



**PROGRAM SPECIFICATION**  
**(Bylaw of PharmD-Clinical Pharmacy)**

**FACULTY OF PHARMACY**

**Future UNIVERSITY**

**2025-2026**

**Program Specifications - Academic Year 2025/2026  
(Bylaw of PharmD-Clinical Pharmacy)**

**A. Basic Information**

|  |  |
|--|--|
| <b>1. Award / degree:</b>  | Bachelor of Pharmacy   |
| <b>2. Program Type:</b>  | Single   |
| <b>3. Departments Delivering the Program</b><br><b>3/a-Faculty Departments</b>         | <ul style="list-style-type: none"> <li>• Department of Pharmaceutical Chemistry</li> <li>• Department of Pharmaceutics and Pharmaceutical Technology</li> <li>• Department of Pharmacology, Toxicology and Biochemistry</li> <li>• Department of Pharmacognosy and Medicinal Plants</li> <li>• Department of Microbiology and Immunology</li> <li>• Department of Pharmacy Practice and Clinical Pharmacy</li> </ul> |
| <b>3/b-Other Faculties and/or departments participating in delivering the program:</b> | <ul style="list-style-type: none"> <li>• Department of University Requirements and Training Center Future University in Egypt.</li> <li>• Departments of Faculty of Medicine, Governmental Universities</li> </ul>   |
| <b>4. Coordinator:</b>   | <ul style="list-style-type: none"> <li>• Ass. Prof. Dr. Iten Mamdouh – Acting Vice Dean for Education and Students Affairs</li> </ul>  |
| <b>5. Internal Evaluator:</b>  | <ul style="list-style-type: none"> <li>• Prof. Dr. Heba Darwish</li> </ul>   |
| <b>6. External Evaluator (s):</b>  | <ul style="list-style-type: none"> <li>• .....</li> </ul>  |
| <b>7. Last date of program specifications approval by faculty council:</b>             | <ul style="list-style-type: none"> <li>• September 2024</li> </ul>   |
| <b>8. Date of program approval</b>   | 12/2020  |

## B. Professional Information

### 1. Program Aims towards graduate attributes:

- 1/1. Provide patient-centered care to optimize therapeutic outcomes and minimize the incidence of illness in individuals and populations. **(NARS 1)**
- 1/2. Design prevention, intervention and educational strategies for individuals & communities to manage infectious and chronic diseases. **(NARS 1)**
- 1/3. Counsel individuals and communities to participate in optimizing the therapeutic outcomes. **(NARS 1)**
- 1/4. Develop skills to carry out duties in accordance with ethical, legal, social and economic guidelines. **(NARS 2)**
- 1/5. Respect social determinants of patients and populations to achieve best quality care. **(NARS 2)**
- 1/6. Utilize evidence-based data to deliver contemporary pharmaceutical products and pharmacy services. **(NARS 3)**
- 1/7. Assure the quality of pharmaceutical materials and products. **(NARS 4)**
- 1/8. Apply integrated evidence-based pharmaceutical, biomedical and clinical information in assessing the appropriateness, effectiveness, and safety of medications. **(NARS 5)**
- 1/9. Manage medication-used system through enhancement of informational and technological resources. **(NARS 5)**
- 1/10. Plan, design and conduct research using appropriate methodologies individually or as a part of a team. **(NARS 6)**
- 1/11. Share therapeutic decision-making as a member of an inter-professional health care team. **(NARS 7)**
- 1/12. Actively participate and engage as a healthcare team member by demonstrating mutual respect, understanding, and values. **(NARS 7)**
- 1/13. Demonstrate effective communication with patients, health care professionals and community. **(NARS 8)**
- 1/14. Be able to engage in innovative activities using entrepreneurial skills. **(NARS8)**

1/15. Demonstrate self-awareness, leadership and business administration skills. **(NARS 8)**

1/16. Be a life-long learner for continuous professional improvement. **(NARS 9)**

1/17. Demonstrate capabilities of performance appraisal and self-assessment. **(NARS 9)**

## **2. Learning Outcomes (LOs) of Program Specification:**

### **Domain 1: fundamental knowledge**

#### **Competency 1-1 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 element 1-1-1-Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.**

1-1-1-1 Demonstrate knowledge of pharmaceutical, mathematics, statistics, chemistry, biochemistry.

1-1-1-2 Demonstrate understanding of knowledge of social, behavioral and administrative sciences.

1-1-1-3 Demonstrate understanding of the basic principles of biomedical and clinical sciences.

**Key element 1-1-2- Utilize the proper pharmaceutical and medical terms, abbreviations and symbols in pharmacy practice**

1-1-2-1 Use proper pharmaceutical and medical terms, abbreviations and symbols in pharmacy practice.

1-1-2-2 Use the appropriate pharmaceutical and medical terminology in communicating with colleagues and other members of the health care team.

**Key element 1-1-3- Integrate knowledge from fundamental sciences to handle, identify, extract, design, prepare, analyze, and assure quality of synthetic/natural pharmaceutical materials/products**

1-1-3-1 Integrate knowledge from fundamental sciences to handle, identify, extract, design, prepare, analyze, and assure quality of synthetic/natural pharmaceutical materials/products.

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

1-1-4-1 Use the knowledge from fundamental sciences to explain the pharmacological action of drugs.

1-1-4-2 Integrate knowledge from fundamental sciences to design pharmaceutical care plans and delivering safe and effective drug therapy.

**Key element 1-1-5- Retrieve information from fundamental sciences to solve therapeutic problems**

1-1-5-1 Retrieve information from fundamental sciences to solve any therapeutic problems and enhance patient-centered care and population-based care.

**Key element 1-1-6- Utilize scientific literature, and collect and interpret information to enhance professional decision**

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

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

1-1-7-1 Analyze newly emerging issues, information and technologies influencing patient health care and pharmacy practice.

1-1-7-2 Assess updates influencing pharmaceutical industry to enhance pharmacy practice services.

**Domain 2: professional and ethical practice**

**Competency 2-1- 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 element 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**

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

2-1-1-2 Design and implement Drug therapy protocols.

2-1-1-3 Effectively communicate, participate and interact with other members of the healthcare team.

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

2-1-2-1 Apply ethics of health care and pharmacy profession.

2-1-2-2 Respect patients' rights and value people diversity.

**Key element 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**

2-1-3-1 Identify self and professional limitations.

2-1-3-2 Accept the conditions of referral to or guidance from other members of the health care team.

**Competency 2-2 Standardize pharmaceutical materials, formulate and manufacture pharmaceutical products, and participate in systems for dispensing, storage, and distribution of medicines**

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

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

**Key element 2-2-2 Apply the basic requirements of quality management system in developing, manufacturing, analyzing, storing, and distributing pharmaceutical materials/ products considering various incompatibilities**

2-2-2 -1 Apply the basic requirements of quality management system in developing, manufacturing, analyzing, storing, and distributing pharmaceutical materials/ products considering various incompatibilities.

2-2-2- 2- Collect, critically analyze and relate population-based data to patient-centered care.

**Key element 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**

2-2-3-1 Recognize the principles of various tools and instruments and select the proper techniques for synthesis and analysis of different materials and production of pharmaceuticals.

**Key element 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**

2-2-4-1 Implement the principles of pharmaceutical calculations, biostatistical analysis, bioinformatics, pharmacokinetics, and biopharmaceutics in modifying drug delivery systems, dose adjustment, bioequivalence studies, and pharmacy practice.

**Competency 2-3- Handle and dispose biologicals and synthetic/natural pharmaceutical materials/products effectively and safely with respect to relevant laws and legislations**

**Key element 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**

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

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

2-3-2- 1 Utilize ethical, legal, and safety guidelines for handling and disposal of biologicals, and pharmaceutical materials/products.

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

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

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

2-4-2-1 Demonstrate understanding of the principles of first aid measures for management of toxicities and medical emergencies

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

2-4-3-1 Communicate with healthcare team to solve any identified medicine-related and pharmaceutical care problems.

2-4-3-2 Construct and implement pharmaceutical care plans for acute and chronic diseases

**Key element 2-4-4 Assess toxicity profiles of different xenobiotics and detect poisons in biological specimens**

2-4-4-1 Relate different toxicity profiles and detect poisons in biological specimens.

**Competency 2-5 Contribute in pharmaceutical research studies and clinical trials needed to authorize medicinal products**

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

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

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

2-5-2-1 Retrieve, interpret, and critically evaluate evidence-based information needed in pharmacy profession.

2-5-2-2 Develop informational and technological resources to manage medication-used system.

**Key element 2-5-3 Contribute in planning and conducting research studies using appropriate methodologies**

2-5-3-1 Contribute in planning and conducting research studies using appropriate methodologies.

2-5-3-2 Document patient-care activities clearly, concisely, and accurately using appropriate systems.

**Competency 2-6 Perform pharmacoeconomic analysis and develop promotion, sales, marketing, and business administration skills.**

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

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

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

2-6-2-1 Utilize the principles of drug promotion, sales, marketing, accounting, and pharmacoeconomic analysis.

**Domain 3: pharmaceutical care**

**Competency 3-1 Apply the principles of body functions to participate in improving health care services using evidence-based data**

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

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

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

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

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

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

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

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

3-1-4-2 Participate in actual or simulated population health management by evaluating and adjusting interventions to improve health.

**Competency 3-2 Provide counseling and education services to patients and communities about safe and rational use of medicines and medical devices**

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

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

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

3-2-2-1 Implement the principles of clinical pharmacology and pharmacovigilance for the rational use of medicines and medical devices.

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

3-2-3-1 Provide evidence-based information about safe use of complementary medicine including phytotherapy, aromatherapy, and nutraceuticals.

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

3-2-4-1 Share information about toxic profiles of drugs and other xenobiotics including sources, identification, symptoms, and management control with healthcare team.

**Key element 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**

3-2-5-1 Educate and counsel patients, other health care professionals, and communities about safe and proper use of medicines including OTC preparations and medical devices.

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

3-2-6-1 Promote public awareness on drug misuse and abuse.

3-2-6-2 Detect, report and manage medication errors and adverse drug reactions.

3-2-6-3 Advocate and assure that patients' best interests are represented in an efficient and cost-effective manner.

#### **Domain 4: personal practice**

##### **Competency 4-1 Express leadership, time management, critical thinking, problem solving, independent and team working, creativity and entrepreneurial skills**

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

4-1-1-1 Demonstrate responsibility for creating and achieving shared goals regardless of position.

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

4-1-2-1 Work autonomously and effectively in a team, express peer evaluation and demonstrate time management skills.

4-1-2-2 Define clear roles and responsibilities for team members to optimize outcomes for specific patient-care encounters.

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

4-1-3-1 Show creativity by applying entrepreneurial skills in simulated entrepreneurial projects.

##### **Competency 4-2 Effectively communicate verbally, non-verbally and in writing with individuals and communities**

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

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

4-2-1-2 Assess a patients' health literacy and modify communication strategies to meet the patients' needs.

**Key element 4-2-2 Use contemporary technologies and media to demonstrate effective presentation skills**

4-2-2-1 Show effective presentation skills through the use of modern information technology and media skills.

**Competency 4-3 Express self-awareness and be a life-long learner for continuous professional improvement**

**Key element 4-3-1 Perform self-assessment to enhance professional and personal competencies**

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

**Key element 4-3-2 Practice independent learning needed for continuous professional development**

4-3-2- 1 Develop self-learning skills as part of continuous professional development to stay updated on all arising issues.

### **3. Academic Standards of Program Specification**

**3/1 National Academic Reference Standards (NARS 2017):**

- By completion of the program, students should achieve the following 12 competencies that cover 4 competency domains. These domains cover all essentials for practicing pharmacy profession including both drug-oriented and patient-oriented disciplines. Several Key Elements are included in each competency, with a total of 42 key elements for all competencies. These key elements 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
- Competency based NARS 2017 was adopted by the faculty council (17-9-2018)
- Based on the requirements of the Pharmacy Sector Committee to update all working bylaws to PharmD., a new curriculum (PharmD- Clinical Pharmacy) was introduced.
- Program aims and the Program Learning Outcomes (PLOs) were set by the Academic standards and Educational Programs Committee to suit the PharmD- Clinical Pharmacy.

and agreed upon by the faculty council as well. Courses' specifications were done accordingly by the departments.

- Key elements of NARS 2017 were adopted and the program learning outcomes were set guided by these key elements.
- The following Alignment Matrices were constructed:
  - Matrix 1: NARS 2017 Graduate Attributes Versus Program Aims
  - Matrix 2: Competencies & Key elements of NARS 2017 Versus Program Learning Outcomes Versus Courses (By departments)
  - Matrix 3: Program Learning Outcomes Versus Courses (By levels)
  - Matrix 4: Competencies and key elements versus APPE rounds

**3/2. Benchmarks:** None

#### **4. Program structure:**

- **Duration of the Bachelor of Pharmacy program:** five years (ten semesters) of full-time study. The program is structured into two semesters each year, each term made up of 15 weeks + One Internship year.

- **The internship year: One year training (36 weeks, 6 rounds)**

The sixth year of study is devoted to an advanced field training, with six training courses for a total of 36 weeks (one academic year). The advanced training should include at least four training courses within hospitals that implement clinical pharmacy practice and one training course in a non-clinical pharmacy practice area (pharmaceutical manufacturing, drug control...etc.).

The advanced training program is designed in an integrated and systematic manner, in a rotating, periodic manner, recorded in hours and training assignments, under the strict supervision from the faculty of Pharmacy and the training facility.

The internship program supervising committee designs the advanced training program annually based on the number of students and the availability of training places, provided that the program is approved by the faculty council prior to its implementation.

