharmaceuticals. Students will develop an understanding of how to plan, implement, analyse, and criticize pharmacoepidemiological studies. This course also provides the student's with understanding of pharmacovigilance importance, concept, processes, systems, global safety standards and regulations and reporting systems.

### **PP 529 Clinical Pharmacy II & Pharmacotherapeutics (1+1)**

The course introduces the student to the principles of pharmacotherapeutics & management of the common disease states (e.g. obstetrics and gynecology, rheumatic diseases, renal diseases, CNS diseases).

### **UR 111 Information Technology (1+1)**

This course tends to provide students of all university's faculties with a brief introduction to the world of computers and the concept of information technology including: number systems and data representation, computer system components: hardware & software, storage and input/output systems, Operating systems and Utility Systems, software applications. Also it gives an overview about computer networks and internet: data communication, transmission modes, transmission media, computer networks, internet protocol, and internet services. It practices some computer applications in the laboratory such as Internet Access, word processing and power point. It gives students a practical experience on developing projects related to the specialty of each faculty.



### UR 112 Human Rights and Corruption Fighting ( 1 + 0 )

يغطي هذا المقرر الموضوعات التالية: حقوق الإنسان في القانون الجنائي، حق الإنسان في تغيير جنسيته أو التخلي عن إحدى جنسياته، المواثيق الدولية المتعلقة بحماية حقوق الإنسان، علاقة العولمة والتنمية بالحقوق الاقتصادية والاجتماعية والثقافية، الحقوق الاقتصادية والاجتماعية والثقافية للإنسان، حقوق الإنسان في الشريعة الإسلامية، حقوق المرأة في قانوني العمل والتأمين الاجتماعي، حقوق الإنسان في التقاضي، الحقوق المدنية والسياسية للإنسان

### UR 123 Psychology (1+0)

The course introduces different principles, theories and vocabulary of psychology as a science. The course also aims to provide students with basic concepts of social psychology, medical sociology and interpersonal communication which relate to the pharmacy practice system that involves patients, pharmacists, physicians, nurses and other health care professionals.

### UR 124 Communication and Presentation skills ( 1+0 )

**Communication skills:** The course will help students develop necessary written and oral communication and presentation skills to improve inter- and intra-professional collaboration and communication with health care providers and patients .

**Presentation skills:** The course describes list elements of successful presentations, mention types and methods of presentations and how to prepare presentation including selection & use of the media.

The course also describes how to develop a personal style of presentation, describe how to deal with speaking anxiety, explain how to capture an audience's attention.

### UR 525 Entrepreneurship (1+0)

This course is designed to enhance a student's knowledge in leadership, business, and financial skills in pharmacy practice while learning the traits of an entrepreneur, current topics in entrepreneurship with a specific focus on pharmacy practice and patient care programs. This course will teach the participants a comprehensive set of critical skills needed to develop a profitable business project. This course is designed to provide the students the personal and business tools including risk-taking, strategic planning, marketing, competitiveness, and social responsibility to make the transition from the academic environment to the daily practice of pharmacy now and in the future, with an emphasis on entrepreneurship.

### NP 111 Mathematics (1+0)

Functions and graphs, limits and continuity, differentiation, exponential, logarithmic, and trigonometric functions, integration, basic differential equations, functions of several variables and problems related to them, probability and random variables, and hypothesis testing.

### NP 212 Scientific Writing ( 1 + 0 )

This course is designed to introduce students to the principles of good scientific writing, to be familiar with basic structure of scientific reports and research articles. It covers methods of paraphrasing, common mistakes in scientific writing, different writing styles, how to write a scientific report, proposal and manuscript, appropriate use of tables and figures in data presentation and evaluation of literature and information sources.