- **Number of Credit Hours: Theoretical: 122    Practical: 59    Total: 181**

| Courses                 | Credit hours |
|-------------------------|--------------|
| University Requirements | 6            |

|                                 |            |
|---------------------------------|------------|
| Elective Faculty Requirements   | 8          |
| Compulsory Faculty Requirements | 167        |
| <b>Total</b>                    | <b>181</b> |

**Table (1): Number of studying hours per week in each semester of program**

| Year            | Semester        | Lectures           |                     | Laboratory / Practical/week |                     | Total hours  |               |
|-----------------|-----------------|--------------------|---------------------|-----------------------------|---------------------|--------------|---------------|
|                 |                 | Credit hours/ week | Contact hours/ week | Credit hours/ week          | Contact hours/ week | Credit hours | Contact hours |
| 1 <sup>st</sup> | 1 <sup>st</sup> | 13                 | 13                  | 5                           | 10                  | 18           | 23            |
|                 | 2 <sup>nd</sup> | 14                 | 14                  | 4                           | 8                   | 18           | 22            |
| 2 <sup>nd</sup> | 1 <sup>st</sup> | 13                 | 13                  | 5                           | 10                  | 18           | 23            |
|                 | 2 <sup>nd</sup> | 11                 | 11                  | 6                           | 12                  | 17           | 23            |
| 3 <sup>rd</sup> | 1 <sup>st</sup> | 12                 | 12                  | 7                           | 14                  | 19           | 26            |
|                 | 2 <sup>nd</sup> | 13                 | 13                  | 6                           | 12                  | 19           | 25            |
| 4 <sup>th</sup> | 1 <sup>st</sup> | 11                 | 11                  | 7                           | 14                  | 18           | 25            |
|                 | 2 <sup>nd</sup> | 12                 | 12                  | 6                           | 12                  | 18           | 24            |
| 5 <sup>th</sup> | 1 <sup>st</sup> | 12                 | 12                  | 6                           | 12                  | 18           | 24            |
|                 | 2 <sup>nd</sup> | 11                 | 11                  | 7                           | 14                  | 18           | 25            |
| Total           |                 | 122                | 122                 | 59                          | 118                 | 181          | 240           |

- **Program Courses by Levels**
  - A. Study Plan**

**First Level/ First Semester**

| Course Title                          | Course Code | Credit Hours |            |           | Prerequisite | Examination Marks |             |     |      | Total Marks | Final Exam Hours |
|---------------------------------------|-------------|--------------|------------|-----------|--------------|-------------------|-------------|-----|------|-------------|------------------|
|                                       |             | Lect.        | Pract./Tut | Total     |              | Period.           | Pract./Tut. | Wr. | Oral |             |                  |
| Pharmaceutical Analytical Chemistry I | PC 101      | 2            | 1          | 3         | Registration | 15                | 25          | 50  | 10   | 100         | 2                |
| Pharmaceutical Organic Chemistry I    | PC 102      | 2            | 1          | 3         | Registration | 15                | 25          | 50  | 10   | 100         | 2                |
| Pharmacy Orientation                  | PT 101      | 1            | --         | 1         | Registration | 25                | --          | 75  | --   | 100         | 1                |
| Medicinal plants                      | PG 101      | 2            | 1          | 3         | Registration | 15                | 25          | 50  | 10   | 100         | 2                |
| Anatomy & Histology                   | MD 101      | 2            | 1          | 3         | Registration | 15                | 25          | 60  | --   | 100         | 2                |
| Information Technology                | PD 101      | 1            | 1          | 2         | Registration | 15                | 25          | 60  | --   | 100         | 1                |
| Mathematics                           | MS 101      | 1            | --         | 1         | Registration | 25                | --          | 75  | --   | 100         | 1                |
| English KET                           | ENG KET     | 2            | --         | 2         | Registration | 25                | --          | 75  | --   | 100         | 2                |
| <b>Total</b>                          |             | <b>13</b>    | <b>5</b>   | <b>18</b> |              |                   |             |     |      | <b>800</b>  |                  |

First Level/ Second Semester

| Course Title                           | Course Code | Credit Hours |            |           | Prerequisite                       | Examination Marks |             |     |      | Total Marks | Final Exam Hours |
|--|-------------|--------------|------------|-----------|------------------------------------|-------------------|-------------|-----|------|-------------|------------------|
|  |             | Lect.        | Pract./Tut | Total     |                                    | Period.           | Pract./Tut. | Wr. | Oral |             |                  |
| Pharmaceutical Analytical Chemistry II | PC 203      | 2            | 1          | 3         | Registration                       | 15                | 25          | 50  | 10   | 100         | 2                |
| Pharmaceutical Organic Chemistry II    | PC 204      | 2            | 1          | 3         | Pharmaceutical Organic Chemistry-I | 15                | 25          | 50  | 10   | 100         | 2                |
| Physical Pharmacy                      | PT 202      | 2            | 1          | 3         | Pharmacy Orientation               | 15                | 25          | 50  | 10   | 100         | 2                |
| Pharmacognosy I                        | PG 202      | 2            | 1          | 3         | Medicinal plants                   | 15                | 25          | 50  | 10   | 100         | 2                |
| Medical Terminology                    | MD 202      | 1            | -          | 1         | Registration                       | 25                | --          | 75  | --   | 100         | 1                |
| Psychology                             | MD 203      | 2            | -          | 2         | Registration                       | 25                | --          | 75  | --   | 100         | 2                |
| Human Rights and Fighting Corruption   | PD 202      | 1            | -          | 1         | Registration                       | 25                | --          | 75  | --   | 100         | 1                |
| English PET                            | ENG PET     | 2            | -          | 2         | ENG KET                            | 25                | --          | 75  | --   | 100         | 2                |
| <b>Total</b>                           |             | <b>14</b>    | <b>4</b>   | <b>18</b> |                                    |                   |             |     |      | <b>800</b>  |                  |

**Second Level/ Third Semester**

| Course Title                                | Course Code | Credit Hours |            |       | Prerequisite      | Examination Marks |             |     |      | Total Marks | Final Exam. Hours |
|---|-------------|--------------|------------|-------|-------------------|-------------------|-------------|-----|------|-------------|-------------------|
|   |             | Lect.        | Pract./Tut | Total |                   | Period.           | Pract./Tut. | Wr. | Oral |             |                   |
| Biochemistry I                              | PB 301      | 2            | 1          | 3     | Registration      | 15                | 25          | 50  | 10   | 100         | 2                 |
| General Microbiology and Immunology         | PM 301      | 2            | 1          | 3     | Registration      | 15                | 25          | 50  | 10   | 100         | 2                 |
| Pharmacognosy II                            | PG 303      | 1            | 1          | 2     | Pharmacognosy I   | 15                | 25          | 50  | 10   | 100         | 1                 |
| Pharmaceutical dosage forms I               | PT 303      | 2            | 1          | 3     | Physical pharmacy | 15                | 25          | 50  | 10   | 100         | 2                 |
| Physiology                                  | MD 304      | 2            | -          | 2     | Registration      | 25                | --          | 75  | --   | 100         | 2                 |
| Scientific writing and Communication skills | PD 303      | 1            | 1          | 2     | Registration      | 15                | 25          | 60  | ---  | 100         | 1                 |

**Program Specifications**

|   |        |           |          |           |              |    |    |    |    |            |   |
|---|--------|-----------|----------|-----------|--------------|----|----|----|----|------------|---|
| Pharmaceutical Legislations and practice ethics | PP 301 | 1         | -        | 1         | Registration | 25 | -- | 75 | -- | 100        | 1 |
| University Elective *                           |        | 2         | -        | 2         |              | 25 | -- | 75 | -- | 100        | 2 |
| <b>Total</b>                                    |        | <b>13</b> | <b>5</b> | <b>18</b> |              |    |    |    |    | <b>800</b> |   |

**Second Level/ Fourth Semester**

| Course Title                  | Course Code | Credit Hours |            |       | Prerequisite                      | Examination Marks |             |     |      | Total Marks | Final Exam. Hours |
|-------------------------------|-------------|--------------|------------|-------|-----------------------------------|-------------------|-------------|-----|------|-------------|-------------------|
|                               |             | Lect.        | Pract./Tut | Total |                                   | Period.           | Pract./Tut. | Wr. | Oral |             |                   |
| Pharmacology –I               | PO 401      | 2            | 1          | 3     | Physiology                        | 15                | 25          | 50  | 10   | 100         | 2                 |
| Phytochemistry I              | PG 404      | 1            | 1          | 2     | Pharmacognosy II                  | 15                | 25          | 50  | 10   | 100         | 1                 |
| Parasitology & Virology       | PM 402      | 2            | 1          | 3     | General Microbiology & Immunology | 15                | 25          | 50  | 10   | 100         | 2                 |
| Pathology and pathophysiology | MD 405      | 2            | 1          | 3     | Physiology                        | 15                | 25          | 60  | --   | 100         | 2                 |

|                                |        |           |          |           |                   |    |    |    |    |            |   |
|--------------------------------|--------|-----------|----------|-----------|-------------------|----|----|----|----|------------|---|
| Pharmaceutical Dosage Forms-II | PT 404 | 2         | 1        | 3         | Physical Pharmacy | 15 | 25 | 50 | 10 | 100        | 2 |
| Biochemistry II                | PB 402 | 2         | 1        | 3         | Biochemistry I    | 15 | 25 | 50 | 10 | 100        | 2 |
| <b>Total</b>                   |        | <b>11</b> | <b>6</b> | <b>17</b> |                   |    |    |    |    | <b>600</b> |   |

**Third Level/ Fifth Semester**

| Course Title                | Course Code | Credit Hours |            |       | Prerequisite                      | Examination Marks |             |     |      | Total Marks | Final Exam. Hours |
|-----------------------------|-------------|--------------|------------|-------|-----------------------------------|-------------------|-------------|-----|------|-------------|-------------------|
|                             |             | Lect.        | Pract./Tut | Total |                                   | Period.           | Pract./Tut. | Wr. | Oral |             |                   |
| Pharmacology-III*           | PO 603      | 2            | 1          | 3     | Pharmacology I                    | 15                | 25          | 50  | 10   | 100         | 2                 |
| Pharmaceutical Microbiology | PM 503      | 2            | 1          | 3     | General Microbiology & Immunology | 15                | 25          | 50  | 10   | 100         | 2                 |

|  |        |           |          |           |                                     |    |    |    |     |            |   |
|--|--------|-----------|----------|-----------|-------------------------------------|----|----|----|-----|------------|---|
| Medicinal Chemistry-I                  | PC 505 | 2         | 1        | 3         | Pharmaceutical Organic Chemistry-II | 15 | 25 | 50 | 10  | 100        | 2 |
| Phytochemistry II                      | PG 505 | 1         | 1        | 2         | Pharmacognosy II                    | 15 | 25 | 50 | 10  | 100        | 1 |
| Pharmaceutical Dosage Forms-III        | PT 505 | 2         | 1        | 3         | Pharmaceutical Dosage Forms-I       | 15 | 25 | 50 | 10  | 100        | 2 |
| Community Pharmacy Practice            | PP 502 | 2         | 1        | 3         | Pharmacology -I                     | 15 | 25 | 50 | 10  | 100        | 2 |
| First Aid and Basic Life Support (BLS) | MD 506 | 1         | 1        | 2         | Physiology                          | 15 | 25 | 60 | --- | 100        | 1 |
| <b>Total</b>                           |        | <b>12</b> | <b>7</b> | <b>19</b> |                                     |    |    |    |     | <b>600</b> |   |

\*Pharmacology III was offered in fifth semester instead of Pharmacology II which was based on comments of reviewers and approval of faculty council.

### Third Level/ Sixth Semester

| Course Title    | Course Code | Credit Hours |            |       | Prerequisite | Examination Marks |             |     |      | Total Marks | Final Exam. Hours |
|-----------------|-------------|--------------|------------|-------|--------------|-------------------|-------------|-----|------|-------------|-------------------|
|                 |             | Lect.        | Pract./Tut | Total |              | Period.           | Pract./Tut. | Wr. | Oral |             |                   |
| Pharmacology-II | PO 502      | 2            | 1          | 3     | Physiology   | 15                | 25          | 50  | 10   | 100         | 2                 |

**Program Specifications**

|   |        |           |          |           |                                  |    |     |    |     |            |   |
|---|--------|-----------|----------|-----------|----------------------------------|----|-----|----|-----|------------|---|
| Medicinal Chemistry-II                  | PC 606 | 2         | 1        | 3         | Medicinal Chemistry-I            | 15 | 25  | 50 | 10  | 100        | 2 |
| Pharmaceutical Dosage Forms-IV          | PT 606 | 2         | -        | 2         | Pharmaceutical Dosage Forms-II   | 25 | --- | 75 | --- | 100        | 2 |
| Hospital Pharmacy Practice              | PP 603 | 2         | 1        | 3         | Pharmaceutical Dosage Forms-II   | 15 | 25  | 50 | 10  | 100        | 2 |
| Pharmaceutical Technology               | PT 607 | 2         | 1        | 3         | Pharmaceutical Dosage Forms- III | 15 | 25  | 50 | 10  | 100        | 2 |
| Clinical Pharmacy Practice              | PP 604 | 2         | 1        | 3         | Pharmaceutical Dosage Forms-II   | 15 | 25  | 50 | 10  | 100        | 2 |
| Pharmacotherapy: Infectious disease II* | PP 706 | 1         | 1        | 2         | Pharmacology-III                 | 15 | 25  | 60 | -   | 100        | 1 |
| <b>Total</b>                            |        | <b>13</b> | <b>6</b> | <b>19</b> |                                  |    |     |    |     | <b>700</b> |   |

**Summer training**

\*Pharmacotherapy: Infectious disease II was offered in sixth semester instead of Pharmacotherapy: Infectious disease I which was based on approval of faculty council

**Fourth Level/ Seventh Semester**

| Course Title                          | Course Code | Credit Hours |            |           | Prerequisite   | Examination Marks |             |     |      | Total Marks | Final Exam. Hours |
|---------------------------------------|-------------|--------------|------------|-----------|--|-------------------|-------------|-----|------|-------------|-------------------|
|                                       |             | Lect.        | Pract./Tut | Total     |  | Period.           | Pract./Tut. | Wr. | Oral |             |                   |
| Medical Microbiology                  | PM 704      | 2            | 1          | 3         | General Microbiology & Immunology  | 15                | 25          | 50  | 10   | 100         | 2                 |
| Biopharmaceutics and Pharmacokinetics | PT 708      | 2            | 1          | 3         | Pharmaceutical Dosage Forms-IV   | 15                | 25          | 50  | 10   | 100         | 2                 |
| Pharmacotherapy: Infectious disease I | PP 604      | 1            | 1          | 2         | Pharmacology-II  | 15                | 25          | 50  | 10   | 100         | 1                 |
| Clinical Nutrition*                   | PB 904      | 1            | 1          | 2         | Biochemistry-II  | 15                | 25          | 60  | ---  | 100         | 1                 |
| Quality Control of Pharmaceuticals    | PT 709      | 2            | 1          | 3         | - Pharmaceutical Dosage Forms-IV<br>- Pharmaceutical Analytical Chemistry II | 15                | 25          | 50  | 10   | 100         | 2                 |
| Pharmacology-IV                       | PO 704      | 2            | 1          | 3         | Pharmacology-I   | 15                | 25          | 50  | 10   | 100         | 2                 |
| Elective course                       |             | 1            | 1          | 2         | --   |                   |             |     |      | 100         | 1                 |
| <b>Total</b>                          |             | <b>11</b>    | <b>7</b>   | <b>18</b> |  |                   |             |     |      | <b>700</b>  |                   |

\*Clinical nutrition was offered in seventh semester instead of Drug Information which was based on approval of faculty council

### Fourth Level/ Eighth Semester

| Course Title  | Course Code | Credit Hours |            |       | Prerequisite                             | Examination Marks |             |     |      | Total Marks | Final Exam. Hours |
|---|-------------|--------------|------------|-------|--|-------------------|-------------|-----|------|-------------|-------------------|
|   |             | Lect.        | Pract./Tut | Total |  | Period            | Pract./Tut. | Wr. | Oral |             |                   |
| Biostatistics   | PO 805      | 1            | 1          | 2     | Medical Terminology                      | 15                | 25          | 60  | --   | 100         | 1                 |
| Pharmacotherapy:<br>Endocrine and Renal<br>Diseases           | PP 808      | 2            | 1          | 3     | Pharmacology IV                          | 15                | 25          | 50  | 10   | 100         | 2                 |
| Pharmacotherapy:<br>Oncological Diseases<br>and Radiopharmacy | PP 809      | 2            | 1          | 3     | Pharmacology III                         | 15                | 25          | 50  | 10   | 100         | 2                 |
| Clinical<br>Pharmacokinetics                                  | PP 810      | 2            | 1          | 3     | Biopharmaceutics and<br>Pharmacokinetics | 15                | 25          | 50  | 10   | 100         | 2                 |
| Clinical Biochemistry   | PB 803      | 2            | 1          | 3     | Biochemistry-II                          | 15                | 25          | 50  | 10   | 100         | 2                 |
| Public Health and<br>Preventive Medicine                      | PM 805      | 2            | --         | 2     | Medical Microbiology                     | 25                | ---         | 75  | --   | 100         | 2                 |

|                 |  |           |          |           |    |  |  |  |  |            |   |
|-----------------|--|-----------|----------|-----------|----|--|--|--|--|------------|---|
| Elective Course |  | 1         | 1        | 2         | -- |  |  |  |  | 100        | 1 |
| <b>Total</b>    |  | <b>12</b> | <b>6</b> | <b>18</b> |    |  |  |  |  | <b>700</b> |   |

**Fifth Level/ ninth semester**

| Course Title                                | Course Code | Credit Hours |            |       | Prerequisite     | Examination Marks |             |     |      | Total Marks | Final Exam. Hours |
|---|-------------|--------------|------------|-------|------------------|-------------------|-------------|-----|------|-------------|-------------------|
|   |             | Lect.        | Pract./Tut | Total |                  | Period.           | Pract./Tut. | Wr. | Oral |             |                   |
| Fundamental & clinical Toxicology           | PO 906      | 2            | 1          | 3     | Pharmacology-IV  | 15                | 25          | 50  | 10   | 100         | 2                 |
| Pharmacotherapy: Neuropsychiatric Diseases  | PP 911      | 2            | 1          | 3     | Pharmacology-II  | 15                | 25          | 50  | 10   | 100         | 2                 |
| Drug Information*                           | PP 707      | 1            | 1          | 2     | Pharmacology-III | 15                | 25          | 60  | --   | 100         | 1                 |
| Pharmacotherapy: Gastrointestinal Diseases* | PP 017      | 1            | 1          | 2     | Pharmacology-II  | 15                | 25          | 50  | 10   | 100         | 2                 |
| Pharmacotherapy: Cardiovascular Diseases    | PP 912      | 2            | 1          | 3     | Pharmacology-III | 15                | 25          | 50  | 10   | 100         | 2                 |

### Program Specifications

|   |        |           |          |           |                                |    |    |    |    |            |          |
|---|--------|-----------|----------|-----------|--------------------------------|----|----|----|----|------------|----------|
| Pharmacotherapy:<br>Respiratory Diseases* | PP 018 | 1         | 1        | 2         | Pharmacology-I                 | 15 | 25 | 50 | 10 | 100        | 1        |
| Entrepreneurship                          | PD 905 | 1         | ---      | 1         | Community<br>Pharmacy Practice | 25 | -- | 75 | -- | 100        | 1        |
| <b>Elective Course</b>                    |        | <b>1</b>  | <b>1</b> | <b>2</b>  |                                |    |    |    |    | <b>100</b> | <b>1</b> |
| <b>Total</b>                              |        | <b>12</b> | <b>6</b> | <b>18</b> |                                |    |    |    |    | <b>800</b> |          |

\*Pharmacotherapy: Gastrointestinal Diseases and Pharmacotherapy: Respiratory Diseases were offered in ninth semester instead of Drug Marketing & Pharmacoeconomics and Alternative and Complementary Medicine which was based on approval of faculty council

### Fifth Level/ tenth semester

| Course Title                         | Course Code | Credit Hours |            |       | Prerequisite                      | Examination Marks |             |     |      | Total Marks | Final Exam. Hours |
|--------------------------------------|-------------|--------------|------------|-------|-----------------------------------|-------------------|-------------|-----|------|-------------|-------------------|
|                                      |             | Lect.        | Pract./Tut | Total |                                   | Period.           | Pract./Tut. | Wr. | Oral |             |                   |
| Family Planning and Women's Health   | PP 013      | 2            | -          | 2     | Pharmacology-IV                   | 25                | ---         | 75  | ---  | 100         | 2                 |
| Drug Marketing & Pharmacoeconomics * | PD 904      | 1            | 1          | 2     | Community<br>Pharmacy<br>Practice | 15                | 25          | 50  | 10   | 100         | 1                 |

**Program Specifications**

|  |        |           |          |           |  |    |      |    |     |            |   |
|--|--------|-----------|----------|-----------|--|----|------|----|-----|------------|---|
| Alternative and Complementary Medicine *                               | PG 905 | 2         | -        | 2         | Pharmacology-III<br>Phytochemistry     | 25 | ---- | 75 | --- | 100        | 2 |
| Pharmacotherapy: Critical Care Patients                                | PP 014 | 1         | 1        | 2         | Pharmacology-III                       | 15 | 25   | 50 | 10  | 100        | 1 |
| Pharmacotherapy: Pediatric and Geriatric Diseases                      | PP 015 | 2         | 1        | 3         | Pharmacology-III                       | 15 | 25   | 50 | 10  | 100        | 2 |
| Pharmacotherapy: Dermatological, Venereal and Musculoskeletal Diseases | PP 016 | 2         | 1        | 3         | Pharmacology IV                        | 15 | 25   | 50 | 10  | 100        | 2 |
| Clinical Research, Pharmacovigilance & Pharmacoepidemiology            | PP 019 | 1         | 1        | 2         | Pharmacotherapy: Infectious disease II | 15 | 25   | 60 | --- | 100        | 1 |
| Elective   |        | 1         | 1        | 2         |  |    |      |    |     | 100        | 1 |
| <b>Total</b>   |        | <b>11</b> | <b>7</b> | <b>18</b> |  |    |      |    |     | <b>800</b> |   |

**Summer training**



## B. University Requirements:

### a. Compulsory University Courses

**Include 4 credit hours of 2 English courses (either KET or PET) according to the Placement test given to student. The results of these courses are not added to GPA**

| Credit hours/week | Course Name          | Prerequisites                            | Course code |
|-------------------|----------------------|--|-------------|
| 2+0               | English KET          | Placement into ENG KET                   | ENG KET     |
| 2+0               | English KET Advanced | Placement into ENG KET-A                 | ENG KET A   |
| 2+0               | English PET          | ENG KET pass or ENG KET-A pass           | ENG PET     |
| 2+0               | English PET Advanced | ENG KET-A with a B+ grade pass or better | ENG PET A   |

### b. Elective University Courses

**2 credit hours of any course of the following (not added to GPA)**

| Credit hours/week | Course name            | Prerequisites | Course code |
|-------------------|------------------------|---------------|-------------|
| 2+0               | Sociology              | -             | SOC 101     |
| 2+0               | Scientific Thinking    | -             | SCT 101     |
| 2+0               | Environmental Sciences | -             | ENV 101     |

## C. Faculty Requirements

### a. Compulsory Faculty Courses (167 credit hours)

| Department                                | Credit Hours |
|---|--------------|
| Pharmaceutical Chemistry                  | 18           |
| Pharmaceutics & Pharmaceutical Technology | 24           |
| Pharmacology, Toxicology & Biochemistry   | 17           |
|   | 11           |
| Pharmacognosy & Medicinal Plants          | 14           |
| Microbiology & Immunology                 | 14           |
| Pharmacy Practice & Clinical Pharmacy     | 47           |
| Mathematics                               | 1            |

### Program Specifications

|                                |            |
|--------------------------------|------------|
| Medical Courses                | 13         |
| Profession Development Courses | 8          |
| <b>Total</b>                   | <b>167</b> |

#### b. Elective Faculty Courses (4 X 2)

| Serial no. | Course Title                          | Prerequisites | Course Code | Credit hr/week |
|------------|---------------------------------------|---------------|-------------|----------------|
| 1          | Applied Analytical Chemistry          | PC 203        | PCE 001     | 1+1            |
| 2          | Instrumental Analysis                 | PC 203        | PCE 002     | 1+1            |
| 3          | Drug Design                           | PC 606        | PCE 003     | 1+1            |
| 4          | Skin Care and Cosmetology             | PT 404        | PTE 004     | 1+1            |
| 5          | Radiopharmaceuticals                  | PT 404        | PTE 005     | 1+1            |
| 6          | Advanced Drug Delivery Systems        | PT 606        | PTE 006     | 1+1            |
| 7          | Biological Standardization            | PO 704        | POE007      | 1+1            |
| 8          | Substance Abuse                       | PO 906        | POE 008     | 1+1            |
| 9          | Veterinary Pharmacy                   | PO 603        | POE 009     | 1+1            |
| 10         | Molecular Biology                     | PB 402        | PBE 010     | 1+1            |
| 11         | Marine Natural Products               | PG 404        | PGE 011     | 1+1            |
| 12         | Forensic Pharmacognosy                | PG 404        | PGE 012     | 1+1            |
| 13         | Industrialization of Medicinal Plants | PG 404        | PGE 013     | 1+1            |
| 14         | Biotechnology                         | PM 502        | PME 014     | 1+1            |
| 15         | Infection and Immunity                | PM 301        | PME 015     | 1+1            |
| 16         | Medical Devices                       | PP 603        | PPE 016     | 1+1            |
| 17         | Evidence Based Medicine               | PP 603        | PPE 017     | 1+1            |
| 18         | Graduation Project                    | Level 5       | PGP 018     | 1+1            |

#### D- Summer Training: (graduation requirement) (100 hour)

Students are required to complete 100 hours of Practical/Field Training for graduation (Miscellaneous for example: Hospital and Clinical pharmacy, Community pharmacy, pharmaceutical industry). Students can start training after the third level and finish them before

graduation. Students should follow the summer training description and the method of assessment as described and announced (attached). The student receives a (Pass/Fail) based on the approval of his academic supervisor depending on data in his logbook and the evaluation rubric at the training site at the end of the training period.

## **5. Courses Content**

### **1. University Requirements (6 Credit Hours)**

#### **A. University Compulsory Courses [4 Credit Hours]:**

English Language: Students take two courses based on their level in the placement exam

Since English is the teaching language at FPSPI, all applicants must go through an English placement exam as an enrollment condition. Based on the exam score the students' English level is classified as: Key English level (KET) or (KET-A) each weigh 2 credit hours or Preliminary English level (PET) or (PET-A) each weigh 2 credits. Students either take the ordinary level of the English language or the A level based on his placement test.

#### **ENG KET: English KET (2+0)**

Prerequisite: Placement into ENG KET

A second tier English language course that focuses on all four skills through the enhancement of language production and reception. The course further builds upon the foundation of the previous course to reinforce language learning. Lexis is drawn from the reading and listening and recycled for consolidation within grammar, writing and speaking. More emphasis is given to fluency thus achieving higher levels of communicative complexity.