## **NP 513 Drug Marketing & Pharmacoeconomics ( 2 + 0 )**

### **Pharmacoeconomics**

the basic concepts of health economics, learning basic terms of health economics and understand key principles. Topics cover the economic mechanisms of health care markets as market failures, and government intervention. The course covers the key components of health care financing, and some methods of how to contain health care expenditure. Alongside the major definitions in health technology assessment, students should have an overview about different types of economic evaluation, budget impact analysis and their uses. Moreover, students should get familiar with different methods of pricing among which value-based pricing.

### **Drug Marketing**

The objective of this course is to introduce students to the concepts, analyses, and activities that comprise marketing management, and to provide practice in assessing and solving marketing problems. The course is also a foundation for advanced electives in Marketing as well as other business/social disciplines. Topics include marketing strategy, customer behavior, segmentation, market research, product management, pricing, promotion, sales force management and competitive analysis.

## **NP 524 Research Methodology (1 + 0)**

The course considers the nature of scientific knowledge and investigates various processes involved in research. Both the quantitative and qualitative approaches will be studied. The course covers the sources of knowledge, the scientific method in research, and the ethics of research. The important steps in planning a research project, sampling techniques and measurement tools necessary for conducting a research project will be covered. The course also discusses the considerations involved in writing a research report.

## **NP 525 Professional Ethics (1 + 0)**

Professional ethics provides general principles and history of pharmacy ethics, general principles of medical ethics, conflicts of interests and its management pharmacists relationship with society and family, ethics in disaster, medication error, research ethics and animal ethics.

## **PAE 01 Advanced Pharmaceutical Analysis - Spectroscopy (1+1)**

Advanced Pharmaceutical applications of different instrumental methods of analysis including UV/Visible spectrophotometry, synchronous fluorimetry, chemiluminescence atomic spectroscopy, mass spectroscopy and nanoanalysis.

## **PAE 02 Therapeutic Drug Monitoring (1+1)**

Introduction, serum drug concentrations, drug protein binding, therapeutic drug monitoring of some typical drug classes eg. Antidepressants, benzodiazepines, antipsychotics, antiarrhythmic drugs, toxicological drug monitoring.

## **POE 03 Combinatorial Chemistry and Quantum Mechanics (1+1)**

It includes: Combinatorial chemistry: Introduction, Applications and Techniques.

Target Identification, Biosensors from quantum mechanics and drug design points of view, virtual libraries and molecular modeling, NMR as quantum mechanics based technique in Drug Design, cheminformatics. Application of quantum mechanics and molecular modeling calculations by modern softwares.



#### **POE 04 Modern Trends in Drug Synthesis (1+1)**

This course introduces the concepts and applications of some new techniques in drug synthesis. Green chemistry of new efficient environmentally friendly methods. Stereochemistry aspects of regulation of chiral drugs, chiral switches of drugs, and diastereomeric interactions. Polymer Chemistry: polymerization mechanisms, properties and applications of polymers in drug industry. Practical applications of modern synthetic techniques.

#### **PDE 05 Drug Targeting (1+1)**

The course covers different divisions such as the fundamental concepts of drug – receptor interaction, the different sites of drug action, including enzymes, receptors and nucleic acids, different methods used to increase drug specificity and delivery of drugs to specific target sites and finally applications and examples of different drug classes.

#### **PDE 06 Advanced Medicinal Chemistry (1+1)**

The course is intended to give advanced knowledge in design, synthesis and biological evaluation of small organic substances as potential lead compounds. Conformational analysis and basic cheminformatics; force-field, energy minimization, 3Ds, pharmacophore identification, Sub-structure search, similarity search, databases. Physico-chemical properties: drug-likeness, design (diversity, scaffold-hopping). Combi, click chemistry, libraries and green chemistry. Proteins: structures, protein-ligand interactions, sequence/structure homology, structure-based design, docking. Synthesis of substances; Retrosynthetic analysis, Diversity-oriented synthesis, Scaffold-based synthesis. Biological evaluation of substances; Cell-free assays, Whole cell assays, Animal assays.