#### **ENG KET-A: English KET Advanced (2+0)**

Prerequisite: Placement into ENG KET-A

This course is very similar to English KET; however it caters to the more advanced students. It is a second tier English language course that focuses on all four skills through the enhancement of language production and reception. The course further builds upon the foundation of the previous course to reinforce language learning. Lexis is drawn from the reading and listening and recycled for consolidation within grammar, writing and speaking. More emphasis is given to fluency thus achieving higher levels of communicative complexity.

#### **ENG PET: English PET (2+0)**

Prerequisite: ENG KET or ENG KET A

A third tier English language course encompassing the lexical approach which focuses on communication by emphasizing fluency and accuracy through the development of sub-skill strategies for interaction, through speaking and writing. Topical and functional lexis provide the reference by which language is introduced and recycled within clear natural contexts. Writing is

explored through a range of texts, by understanding genre-specific conventions, and developing confidence by planning and discussions and by applying both process and product approaches.

### **ENG PET-A: English PET Advanced (2+0)**

Prerequisite: ENG KET-A

This course is very similar to English PET; however it caters to the more advanced students. IT is a third tier English language course encompassing the lexical approach which focuses on communication by emphasizing fluency and accuracy through the development of sub-skill strategies for interaction, through speaking and writing. Topical and functional lexis provide the reference by which language is introduced and recycled within clear natural contexts. Writing is explored through a range of texts, by understanding genre-specific conventions, and developing confidence by planning and discussions and by applying both process and product approaches. This course is very similar to English PET; however it caters to the more advanced students.

**B. University Elective Courses** (2 Credit are required) Students select one of the following courses.

### **SOC 101: Sociology (2+0)**

Prerequisite: Registration

This course analyses the evolution of human communities from tribal societies to modern states. It examines problems and issues related to the relationship between humans and their environment and their ability to adapt and develop. It also deals with problems of urbanization and hyper-urbanization such as tension, conflict and violence. It also touches on the role of civic society organizations, charities as well as NGOs in creating and maintaining social equilibrium and tranquility.

### **SCT 101: Scientific Thinking (2+0)**

Prerequisite: Registration

This course provides students with basic understanding of scientific thinking. Students will be given exposure to the concepts, terminology, principles and theories that comprise a course in thinking scientifically. Topics covered are to synthesize the broad range of knowledge about thinking scientifically, to emphasize research methodology, to encourage critical thinking, and to convey a scientific as well as systematic approach to think over a concept.

### **ENV 101: Environmental Sciences (2+0)**

Prerequisite: Registration

Environmental Sciences course helps students develop knowledge required to critically evaluate environmental problems and issues and provide applied solutions. The course is decidedly interdisciplinary in nature, focusing on the underlying natural processes relating to the environment, understanding and employing the scientific methods. The course includes studying natural resources, the relationship between environmental issues and society, as well as sustainable development. This course also perceives how respective official and non-official institutions deal with these issues and what sort of impact they have.

## 2- Faculty Compulsory and Elective Courses (176 Credit Hours)

### I. COURSES DELIVERED OR SUPERVISED BY THE DEPARTMENT OF PHARMACEUTICAL CHEMISTRY

#### A- Compulsory Courses

##### PC 101: Pharmaceutical Analytical Chemistry I (2+1)

Prerequisite: Registration

This course includes basic information about qualitative inorganic analysis, such as different types of solutions, law of mass action, chemical equilibrium, equilibrium constants [e.g. Ionic product of water (KW), acidity constant (Ka), basicity constant (Kb), solubility product constant (KSP.), instability constant (KINST.)], Le Chatelier principle, common ion effect, buffer solutions and amphoteric metals. Types of chemical reactions [e.g. neutralization, precipitation, complexation and redox reactions]. How to write and balance different types of chemical equations. Systematic examination of individual ion (cation or anion) through chemical tests and how to carry out systematic separation and identification of their mixtures.

##### PC 102: Pharmaceutical Organic Chemistry I (2+1)

Prerequisite: Registration

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 electronic structure of atom, alkanes [nomenclature, synthesis and reactions (free radical reactions)], and cycloalkanes. Alkenes, alkydienes and alkynes. Alkyl halides (nomenclature, preparation and chemical reactions (S<sub>N</sub>1, S<sub>N</sub>2, E<sub>1</sub>, E<sub>2</sub>)). Arenes and aromatic compounds (Kekule structure, Huckel rule, Electrophilic aromatic substitution and orientation). In addition it covers Stereochemistry (Optical isomers, racemic modification and nomenclature of configurations).

##### PC 203: Pharmaceutical Analytical Chemistry II (2+1)

Prerequisite: Registration

This course deals with quantitative analysis of selected samples either individually or in mixtures. It includes; neutralization reactions in aqueous medium [acids & bases, pH, calculation of pH of different electrolytes, buffer solutions, detection of end point]. Complexation reactions (types of complexing agents, detection of end point, cyanometric, mercurimetric and EDTA titrations). Precipitation reactions [detection of end point, argentometric determinations (Mohr's method, Volhard's method, Fajan's method, Leibeg's method)]. Oxidation – reduction reactions, Nernst equation, factors affecting oxidation potential, detection of end point, permanganometry, iodometry, iodimetry.

**PC 204: Pharmaceutical Organic Chemistry II (2+1)**

Prerequisite: PC 102

This course involves different classes of aliphatic and aromatic compounds: aryl halides, Alcohols, Phenols, ethers & epoxides, aldehydes, ketones, carboxylic acid & acid derivatives and polynuclear compounds. The course also aims at giving students knowledge about the mechanism of reactions of Heterocyclic compounds and upon successful completion of this course the students can differentiate most of the heterocyclic organic compounds.

**PC 505: Medicinal Chemistry I (2+1)**

Prerequisite: PC 204

The course includes the study of chemical structures, nomenclatures, interactions with the receptor binding sites (mechanism of action), structure activity relationships, synthesis and metabolic pathways of different chemical classes of various medicinal active agents which include: Antibiotics, Anti-infective, Anthelmintics, Antifungal drugs, and others Chemotherapeutic agents. Finally, various Anticancer therapies, and related drugs are also covered. The practical course is designed to expose the students to various synthetic and purification techniques in medicinal chemistry and methods of determination of drug substance, dosage forms and purity tests.

**PC 606: Medicinal Chemistry II (2+1)**

Prerequisite: PC 505

This course is tailored to assist the students to gain concrete knowledge about chemical structures, nomenclatures, interactions with the receptor binding sites (mechanism of action), structure activity relationships, synthesis and metabolic pathways of different chemical classes of various medicinal active agents which includes drugs affecting: the autonomic nervous system (ANS), cardiovascular system (CVS), central nervous system (CNS) and drugs affecting neurodegenerative disorders. Moreover, endocrine-related drugs (Diabetes, thyroid and steroidal hormones), antihistamines (H1, H2 blockers and anti-ulcer PPIs), drugs controlling pain and inflammation (NSAIDs) are also studied.

**B- Elective Courses**

**PCE 001: Applied Analytical Chemistry (1+1)**

Prerequisite: PC 203

This course includes, application of the previously studied techniques of analysis for Analysis of: *Water*: to ensure that it is suitable for its intended use (Pharmaceutical water, industrial water and potable water), through its physical examination [ its color, odor, taste, turbidity, electrical conductivity, pH] and chemical examination [its total solids, acidity, alkalinity, chloride, fluoride, hardness as well as gases(CO<sub>2</sub>, Cl<sub>2</sub>, O<sub>2</sub>, H<sub>2</sub>S) and different metals in addition to evaluation of water pollution through determination of O<sub>2</sub> absorbed and dissolved, NO<sub>3</sub><sup>-</sup>, NO<sub>2</sub><sup>-</sup>, NH<sub>3</sub>. *Food & cosmetics*: Student will be introduced to oils and fats concerning composition, physical and chemical examination for detection and determination of adulterants and suitability of lipid for human consumption. The course will also introduce the classification of cosmetics, types and

analysis of its active ingredients, additives, preservatives, volatile and non-volatile materials, water content and nitrogen content.

**PCE 002: Instrumental Analysis (1+1)**

Prerequisite: PC 203

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.

**PCE 003: Drug Design (1+1)**

Prerequisite: PC 606

The course is tailored to assist the students to gain concrete knowledge about the recent techniques used in drug design (based on computer-aided drug design, Molecular Modeling aspects, pharmacophore generation) and drug optimization process. The student will be able to understand the physicochemical properties of drugs in relation to biological action, drug receptor interactions, isosterism, drug metabolism and prodrug concept. In the practical course, the student will be able to deal with some computer aided drug design software.

**II. COURSES DELIVERED OR SUPERVISED BY THE DEPARTMENT OF PHARMACEUTICS & PHARMACEUTICAL TECHNOLOGY**

**A- Compulsory Courses**

**PT 101: Pharmacy Orientation (1+0)**

Prerequisite: Registration

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, ethics, 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. The course comprises also pharmacy education and pharmaceutical national and international organizations. In addition to the history of pharmacy practice in various civilizations.

**PT 202: Physical Pharmacy (2+1)**

Prerequisite: PT 101

This course provides students with knowledge of physicochemical 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 rheological behavior of dosage forms focusing on the theory behind phenomena and its application in pharmacy needed for dosage form design.

**PT 303: Pharmaceutical dosage forms I (2+1)**

Prerequisite: PT 202

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 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 404: Pharmaceutical dosage forms II (2+1)**

Prerequisite: PT 202

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, manufacturing and quality control tests of emulsions (oral, parenteral and topical) and traditional dermatological semisolid dosage forms (creams, ointments, gels and pastes). Formulation, manufacturing and quality control tests of different types of suppositories as molded solid preparations are also included.

**PT 505: Pharmaceutical dosage forms III (2+1)**

Prerequisite: PT 303

The course introduces the students to the kinetics of drug degradation including rate and order of the reaction, factors affecting reaction kinetics, determination of the half-life, expiration date by different methods, prediction of product shelf-life, stability studies, degradation pathways and how to protect drugs in different pharmaceutical dosage forms. This course is also designed to provide the student with adequate knowledge on sterile dosage forms including parenterals and ophthalmic preparations, regarding principles of formulation, development, sterilization, packaging and quality control testing Principles for calculation and manipulation of parenterals, ophthalmic preparations, vaccines and blood products are emphasized.

**PT 606: Pharmaceutical dosage forms IV (2+0)**

Prerequisite: PT 404

The course covers the principles and techniques involved in the formulation, and manufacturing of solid dosage forms including powders, granules, tablets and capsules including the modified and controlled release dosage forms. An in-depth study on types, methods of preparation, problems encountered during manufacturing as well as quality control testing will be covered. The course also deals with aerosols and other inhalation products regarding their types, components, preparation, packaging and quality control testing.

**PT 607: Pharmaceutical Technology (2+1)**

Prerequisite: PT 505

The course provides students with an introduction to industrial pharmacy. It deals with the principles of various unit operations such as particle size reduction and enlargement, powder and liquid mixing, heat transfer, evaporation, drying, distillation, filtration, centrifugation, crystallization and extraction. It focuses on the application of these unit operations in pharmaceutical industry. The course also introduces the student to layout of industrial firms, material for plant construction, environmental considerations, validation, and safety measurements in industrial factories.

**PT 708: Biopharmaceutics and Pharmacokinetics (2+1)**

Prerequisite: PT 606

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. 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 709: Quality Control of Pharmaceuticals (2+1)**

Prerequisite: PT 606; PC 203

This course is designed to let the student have the necessary knowledge about the inter-relationship between quality control, quality assurance and good manufacturing practice as well as the concept of process validation (prospective, retrospective, concurrent and revalidation). In addition, the course covers quality by design, pharmaceutical regulations according to FDA & EMA (European medicine agency), ISO, BSI and documentation. It will also cover the subjects related to good laboratory and analytical practice and sampling, including validation parameters for analytical methods according to ICH Guidelines Q2 R1, establishment of analytical methods of raw materials and end products, development of stability indicating assays, sampling methods and procedures.

**MS 101: Mathematics (1+0)**

Prerequisite: Registration

This course represents an introduction of the students to 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.

**B. Elective Courses:**

**PTE 004: Skin Care and Cosmetology (1+1)**

Prerequisite: PT 404

The course comprises the function of skin, hair and nails; their response to environmental, physiological and aging factors; cosmetic regulations pertaining to cosmetic product safety. Formulation of skin bleaches, sunscreens, antiperspirants, deodorants, anti-acne, masks, scrubs, cleansing products, shaving preparations, color cosmetics, nail polishes, shampoos and hair setting products as well as depilatories are included in this course. The course also deals with dermatological reactions of the skin, hair and nails to cosmetic raw materials and formulations; functions, properties, stability, and possible side effects of the active and inactive cosmetic ingredients and formulations.

**PTE 005: Radiopharmaceuticals (1+1)**

Prerequisite: PT 404

The course aims to give students a background of the basic principles of radio pharmacy necessary for the pharmacist to take responsibility in handling and using radio-pharmaceuticals efficiently and safely in different clinical applications. This course is designed to let the student familiar with fundamentals of radiopharmaceuticals with emphasis on production and application of radioisotopes in pharmacy, therapy, diagnosis and in research work. In addition, students will get acquainted with the methods of handling, disposal and protection from radiation and gain ability to conduct basic radiation dosimetry calculations and dose estimates.

**PTE 006: Advanced Drug Delivery Systems (1+1)**

Prerequisite: PT 606

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. The course also introduces the students to the formulation principles and applications of novel and targeted drug delivery systems for different routes by transforming proteins, genes, and other biotechnology driven compounds into therapeutic products. It also covers the application of polymers and excipients to solve problems/issues concerning the optimization of absorption, selective transport, and targeting. The course will also discuss and explain formulation, characterization and application of nanotechnology for enhancing drug delivery.

**III. COURSES DELIVERED OR SUPERVISED BY DEPARTMENT OF PHARMACOLOGY,  
TOXICOLOGY AND BIOCHEMISTRY**

**A- Compulsory Courses**

**PO 401: Pharmacology-I (2+1)**

Prerequisite: MD 304

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 and neuromuscular disorders. This includes the pharmacological effects, clinical use and adverse effects of sympatho and

parasympatho -mimetics and -lytics related drugs. Autacoids, anti-inflammatory drugs, analgesics, and drugs used in treatment of inflammatory diseases are also included. Besides, drugs used for management of common pulmonary diseases are involved.

**PO 502: Pharmacology-II (2+1)**

Prerequisite: MD 304

This course integrates principles of pharmacology with conceptual knowledge of physiology and pathophysiology disease processes regarding drugs acting on cardiovascular systems, such as antihypertensives, drugs used in heart failure, angina and coronary heart diseases, and arrhythmia. The course also deals with drugs used in central nervous system related disorders, such as anti-alzheimer, anti-parkinsonism, antidepressants, anti-psychotics, anti-epileptics, and sedative and hypnotics. Drugs used in disorders of the gastro-intestinal tract are also included, such as drugs used for peptic ulcer, diarrhea and constipation, nausea and vomiting, as well as inflammatory bowel disease. In all these subjects, the mechanism of action, pharmacological effects, clinical use and adverse effects are described.

**PO 603: Pharmacology-III (2+1)**

Prerequisite: PO 401

This course integrates principles of pharmacology with conceptual knowledge of physiology and pathophysiology disease processes regarding drugs used in hyperlipidemia and hematologic disorders, involving anti-coagulants, anti-platelets, and fibrinolytics. Also, the chemotherapeutic drugs, including antimicrobials, anticancer and immunosuppressant are within the scope of the course. For these classes and drugs the mechanism of action, pharmacological effects, clinical use and adverse effects are described. Stem cell therapy is also included.

**PO 704: Pharmacology-IV (2+1)**

Prerequisite: PO 401

This course integrates principles of pharmacology with conceptual knowledge of physiology and pathophysiology disease processes regarding drugs related to the endocrine system, involving disorders of thyroid/parathyroid glands, adrenal gland pituitary glands, growth hormone, diabetes and gynecological disorders. The course also covers the drugs used in renal disorders, such as acute and chronic renal failure and diuretics. The course covers also drugs used in dermatologic disorders, including acne vulgaris, psoriasis, and atopic dermatitis as well as dermatologic drug reaction.

**PO 805: Biostatistics (1+1)**

Prerequisite: MD 202

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.

**PO 906: Fundamental & Clinical Toxicology (2+1)**

Prerequisite: PO 704

This course provides basics and concepts of toxicology, branches of toxicology, and types of toxic effects. The course covers the mechanism of toxicity, target organ(s) and target molecules of different classes of toxicants. Different methods of management and treatments of intoxications are also involved. The course covers various toxic groups including heavy metals, toxic gases, animal, plant and marine poisons, pesticides and radiation hazards are covered. Environmental, occupational, reproductive, genetic and developmental 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.

**PB 301: Biochemistry I (2+1)**

Prerequisite: Registration

Proteins (protein structure- types of simple, conjugated and derived proteins- functions of various proteins- some biologically important peptides) - Enzymology (enzyme characteristics and kinetics - regulation - enzyme inhibitors as drugs) - Hemoglobin and porphyrins (Hb derivatives and types- metabolism of Hb and regulation) - Biological oxidation (electron transport chain- oxidative phosphorylation and ATP synthesis - inhibitors and uncouplers- free radicals and antioxidants) - Nucleic acids (DNA replication- RNA transcription – translation and protein synthesis).

**PB 402: Biochemistry II (2+1)**

Prerequisite: PB 301

Energy production and other metabolic pathway of dietary fuels (carbohydrates, lipids and proteins) – Fate of proteins – Amino acids as precursors for biosynthesis of biomolecules– Carbohydrates (structure of glycoproteins and proteoglycans - glucose transporters) – Lipids (physiologically important lipid molecules – cholesterol and steroids – lipoprotein metabolism) - Integration of metabolism (Feed/fast cycle) – Nitrogen metabolism and nitrogen balance – Allosteric and hormonal regulation of metabolism.

**PB 803: Clinical Biochemistry (2+1)**

Prerequisite: PB 402

Biochemical/pathophysiological changes and laboratory diagnostic markers for disorders of (endocrine glands - 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 – Diabetes mellitus – Obesity - Inborn errors of metabolism- Abnormalities of iron metabolism and different types of porphyria- Handling, preservation, storage and analysis of biological samples — Urine analysis – Tumor markers - Recent diagnostic biomarkers - Clinical correlations.

**PB 904: Clinical Nutrition (1+1)**

Prerequisite: PB 402

The course introduces students to basic concepts of clinical nutrition including; detailed information about micro and macronutrients, types of healthy and unhealthy food, energy homeostasis and essential medical nutrition in particular disease conditions, e.g. diabetes, obesity, cardiovascular diseases, renal diseases, neurological disorders, GIT disorders, bone diseases, cancer etc.

**MD 101: Anatomy & Histology (2+1)**

**Prerequisite: Registration**

Students will study 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. The course will also give 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.

**MD 202: Medical Terminology (1+0)**

**Prerequisite: Registration**

The course is an introduction to medical and pharmaceutical terminologies, medical abbreviations, medical idioms, suffixes and prefixes, medical terms pertaining to major body systems, including muscular system, skeletal system, respiratory system, cardiovascular system, digestive system, reproductive system, and urinary system.

**MD 203: Psychology (2+0)**

**Prerequisite: Registration**

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.

**MD 304: Physiology (2+0)**

**Prerequisite: Registration**

The course is an introduction to normal structure and function of the body and major systems. The course covers 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.

**B- Elective Courses**

**POE007: Biological Standardization (1+1)**

**Prerequisite: PO 704**

Students will study the general principles of drug screening from simple one to more sophisticated programmed screening. These screening tests are crucial for drug evaluation and discovery. The course offers knowledge about an array of experimental models both in vitro and in vivo which are required for the evaluation of a plethora of drug classes such as adrenergic agonists and antagonists, cholinomimetics and parasympatholytics, anti-hypertensives, cardiotonics, anti-arrhythmics, anti-epileptics, anti-histaminics as well as differential screening of some drug mixtures. The course presents also good knowledge of the biological standardization of a myriad of drugs.

**POE008 Substance Abuse (1+1)**

Prerequisite: PO 906

The course covers the neurochemical basis of drug dependence and how it affects the soft and hard use of many abused substances. The psychoactive effects of central acting drugs including depressant drugs such as opioids, sedative hypnotics (barbiturates, Benzodiazepines), alcohol, cannabinoids, as well as psychostimulant drugs, such as caffeine, cocaine and amphetamines. Besides, inhalants, hallucinogens and designer drugs are also an integral part of the curriculum. Recent trends in the management of dependence associated with the aforementioned classes of drug are also provided.

**POE009: Veterinary Pharmacology (1+1)**

Prerequisite: PO 603

This course integrates principles of pharmacology with conceptual knowledge of physiology and pathophysiology disease processes regarding veterinary drugs in the Egyptian field, and the use of specific drugs for treatment of diseased conditions caused by different infective agents with thorough information on the side effects, interactions and the hazards of veterinary drugs uses on environment and human health like drug residues. The veterinary medicinal products available in the Egyptian market will be also introduced.

**PBE010: Molecular Biology (1+1)**

Prerequisite: PB 402

The course demonstrates an understanding of genome organization in prokaryotes and eukaryotes, outlines the recent advances in approaching gene discovery through, explaining gene expression, regulation and molecular biology techniques. In addition to, cancer development, progression mechanisms (carcinogenesis & apoptosis) and different models of cell division/cell cycle control are illustrated. The course emphasizes new approaches using molecular biology to undertake gene manipulation in diagnosing and controlling different diseases.

**IV. COURSES DELIVERED OR SUPERVISED BY DEPARTMENT OF PHARMACOGNOSY AND MEDICINAL PLANTS**

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**A- Compulsory Courses**

**PG 101: Medicinal Plants (2+1)**

Prerequisite: Registration

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 and physiology, as well as different classes of secondary metabolites, and the variability in occurrence of pharmacologically active substances in certain official medicinal plants according to their WHO monographs. The course introduces students to certain botanical drugs of leaves origin. Students will learn to identify examples of these drugs in their entire and powdered forms as well as their major constituents, folk uses, clinically proven uses, precautions, possible herbal-drug interactions and to have an overview over their phyto-pharmaceuticals available on the market especially the Egyptian market.

**PG 202: Pharmacognosy I (2+1)**

Prerequisite: PG 101

After completion of the course the student should have the knowledge and skills that enable the student to differentiate between different organs of through their monographs. The course comprises the study of identification of different organs through their monographs: (fruits, flowers, seeds) ; 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 phyto-pharmaceuticals available on the market specially the Egyptian market

**PG 303: Pharmacognosy II (1+1)**

Prerequisite: PG 202

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: (herbs, Subterranean organs, unorganized drugs in addition to drugs of marine and animal origin) including identification of their active constituent , macro-morphological characteristics, benefits and precautions of their medicinal uses, side effect , contraindications and to have an overview over their phytopharmaceuticals available on the market specially the Egyptian market.

**PG 404: Phytochemistry I (1+1)**

Prerequisite: PG 303

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 give students the knowledge and skills that enable them to understand, describe and deal with the chemistry of volatile oils, resins, miscellaneous terpenoids, bitters, alkaloids, glycosides, tannins, antioxidants and carbohydrates 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 subplant constituents and their pharmacological actions and medicinal uses.

**PG 505: Phytochemistry (1+1)**

Prerequisite: PG 303

The course aims to enable students to demonstrate knowledge of basic concepts of chemistry and bioactivities of alkaloids, tannins and antioxidants as well as chromatographic techniques for their isolation and identification. The course emphasizes on drugs with valuable use in the Egyptian and worldwide markets, such as drugs affecting CNS, drugs ameliorating liver diseases and anti-inflammatory agents. Finally, the course focuses on the structure activity relationships (SAR) of these natural products derived compounds and their pharmacophoric features.

**PG 905: Alternative & Complementary Medicine (2+0)**

Prerequisite: PO 603; PG 404

Upon successful completion of this course, 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

Phyto-pharmaceuticals in Egyptian Market. the students will be introduced to guidelines for prescribing herbal medicinal drugs on the basis of the pharmacological properties of these drugs including therapeutic uses, dosage, adverse reactions, contraindications & drug interactions.

### **B- Elective Courses**

#### **PGE 011: Marine Natural Products (1+1)**

Prerequisite: PG 404

After completion of the course, the students should have both the knowledge and skills that enable them to understand, describe and deal with the composition and bioactivity of sea water, the marine ecosystem and the classification of major phyla of marine organisms, the importance of marine drugs as leads for novel pharmaceuticals; the chemistry, bioactivity and/or toxicity of metabolites derived from marine organisms (specially algae, invertebrates and microorganisms), as well as, the techniques adopted for drug development from marine resources.

#### **PGE 012: Forensic Pharmacognosy (1+1)**

Prerequisite: PG 404

The aim of this course is to provide the pharmacy student with sufficient knowledge concerning plants and their natural products that constitute health hazards, or intended for criminal uses to produce, abortion, loss of mental control, hallucination, heart arrest. It also 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.

#### **PGE 013: Industrialization of Medicinal Plants (1+1)**

Prerequisite: PG 404

The course deals with the different methods for cultivation of medicinal plants as well as quality control procedures and standardization of herbal pharmaceuticals. The methods and factors affecting cultivation, proper collection, harvesting technology, post-harvesting treatment, storage, and packaging of medicinal and aromatic plants prior human consumption are dealt with. The course focuses on the potentialities of industrialization of medicinal and aromatic plants with emphasis on the production of standardized herbals and phyto-pharmaceuticals. Also it covers the modern methods for production of active constituents of natural sources by tissue culture and precautions to be taken for the optimum yield.

### **V. COURSES DELIVERED OR SUPERVISED BY DEPARTMENT OF MICROBIOLOGY AND IMMUNOLOGY**

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#### **A- Compulsory Courses**

#### **PM 301: General Microbiology and Immunology (2+1)**

Prerequisite: Registration

The course covers the fundamental aspects of microbiology including: taxonomy, structure, physiology, growth, reproduction and genetics. Basic techniques for staining and identifying microorganisms are emphasized in the laboratory. Moreover, it introduces the basic concepts of

medical immunology, with an emphasis on host parasite relationship, non-specific and specific immunity including antibody and cell-mediated immunity. The course also covers antigen and antibody structure, function and types, complement system, active and passive immunization, in vitro antigen antibody reactions, hypersensitivity, immuno-deficiency, auto-immune disease and organ transplantation.

**PM 402: Parasitology and Virology (2 +1)**

Prerequisite: PM 301

This course includes two distinctive parts, the first part focus on the occurrence of human parasitic diseases with emphasis on diseases causing serious health problems in Egypt. It deals with human parasites including helminthology, protozoology and entomology concerning their morphological features, life cycle, pathogenesis, clinical manifestations, different diagnostic techniques, the most recent lines of treatment and prevention. The other part of the course provides students with the essential virology aspects to recognize the epidemiology, mechanisms of pathogenesis, clinical picture, methods of laboratory diagnosis, treatment, prevention and control measures of viral infections in human caused by different RNA and DNA viruses with emphasis on new emerging human viruses.

**PM 503: Pharmaceutical Microbiology (2+1)**

Prerequisite: PM 301

This course describes in details the physical and chemical methods for effective control of microbial growth in the field of pharmaceutical industry / hospitals. It includes different methods of sterilization, and validation of sterilization process. The course addresses classes and modes of action of chemotherapeutic agents and non-antibiotics antimicrobial agents including the new approaches to overcome bacterial resistance. The course includes microbiological evaluation of antibiotics and non- antibiotics. Laboratory procedures such enumeration and identification of microbial contaminants in commercial pharmaceutical products, sterility test and evaluation of antimicrobial effectiveness are also covered.