#### **PBE 07 Clinical Nutrition (1+1)**

Macronutrients – Micronutrients – Energy Balance – Obesity & Management of Obesity – Nutrition in pregnancy - Nutrition in pediatrics & geriatrics – Nutrition in liver disease – Nutrition in kidney disease – Nutrition in G.I.T disorders – Nutrition in Respiratory disorders – Food Allergy.

#### **PBE 08 Cancer Biology (1+1)**

DNA replication and its repair – Transcription and post-transcriptional modifications – Translation – Oncogenes & Proto-oncogenes -Normal cell vs. Cancer cell – Cell Cycle & check points – Apoptosis & Necrosis – Tumor Markers – Autophagy-Angiogenesis.

#### **PHE 09 Geriatrics (1+1)**

The course integrates the critical issues of aging, and the importance of team-based health care for geriatric patients in long term care facilities. The Geriatrics course is designed to provide students with the knowledge, skills, and experience to recognize and approach common problems in older adults in inpatient and outpatient settings as well as in the nursing home, common disease in old ages (neurodegenerative disease, osteoarthritis, fall & dizziness, hypertension, ischemic heart disease, arrhythmias and stroke).

#### **PHE 010 Advanced therapeutics: (1+1)**

The course provides the classification, symptoms, principles of therapy & treatment of certain disease (Autonomic nervous system disorders, peripheral vascular disorder, hematological disorder & special sense including eye, ear & skin).



**PME 011 Infection control and antimicrobial stewardship (1+1)**

The course includes infection prevention and control practices, the chain of infection, standard and transmission-based precautions, barriers and use of personal protective equipment, strategies for preventing the spread of infectious disease to healthcare workers and patients and disposal of biohazard waste. The course also addresses the improvement of antimicrobial agents prescription in the clinical practice through the application of stewardship programs in medical institutions. The course focuses on all elements and considerations required for the establishment and implementation of a successful antimicrobial policy.

**PME 012 Microbiological control of pharmaceutical products (1+1)**

The course includes methods for quantitative estimation of the biological activity of antimicrobial agents and vaccines according to pharmacopeias. The microbial estimation of non-sterile pharmaceutical products according to USP. Determination of endotoxin limit in sterile pharmaceutical products by LAL test according to USP. Assay of antiviral agents.

**PTE 013 Nano & Radiopharmaceuticals (1+1)**

Introduction to nanotechnology, nano-disperse system including (nano-emulsion and nano-suspension) - preparation and their application - nano-particles (nano-crystals and polymeric nano-particles) preparation and their application and nano-metals (silver, gold, carbon and nano-tube).

**PTE 014 Cosmetic Preparations (1+1)**

Definition, classification, anti dandruff preparations, fragrance preparations, nail lacquers, skin care products (emollients and tanning), antiperspirants and deodorants preparations, shampoo, dentifrices preparations, eye, make-up preparations, acne preparations, hair dyes preparations, rouge preparations, lipstick preparations and quality control tests and evaluation of cosmetic preparations.

**PGE 015 Complementary & Alternative medicine (1+1)**

The course covers definition of terms "Complementary medicine" and "alternative medicine with an overview of different domains of mind- body interventions, alternative medical systems. This course will also encompass the studying of the nutraceuticals as types of biologically based therapies. including dietary supplements, vitamins and minerals, functional foods and medical foods. The course will also include aromatherapy: definition, effective application and safety guidelines.

**PGE 016 Production and Manufacture of Medicinal Plants (1+1)**

This course will include cultivation, collection, preparation, storage, modern methods for extraction, isolation of biologically active constituents, structure elucidation and formulation of medicinal plants. It will also encompass studying of the industrial pharmacognosy, economic production of phytochemicals and natural products. The potential use of natural products in the preparation of pharmaceutical forms and dietary supplements such as whey protein, slimming preparations, plants' carotenes and pigments, chitosan, quercetins and crude flavonoids, as well as final packing of entire powdered forms or extract.

تم بحمد الله.