**PM 704: Medical Microbiology (2+1)**

Prerequisite: PM 301

The course aims at studying microorganisms causing infectious disease of major public health significance in human. The etiology of infectious diseases, their clinical manifestations, route of transmission, treatment and techniques for detection and identification of pathogenic microorganisms are covered. The microorganisms studied in this course include Gram negative and Gram positive bacteria, mycobacteria, fungi, mycoplasmas, rickettsiae and chlamydiae. Methods for laboratory diagnosis and identification of bacterial pathogens are emphasized in the laboratory.

**PM 805: Public Health & Preventive Medicine (2+0)**

Prerequisite: PM 704

The purpose of this course is to provide pharmacy student with basic concepts and knowledge of public health necessary for health promotion and prevention of diseases. It introduces the components of health care systems in Egypt and all scientific disciplines required for health education and promotion directed to the community health. Detailed scientific information for

control of communicable, non-communicable diseases, improving mental, social, geriatric and family health is provided. It also includes the impact of environment on health and the relationship between health and environmental quality such as water, sewage disposal, air, industrial and toxic wastes, occupational hazards and proper intervention during disasters.

**PD 101: Information Technology (1+1)**

Prerequisite: Registration

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.

**PD 202 Human Rights and Fighting Corruption (1+ 0)**

Prerequisite: Registration

This course examines the conceptual foundations of human rights, history of the field, the development of human rights framework and the multidisciplinary character of the field as an area of study. It covers in details the Universal Declaration on Human Rights, the International Covenant on Civil and Political Rights, the International Covenant on Economic, Social and Cultural Rights and all related agreements. It also touches on the state of Human Rights in Egypt and the Arab World.

**B- Elective Courses**

**PME 014: Biotechnology (1+1)**

Prerequisite: PM 503

The course aims to provide students with fundamentals, scope and applications of biotechnology through studying fermentation technology, upstream and downstream processes, scaling up, production of metabolites and enzymes. The course addresses the methods of regulation of gene expression, production of recombinant proteins and the major biotechnological products such as vaccines and monoclonal antibodies. Recent molecular techniques and other applications of biotechnology including biotransformation, bioremediation, bioleaching, bioinsecticides, biosensors, biosurfactants and energy production are also included.

**PME 015: Infection and Immunity (1+1)**

Prerequisite: PM 301

The course deals with the study of mechanisms of microbial pathogenicity including both overt microbial factors and complex interactions with the host that produce symptoms of the disease. The cellular, biochemical, molecular, and genetic basis for modern understanding of microbial disease will be included. An in-depth study of the advanced topics in immunology, primarily focusing on the genetics, mechanisms, and regulation of the immune system will be covered. In

addition, the immune response during a variety of disease conditions and immune chemistry will be discussed.

#### **IV. COURSES DELIVERED OR SUPERVISED BY DEPARTMENT OF PHARMACY PRACTICE AND CLINICAL PHARMACY**

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##### **A- Compulsory Courses**

##### **PP 301: Pharmaceutical Legislations and Practice Ethics (1 + 0)**

Prerequisite: Registration

A detailed presentation of law that governs and affects the practice of pharmacy, legal principles for non-controlled and controlled prescriptions, 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 are also included.

##### **PP 502: Community Pharmacy Practice (2+1)**

Prerequisite: PO 401

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 including upper respiratory tract, gastrointestinal, musculoskeletal, skin, eyes and ears. It also provides concepts of patient assessment and counselling, 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 603: Hospital Pharmacy Practice (2+1)**

Prerequisite: PT 505

Organization and structure of a hospital pharmacy, hospital pharmacy facilities and emphasize the role of hospital pharmacist in different services (inpatient and outpatient services), transfer of care, patient's medication record, and rational medication use, hospital formulary, pharmacy and therapeutic committee, I.V. admixtures and incompatibilities, enteral and parenteral nutrition, handling of cytotoxic drugs, therapeutic drug monitoring, patient counselling and safety, and risk management.

##### **PP 604: Clinical Pharmacy Practice (2+1)**

Prerequisite: PT 404

This course includes professional application of case history and case presentation, medication history taking, clinical problem solving, and therapeutic planning, clinical rounding and assessment of patient compliance. Detection and management of drug-related problems. The student will be exposed to cases with different comorbidities and how to apply therapy management including prescription problems, laboratory data review, diagnostic procedures, clinical manifestations of diseases, problem listing, pharmacist recommendations and reporting of adverse drug reactions.

**PP 605: Pharmacotherapy: Infectious disease I (1+1)**

Prerequisite: PO 502

This course includes the definition and concepts of clinical pharmacy and pharmaceutical care. General concepts of antimicrobial drug selection, bacterial resistance and antimicrobial stewardship will be addressed and how antimicrobials differ from other drug classes in terms of their effects on individual patients as well as on society as a whole. Principles of management of different bacterial infections will be discussed in details (CNS infections, upper and lower respiratory infections, skin and soft tissue infections, urinary tract infections, gastrointestinal infections, intra-abdominal infections, etc).

**PP 706: Pharmacotherapy: Infectious disease II (1+1)**

Prerequisite: PO 603

Principles of management of superficial and invasive fungal infections will be addressed. Management of different viral and parasitic infections (Human immunodeficiency virus infection, cytomegalovirus, influenza, amebiasis, malaria etc). Definitions of vaccination and immunization and how to recommend an immunization schedule for a normal and immunocompromised child and adults based on comorbid conditions and lifestyle choices. In addition, evaluation of an adverse reaction and its probable association with a vaccine.

**PP 707: Drug information (1+1)**

Prerequisite: PO 603

This course includes an advanced application of the science of drug information in terms of: its practice within the drug information centers and various clinical sites. The course will focus on Drug information and poison information centers, different drug information resources, use of the internet for drug and research information, evaluating information on the web. The basic statistical concepts are detailed. Basics of pharmacoeconomic literature are described.

**PP 808: Pharmacotherapy: Endocrine & renal diseases (2+1)**

Prerequisite: PO 704

This course includes the pathophysiology, causes, clinical presentation, diagnosis and application of pharmaceutical care plans in different endocrinologic disorders (Diabetes, thyroid disorder, Cushing syndrome,...) and different renal disorders and related fluid and electrolyte disturbances (acid-base disorders, acute and chronic kidney disease, end stage renal failure and kidney stones). The course develops the students' ability to design, monitor, refine safe and cost-effective treatment plans and provide appropriate information to patient, caregivers, and health professionals.

**PP 809: Pharmacotherapy: Oncologic Diseases and Radiopharmacy (2+1)**

Prerequisite: PO 603

This course develops the ability of the students to integrate cancer etiology, risk factors, cancer staging and grading, diagnosis, prognosis to optimize patients chemotherapeutic regimens for different types of tumors (solid and hematologic) and their management, toxicities of chemotherapy, supportive treatment, pharmaceutical care and patient's support measures. This course also includes studying radioactive isotopes, medical applications and precautions of their usage.

**PP 810: Clinical Pharmacokinetics (2+1)**

Prerequisite: PT 708

This course provides an introduction to basic principles of pharmacokinetics and their application to the clinical setting. Clinical pharmacokinetic equations and calculations 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, Renal and Hepatic Disease, Dialysis, Heart Failure. Dosage individualization of drugs of narrow therapeutic index (aminoglycosides, vancomycin, digoxin, phenytoin, etc). Therapeutic drug monitoring and pharmacogenomics approaches are applied.

**PP 911: Pharmacotherapy: Neuropsychiatric diseases (2+1)**

Prerequisite: PO 502

This course aims to provide the student with the knowledge in, pathophysiology, clinical and laboratory interpretation, pharmacotherapy, patient counseling and management of neuropsychiatric diseases: management of pain, mental health disorders, schizophrenia, depression, anxiety, seizure disorders, parkinsonism, multiple sclerosis, migraines. Monitoring of sedatives and hypnotics, general anesthetics and opioid analgesics.

**PP 912: Pharmacotherapy: Cardiovascular diseases (2+1)**

Prerequisite: PO 603

This course includes the pathophysiology, causes, clinical presentation, diagnosis and application of pharmaceutical care plans in different diseases affecting the cardiovascular system, symptoms, laboratory investigation and interpretation, prognosis, pharmacological and non-pharmacological management, patient counseling and monitoring of dyslipidaemias, hypertension, coronary artery disease, acute coronary syndromes, heart failure, dysrhythmias, thromboembolic disorders, and stroke. Different types of blood disorders will be included.

**PP 013: Family Planning and Women's Health (2+0)**

Prerequisite: PO 704

This course introduces the students to identification of drugs that are considered safe and unsafe during pregnancy and lactation. Recommend, modify and individualize contraceptive regimens on the basis of estrogen- and progestin-related adverse effects or drug interactions. Construct a pharmacotherapeutic plan for appropriate contraceptive use, and use of emergency contraception. Identify common menstrual disorders, infertility, hormone therapy in menopause and recommend appropriate pharmacotherapy.

**PP 014: Pharmacotherapy: Critical care patients (1+1)**

Prerequisite: PO 603

This course aims to provide the student with the knowledge in: pathophysiology, clinical manifestation, laboratory investigation and interpretation, pharmacotherapy and management of critical care illness (e.g. neuro-critical care, cardiovascular critical care, sepsis, septic shock, pain and analgesia, bleeding disorders and anticoagulation, enteral and parenteral nutritional support and therapy, hemodynamic monitoring, fluid and electrolyte disorders).

**PP 015: Pharmacotherapy: Pediatric and Geriatric diseases (2+1)**

Prerequisite: PO 603

This course will evaluate the pharmacotherapeutic regimens of older adults and pediatrics based on age-related pharmacokinetic and pharmacodynamic changes to support optimal risk and benefit of medications. Pharmacotherapeutic recommendations of age-related diseases will be discussed (Nutritional requirements, nutritional disorders, infectious diseases in pediatrics, congenital heart diseases, endocrine, neurological, haematologic, renal, and respiratory disorders, pediatric emergencies).

**PP 016: Pharmacotherapy: Dermatological, Venereal and musculoskeletal diseases (2+1)**

Prerequisite: PO 704

This course includes the pathophysiology, causes, clinical presentation, diagnosis, application of pharmaceutical care plans and the pharmacotherapy and management of most popular skin, venereal diseases and musculoskeletal disorders will be addressed (drug induced dermatologic disorders, photosensitivity, photoaging, burn injuries, psoriasis, acne vulgaris, contact dermatitis, sexually transmitted diseases, gonorrhea, syphilis, male infertility, gout and hyperuricemia, systemic lupus erythematosus Osteoporosis, osteoarthritis, and rheumatoid arthritis).

**PP 017: Pharmacotherapy: Gastrointestinal diseases (1+1)**

Prerequisite: PO 502

This course includes epidemiology, etiology, underlying pathophysiology, clinical manifestation, laboratory investigations and interpretation, pharmacologic and non-pharmacologic treatment, monitoring therapeutics of hepatic disorders including viral hepatitis, pancreatitis, gastrointestinal bleeding, peptic ulcer, gastro-esophageal reflux disease, inflammatory bowel diseases and irritable bowel syndrome as well as gastrointestinal symptoms including nausea, vomiting, constipation, and diarrhea.

**PP 018: Pharmacotherapy: Respiratory diseases (1+1)**

Prerequisite: PO 401

This course includes epidemiology, etiology, underlying pathophysiology, clinical manifestation, laboratory investigations and interpretation, pharmacologic and non-pharmacologic treatment, monitoring therapeutics, use of inhalers and patient counseling of acute and chronic bronchitis, bronchial asthma, chronic obstructive pulmonary disease, cystic fibrosis, and drug-induced respiratory problems.

**PP 019: Clinical Research, Pharmacovigilance and Pharmacoepidemiology (1+1)**

Prerequisite: PP 705

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 also provides the student's with understanding of pharmacovigilance importance, concept, processes, systems, global safety standards and regulations and reporting systems. The course will cover historical and legal background of

pharmacoepidemiology and its study designs. In addition, application of phamacoepidemiology principles and methods into practical drug issues focusing on retro- and prospective study design.

**MD 405: Pathology and Pathophysiology (2+1)**

Prerequisite: MD 304

The aim of this course is to provide the 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. The course also aquent students with the 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.

**MD 506: First Aid & Basic Life Support (1+1)**

Prerequisite: MD 203

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.

**PD 303: Scientific Writing & Communication skills (1 + 1)**

Prerequisite: Registration

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

**PD 904: Drug marketing & Pharmacoeconomics (1 + 1)**

Prerequisite: PP 502

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. Topics include marketing strategy, customer behavior, segmentation, market research, product management, pricing, promotion, sales force management and competitive analysis. The course also focuses on 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.

**PD 905: Entrepreneurship (1+0)**

Prerequisite: PP 502

This course is designed to enhance students' 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. The course is designed to introduce the students to 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.

**B- Elective Courses**

**PPE 016: Medical Devices (1+1)**

Prerequisite: PP 603

The role of medical devices in healthcare is essential. The diversity and innovativeness of this sector contribute significantly to enhance the quality and efficacy of healthcare. Covering a wide range of products, from simple bandages to the most sophisticated life-supporting products, the medical devices sector plays a crucial role in the diagnosis, prevention, monitoring, and treatment of diseases and the improvement of the quality of life of people suffering from disabilities.

**PPE 017: Evidence Based Medicine (1+1)**

Prerequisite: PP 603

This course teaches the principles of drug information and literature evaluation using the concepts of evidence-based practice. Skills include identifying resources to answer clinical questions, developing search strategies, and critically evaluating scientific literature, applying the evidence in clinical practice, allowing students to identify, utilize the best evidence to make decisions regarding patient care and exploring.

**6. Program Admission Requirements:**

- The Faculty of Pharmaceutical Sciences and Pharmaceutical Industries at FUE follows the regulations and score set by the Supreme Council of higher education in Egypt.
- FUE accepts students holding the Egyptian General Secondary Certificate of Education (Thanawya Amma) or its equivalent, as per the rules and regulations set by the Supreme Council of the Egyptian Universities; Thanawya Amma from other Arab countries, the American High School Diploma, the British Secondary School Certificates (GCSE, IGCSE),

the German Secondary School Certificate (Abitur), the French Secondary School Certificate (Baccalaureat de L'Enseignement Secondaire), and the International Baccalaureate.

- According to the regulations of the Egyptian Ministry of Higher Education, all students who have an Egyptian nationality holding foreign high school certificates and who did not take Thanawya Amma Arabic Language and religion exams during their high school MUST sit for and obtain a passing grade in the Thanawya Amma Arabic Language and religion exams prior to graduation from the University.
- All new students applying for admission at FUE must take the English Placement Test (EPT) and achieve the required English proficiency level before they can enroll in English language credit courses. Students will be placed according to their scores in an English language course. Students holding a valid International TOEFL certificate with an equivalent score of 550 and above are exempt from the placement test. Students who fail the English Placement Test (EPT) are required to complete and pass a remedial course (ENG 90 – Basic English) over a period of one semester.
- According to the university regulations, applicants should pass a medical examination prior to their acceptance.
- Students, who had their General Secondary certificate or its equivalent two years before the date of submission, can apply to the university on condition that they were not registered in other Universities the year they had their certificate and according to the previously mentioned regulations.

### **Requirements for Transfer-Students:**

#### **Transfer from other Universities**

- The transfer student must fulfill FUE admission requirements including the attainment of high school certificate with a score complying with the Supreme Council of Egyptian Private Universities regulations for the year during which the certificate was obtained.
- Applicants should pass the tests specified by the University.

### Program Specifications

- Applicants should possess a minimum grade of ‘C’ in case the applicant is transferring from a Credit Hours system or a minimum of ‘Good’ in case of transferring from full year system program or 2 semesters system program.
- Transfer students should study in the faculty for at least four semesters with a minimum of 50 credit hours.
- The student must submit official transcripts of the courses taken with detailed course descriptions stamped from an accredited university, including the credit hours and grades achieved.
- Upon final acceptance at FUE, the student will be requested to submit a withdrawal letter from the previous university.
- Applicant courses’ that will be transferred must satisfy the following conditions:
  - Courses covering at least 75% of the content of their counterparts at the FUE.
  - The applicant should possess a minimum grade of ‘Good’
- **Transfer from FUE Faculties:** Transfer from an FUE faculty to another is only available within two weeks from the beginning of the semester during the Add/Drop period. Students who wish to transfer from one faculty to another must obtain the approval of both the Dean and the academic advisor. Students score should be compatible with the score required by the faculty they want to join.
- **Registration:** Each student is assigned an academic advisor from the faculty staff. At the beginning of each semester, the student selects the courses to be studied during the semester from the list of courses offered by the faculty, with the guidance and consultation of the academic advisor assigned to him. The selected courses could only be studied after successful completion of the pre-requisite for registration.
- **Academic load:** The academic load is the number of registered credit hours per student each semester. The academic load in each semester for regular students ranges from 12-19 credit hours. Distinguished students (having cGPA 3.5 or more) could register more hours (with a maximum of 21 hours) after the approval of the academic advisor and the Vice Dean of education and students affairs.

Academic load could also be increased to 21 hours for graduation purpose, on condition that the cGPA should not be less than 2. If a student is put under probation (obtaining cGPA less than 2), he is not allowed to take an academic load more than 14 hours.

The academic load for the summer semester is 7 credit hours and could be increased to 9 for graduation purpose.

- **Add/drop:** The student is allowed to add or drop a course within the first 2 weeks from the beginning of the semester.
- **Withdrawal, absence and deprivation:** The student is allowed to withdraw a course during the first ten weeks of the semester. If the absence percentage was more than 25% in the twelfth week, the student will not be allowed to withdraw the course (deprived) or to complete it and he receives an (F) grade.

### **7. Regulations for Progression and Program Completion**

- First Year (Freshman):** Students are required to complete less than 36 credit hrs.
- Second Year (Sophomore):** Students are required to complete from 36 to less than 71 credit hrs.
- Third Year (Junior):** Students are required to complete from 71 to less than 109 credit hrs.
- Fourth Year (Senior1):** Students are required to complete from 109 to less than 145 credit hrs.
- Fifth Year (Senior 2):** Students are required to complete from 145 to less than 181 credit hrs.

#### **Requirements for Graduation**

- Students must pass all required courses and achieve a minimum cumulative GPA of 2.00.
- Students are required to complete 100 hours of Practical/Field Training and an internship year.

#### **Calculation of CGPA:**

$$\text{CGPA} = \frac{\sum_{\text{for all studied courses}} (\text{Grade of a course} \times \text{Credit hours of the course})}{\sum_{\text{for all studied courses}} (\text{Credit hours})}$$

#### **The Equivalent Grade to each CGPA**

| Grade | CGPA | Percentage       | Equivalent grade |
|-------|------|------------------|------------------|
| A     | 4.0  | From 90% to 100% | Excellent        |

|    |     |                               |           |
|----|-----|-------------------------------|-----------|
| A- | 3.7 | From 85% to less than 90%     |           |
| B+ | 3.4 | From 82.5% to less than 85%   | Very Good |
| B  | 3.2 | From 77.5% to less than 82.5% |           |
| B- | 3.0 | From 75% to less than 77.5%   |           |
| C+ | 2.8 | From 72.5% to less than 75%   | Good      |
| C  | 2.6 | From 67.5% to less than 72.5% |           |
| C- | 2.4 | From 65% to less than 67.5%   |           |
| D+ | 2.2 | From 62.5% to less than 65%   | Pass      |
| D  | 2.0 | From 60% to less than 62.5%   |           |
| F  | -   | Less than 60%                 | Fail      |

**Honors:** Students with a cumulative average of 3.7 or above at graduation are granted a B.Sc. with 1st class honors. Students with a cumulative average between 3.0 and 3.7 at graduation are granted a B.Sc. with 2nd class honors. To be granted with class honors, students must not fail in any of the provided courses.

## 8. Teaching and Learning methods

- Blended education (Online and on campus lectures and labs)
- Tutorials
- Laboratory Sessions
- Experiential education (Case Studies- Role Play- Hospital visits- Apps.- Patient counselling)
- Field Trips
- Learning projects
- Problem Solving
- Workshops
- Summer training
- Graduation project

## 9. Assessment Methods for Students:

**Periodical – Practical exams- Written exams- Oral exams**

*Summarized as follows:*

| Serial | Course Credit Hours |        |       | Examination Marks |        |     |      | Total Marks | Final Exam. Hours |
|--------|---------------------|--------|-------|-------------------|--------|-----|------|-------------|-------------------|
|        | Lect.               | Pract. | Total | Period.           | Pract. | Wr. | Oral |             |                   |
| 1      | 2                   | 1      | 3     | 15                | 25     | 50  | 10   | 100         | 2                 |
| 2      | 2                   | 1      | 3     | 15                | 25     | 60  | --   | 100         | 2                 |
| 3      | 1                   | 1      | 2     | 15                | 25     | 50  | 10   | 100         | 1                 |
| 4      | 1                   | 1      | 2     | 15                | 25     | 60  | --   | 100         | 1                 |
| 5      | 2                   | --     | 2     | 20                | --     | 70  | 10   | 100         | 2                 |
| 6      | 2                   | --     | 2     | 25                | --     | 75  | --   | 100         | 2                 |
| 7      | 1                   | --     | 1     | 25                | --     | 75  | --   | 100         | 1                 |

- The student will receive an (F) grade if he obtains a mark less than 30% in the final written exam.
- A student either receives a Pass or Fail in summer training.

### 10. Evaluation of the program

| Evaluator                                   | Tool  | Sample  |
|---|---|---|
| 1. Senior students<br>(Students at level 5) | - Meetings<br>- Questionnaire                 | 25%   |
| 2. Alumni                                   | - Questionnaire                               | 20%   |
| 3. Stakeholders                             | • Questionnaires.<br>• Meetings               | Representative samples from different related sectors |
| 4. Internal evaluator (s)                   | Report  | 1   |
| 5. External Evaluator (s)                   | Report  | 1-2   |
| 6. Other Audits                             | Reports from external reviewers of the course | one per department                                    |

|                                   |   |
|-----------------------------------|---|
| Signature of Program Coordinator: | Ass. Prof. Dr. Iten Mamdouh – Acting Vice Dean for Education and Students Affairs |
| Signature of Faculty Dean         | Prof. Dr. Hanan Refaat  |
| Faculty Council Approval Date     | 9/2024  |

**Matrix (1)**

**Matrix of NARS 2017 Graduate Attributes Versus Program Aims**

| NARS (2017) Graduate Attributes   | Program Aims   |
|---|--|
| 1. Educate and counsel individuals and communities to participate in optimizing therapeutic outcomes and minimizing the incidence of illness of individuals and populations | 1/1. Provide patient-centered care to optimize therapeutic outcomes and minimize the incidence of illness in individuals and populations.                            |
|   | 1/2. Design prevention, intervention and educational strategies for individuals & communities to manage infectious and chronic diseases.                             |
|   | 1/3. Counsel individuals and communities to participate in optimizing the therapeutic outcomes.  |
| 2. Practice and perform responsibilities and authorities legally, professionally, and ethically respecting patients' rights   | 1/4. Develop skills to carry out duties in accordance with ethical, legal, social and economic guidelines.   |
|   | 1/5. Respect social determinants of patients and populations to achieve best quality care.   |
| 3. Utilize evidence-based data to deliver contemporary pharmaceutical products and pharmacy services  | 1/6. Utilize evidence-based data to deliver contemporary pharmaceutical products and pharmacy services.  |
| 4. Assure the quality of pharmaceutical materials and products  | 1/7. 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                       | 1/8. Apply integrated evidence-based pharmaceutical, biomedical and clinical information in assessing the appropriateness, effectiveness, and safety of medications. |
|   | 1/9. Manage medication-used system through enhancement of informational and technological resources.   |
| 6. Contribute effectively in planning and conducting research using appropriate methodologies   | 1/10. Plan, design and conduct research using appropriate methodologies individually or as a part of a team.   |

|  |   |
|--|---|
| 7. Work collaboratively and share therapeutic decision-making as a member of an inter-professional health care team                              | 1/11. Share therapeutic decision-making as a member of an inter-professional health care team.                                |
|  | 1/12. Actively participate and engage as a healthcare team member by demonstrating mutual respect, understanding, and values. |
| 8. Demonstrate effective communication, leadership, business administration, and entrepreneurial skills  | 1/13. Demonstrate effective communication with patients, health care professionals and community.                             |
|  | 1/14. Be able to engage in innovative activities using entrepreneurial skills.  |
|  | 1/15. Demonstrate self-awareness, leadership and business administration skills.  |
| 9. Work as a life-long learner for continuous professional improvement and demonstrate capabilities of performance appraisal and self-assessment | 1/16. Be a life-long learner for continuous professional improvement.   |
|  | 1/17. Demonstrate capabilities of performance appraisal and self-assessment.  |

**Program Specifications**

| NARS<br>(2017)<br>Graduate<br>Attributes | Program Aims |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |
|--|--------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|
|  | 1/1          | 1/2 | 1/3 | 1/4 | 1/5 | 1/6 | 1/7 | 1/8 | 1/9 | 1/10 | 1/11 | 1/12 | 1/13 | 1/14 | 1/15 | 1/16 | 1/17 |
| 1  | X            | X   | X   |     |     |     |     |     |     |      |      |      |      |      |      |      |      |
| 2  |              |     |     | X   | X   |     |     |     |     |      |      |      |      |      |      |      |      |
| 3  |              |     |     |     |     | X   |     |     |     |      |      |      |      |      |      |      |      |
| 4  |              |     |     |     |     |     | X   |     |     |      |      |      |      |      |      |      |      |
| 5  |              |     |     |     |     |     |     | X   | X   |      |      |      |      |      |      |      |      |
| 6  |              |     |     |     |     |     |     |     |     | X    |      |      |      |      |      |      |      |
| 7  |              |     |     |     |     |     |     |     |     |      | X    | X    |      |      |      |      |      |
| 8  |              |     |     |     |     |     |     |     |     |      |      |      | X    | X    | X    |      |      |
| 9  |              |     |     |     |     |     |     |     |     |      |      |      |      |      |      | X    | X    |

**Matrix 2**

**Competencies & Key elements of NARS Versus Program Learning Outcomes Versus Courses (By Departments)**

| Competencies of pharmacy graduates (NARS 2017)  | Key Elements (NARS 2017)   | Program LOs   | Courses by Departments   |
|---|--|---|--|
| <p>1-1<br/>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>1-1-1- Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.</p> | <p>1-1-1-1 Demonstrate knowledge of pharmaceutical, mathematics, statistics, chemistry, biochemistry.</p> | <ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmaceutical Analytical Chemistry 1 (PC 101)</li> <li>- Pharmaceutical organic chemistry 1 ( PC 102)</li> <li>- Pharmaceutical organic chemistry 2 (PC 204)</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmacy Orientation (PT 101)</li> <li>- Physical Pharmacy (PT 202)</li> <li>- Mathematics (MS 101)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Biostatistics (PO 805)</li> <li>- Biochemistry 1 (PB 301)</li> <li>- Biological Standardization (POE 007)</li> </ul> </li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Medicinal plants (PG 101)</li> <li>- Pharmacognosy I (PG 202)</li> <li>- Pharmacognosy II (PG 303)</li> </ul> </li> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- General Microbiology and Immunology (PM 301)</li> <li>- Medical Microbiology (PM 704)</li> <li>- Infection and Immunity (PME 015)</li> </ul> </li> </ul> |

|  |   |   |  |
|--|---|---|--|
|  |   | 1-1-1-2 Demonstrate understanding of knowledge of social, behavioral and administrative sciences. | <ul style="list-style-type: none"> <li>● <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmacy Orientation (PT 101)</li> </ul> </li> <li>● <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- Human Rights</li> </ul> </li> <li>● <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Psychology (MD 203)</li> </ul> </li> <li>● <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Entrepreneurship (PD 905)</li> </ul> </li> <li>● <b>University Requirements</b> <ul style="list-style-type: none"> <li>- Sociology (SOC 101)</li> <li>- Environmental Sciences (ENV 101)</li> <li>- Scientific Thinking (SCT 101)</li> </ul> </li> </ul>   |
|  |   | 1-1-1-3 Demonstrate understanding of the basic principles of biomedical and clinical sciences.    | <ul style="list-style-type: none"> <li>● <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Medical Terminology (MD 202)</li> <li>- Biochemistry 1 (PB 301)</li> </ul> </li> <li>● <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Pathology and Pathophysiology (MD 405)</li> <li>- Pharmacotherapy: Infectious disease I (PP 605)</li> <li>- Pharmacotherapy: Infectious disease II (PP 706)</li> <li>- Pharmacotherapy: Dermatological, Venereal and musculoskeletal diseases (PP 016)</li> <li>- Pharmacotherapy: Endocrine &amp; renal diseases (PP 808)</li> <li>- Pharmacotherapy: Neuropsychiatric diseases (PP 911)</li> <li>- Pharmacotherapy: Cardiovascular diseases (PP 912)</li> <li>- Pharmacotherapy: Gastrointestinal diseases (PP 017)</li> </ul> </li> </ul> |
|  | 1-1-2- Utilize the proper pharmaceutical and medical terms, abbreviations and | 1-1-2-1 Use proper pharmaceutical and medical terms, abbreviations and                            | <ul style="list-style-type: none"> <li>● <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmaceutical Analytical Chemistry 1 (PC 101)</li> <li>- Pharmaceutical Analytical Chemistry II (PC 203)</li> </ul> </li> <li>● <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmacy Orientation (PT 101)</li> </ul> </li> </ul>   |

|  |  |  |   |
|--|--|--|---|
|  | symbols in pharmacy practice   | symbols in pharmacy practice   | <ul style="list-style-type: none"> <li>- Pharmaceutical Dosage Forms I (PT 303)</li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b></li> <li>- Anatomy and Histology (MD 101)</li> <li>- Medical Terminology (MD 202)</li> <li>• <b>Microbiology &amp; Immunology Department</b></li> <li>- Pharmaceutical Microbiology (PM 503)</li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b></li> <li>- Hospital Pharmacy Practice (PP 603)</li> </ul>  |
|  |  | 1-1-2-2 Use the appropriate pharmaceutical and medical terminology in communicating with colleagues and other members of the health care team.   | <ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b></li> <li>- Pharmacy Orientation (PT 101)</li> <li>- Pharmaceutical Dosage Forms I (PT 303)</li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b></li> <li>- Medical terminology (MD 202)</li> <li>- Biochemistry II (PB 402)</li> <li>• <b>Microbiology &amp; Immunology Department</b></li> <li>- Pathology and Pathophysiology (MD 405)</li> <li>- Pharmaceutical Microbiology (PM 503)</li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b></li> <li>- First Aid and Basic Life Support (BLS) (MD 506)</li> </ul> |
|  | 1-1-3- Integrate knowledge from fundamental sciences to handle, identify, extract, design, prepare, analyze, and assure quality of synthetic/natural pharmaceutical materials/products | 1-1-3-1 Integrate knowledge from fundamental sciences to handle, identify, extract, design, prepare, analyze, and assure quality of synthetic/natural pharmaceutical materials/products. | <ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b></li> <li>- Pharmaceutical Organic Chemistry I (PC 102)</li> <li>- Pharmaceutical Analytical Chemistry II (PC 203)</li> <li>- Instrumental Analysis (PCE 002)</li> <li>- Drug design (PCE 003)</li> <li>- Pharmaceutical organic chemistry 2 (PC 204)</li> <li>- Medicinal Chemistry 1 (PC 505)</li> <li>- Medicinal Chemistry 2 (PC 606)</li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b></li> <li>- Pharmaceutical Dosage Forms I (PT 303)</li> <li>- Pharmaceutical Dosage Forms II (PT 404)</li> </ul>  |

|  |  |   |   |
|--|--|---|---|
|  |  |   | <ul style="list-style-type: none"> <li>- Pharmaceutical Dosage Forms IV (PT 606)</li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b></li> <li>- Medicinal plants (PG 101)</li> <li>- Pharmacognosy I (PG 202)</li> <li>- Pharmacognosy II (PG 303)</li> <li>- Phytochemistry I (PG 404)</li> <li>- Phytochemistry II (PG 505)</li> <li>- Forensic Pharmacognosy (PGE 012)</li> <li>- Marine natural products (PGE 011).</li> <li>• <b>Microbiology &amp; Immunology Department</b></li> <li>- Biotechnology (PME 014)</li> <li>- Pharmaceutical Microbiology (PM 503)</li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b></li> <li>- Pharmacotherapy: Oncologic Diseases and Radiopharmacy (PP 809)</li> </ul> |
|  | 1-1-4- Articulate knowledge from fundamental sciences to explain drugs' actions and evaluate their appropriateness, effectiveness, and safety in individuals and populations | 1-1-4-1 Use the knowledge from fundamental sciences to explain the pharmacological action of drugs. | <ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b></li> <li>- Drug design (PCE 003)</li> <li>- Medicinal Chemistry 1 (PC 505)</li> <li>- Medicinal Chemistry 2 (PC 606)</li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b></li> <li>- Pharmacology 1 (PO 401)</li> <li>- Pharmacology 2 (PO 502),</li> <li>- Pharmacology 3 (PO 603)</li> <li>- Pharmacology 4 (PO 704)</li> <li>- Veterinary pharmacology (POE 009)</li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b></li> <li>- Alternative and complementary medicine (PG 906)</li> <li>- Industrialization of medicinal plants (PGE 013)</li> </ul>  |
|  |  | 1-1-4-2 Integrate knowledge from  | <ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b></li> <li>- Pharmaceutical Dosage Forms II (PT 404)</li> </ul>   |

|  |  |  |   |
|--|--|--|---|
|  |  | <p>fundamental sciences to design pharmaceutical care plans and delivering safe and effective drug therapy.</p>  | <ul style="list-style-type: none"> <li>- Pharmaceutical Dosage Forms IV (PT 606)</li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b></li> <li>- Pharmacology 2 (PO 502)</li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b></li> <li>- Community Pharmacy Practice (PP 502)</li> <li>- Pharmacotherapy: Infectious disease I (PP 605)</li> <li>- Pharmacotherapy: Infectious disease II (PP 706)</li> <li>- Pharmacotherapy: Dermatological, Venereal and musculoskeletal diseases (PP 016)</li> <li>- Pharmacotherapy: Pediatric and Geriatric diseases (PP 015)</li> <li>- Pharmacotherapy: Respiratory diseases (PP 018)</li> <li>- Family Planning and Women's Health (PP 013)</li> </ul>   |
|  | <p>1-1-5- Retrieve information from fundamental sciences to solve therapeutic problems</p> | <p>1-1-5-1 Retrieve information from fundamental sciences to solve any therapeutic problems and enhance patient-centered care and population based care.</p> | <ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b></li> <li>- Biopharmaceutics and Pharmacokinetics (PT 708)</li> <li>- Pharmaceutical dosage form III (PT 505)</li> <li>- Mathematics (MS 101)</li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b></li> <li>- Fundamental &amp; clinical Toxicology (PO 906)</li> <li>- Pharmacology IV (PO 704)</li> <li>- Biochemistry II (PB 402)</li> <li>- Clinical Biochemistry (PB 803)</li> <li>- Pharmacology 3 (PO 603)</li> <li>- Molecular Biology (PBE 010)</li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b></li> <li>- Alternative and complementary medicine (PG 906)</li> <li>• <b>Microbiology &amp; Immunology Department</b></li> <li>- Public Health and Preventive Medicine (PM 805)</li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b></li> <li>- Community Pharmacy Practice (PP 502)</li> <li>- Clinical Pharmacokinetics (PP 810)</li> </ul> |

|  |   |   |   |
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|  |   |   | <ul style="list-style-type: none"> <li>- Drug information (PP 707)</li> <li>- Clinical research, Pharmacovigilance &amp; Pharmacoepidemiology (PP 019)</li> <li>- Medical Devices (PPE 016)</li> <li>- Pharmacotherapy: Pediatric and Geriatric diseases (PP 015)</li> <li>- Pharmacotherapy: Oncologic Diseases and Radiopharmacy (PP 809)</li> </ul>  |
|  | <p>1-1-6- Utilize scientific literature, and collect and interpret information to enhance professional decision</p> | <p>1-1-6-1 Utilize scientific literature, collect and interpret information to enhance professional decision.</p> | <ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Drug design (PCE 003)</li> <li>- Applied Analytical Chemistry (PCE 001)</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmaceutical Technology (PT 607)</li> <li>- Skin Care and cosmetology (PTE 004)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Veterinary Pharmacology (POE 009)</li> <li>- Clinical Nutrition (PB 904)</li> <li>- Clinical Biochemistry (PB 803)</li> <li>- Substance Abuse (POE 008)</li> <li>- Molecular Biology (PBE 010)</li> </ul> </li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Marine natural products (PGE 011)</li> </ul> </li> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- Information Technology (PD 101)</li> <li>- General Microbiology and Immunology (PM 301)</li> <li>- Medical Microbiology (PM 704)</li> <li>- Pharmaceutical Microbiology (PM 503)</li> <li>- Biotechnology (PME 014)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Entrepreneurship (PD 905)</li> <li>- Drug information (PP 707)</li> </ul> </li> </ul> |

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|  |  |  | <ul style="list-style-type: none"> <li>- Clinical research, Pharmacovigilance &amp; Pharmacoepidemiology (PP 019)</li> <li>- Drug Marketing &amp; Pharmacoeconomics (PD 904)</li> <li>- Evidenced Based Medicine (PPE 017)</li> <li>- Pharmacotherapy: Gastrointestinal diseases (PP 017)</li> <li>- Pharmacotherapy: Respiratory diseases (PP 018)</li> <li>• <b>Summer training</b></li> </ul>   |
|  | 1-1-7- Identify and critically analyze newly emerging issues influencing pharmaceutical industry and patient health care | 1-1-7-1 Analyze newly emerging issues, information and technologies influencing patient health care and pharmacy practice. | <ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Quality Control of Pharmaceuticals (PT 709)</li> <li>- Pharmaceutical Technology (PT 607)</li> <li>- Skin Care and cosmetology (PTE 004)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Clinical Nutrition (PB 904)</li> <li>- Substance Abuse (POE 008)</li> </ul> </li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Industrialization of medicinal plants (PGE 013)</li> </ul> </li> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- Public Health and Preventive Medicine (PM 805)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Scientific Writing &amp; Communication skills (PD 303),</li> <li>- Family Planning and Women's Health (PP 013),</li> <li>- Pharmacotherapy: Infectious disease I (PP 605)</li> <li>- Pharmacotherapy: Infectious disease II (PP 706)</li> <li>- Pharmacotherapy: Endocrine &amp; renal diseases (PP 808)</li> </ul> </li> </ul> |

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|   |  | 1-1-7-2 Assess updates influencing pharmaceutical industry to enhance pharmacy practice services.  | <ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Skin Care and Cosmetology (PTE 004)</li> </ul> </li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Industrialization of medicinal plants (PGE 013)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Pharmacotherapy: Oncologic Diseases and Radiopharmacy (PP 809)</li> <li>- Pharmacotherapy: Critical Care patients (PP 014)</li> <li>- Pharmacotherapy: Respiratory diseases (PP 018)</li> </ul> </li> </ul>  |
| 2-1<br>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 | 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. | 2-1-1-1 Perform responsibilities and authorities in compliance with the legal and professional structure and role of all members of the health care professional team. | <ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmacy Orientation (PT 101)</li> <li>- Skin Care and cosmetology (PTE 004)</li> </ul> </li> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- Public Health and Preventive Medicine (PM 805)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Hospital Pharmacy Practice (PP 603)</li> <li>- Clinical Pharmacokinetics (PP 810)</li> <li>- Clinical research, Pharmacovigilance &amp; Pharmacoepidemiology (PP 019)</li> <li>- Pharmaceutical Legislations and Practice Ethics (PP 301)</li> </ul> </li> <li>• <b>Summer Training.</b></li> </ul> |
|   |  | 2-1-1-2- Design and implement Drug therapy protocols.  | <ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmacy orientation (PT 101)</li> <li>- Skin Care and Cosmetology (PTE 004)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Clinical Pharmacy Practice (PP604)</li> <li>- Pharmacotherapy: Critical care patients (PP 014)</li> <li>- Pharmacotherapy: Neuropsychiatric diseases (PP 911)</li> </ul> </li> </ul>   |

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|  |   | 2-1-1-3 Effectively communicate, participate and interact with other members of the healthcare team. | <ul style="list-style-type: none"> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Community Pharmacy Practice Hospital Pharmacy Practice (PP 603)</li> <li>- Scientific writing and Communication Skills (PD 303)</li> </ul> </li> </ul>   |
|  | 2-1-2 Adopt ethics of health care and pharmacy profession respecting patients' rights and valuing people diversity  | 2-1-2-1 Apply ethics of health care and pharmacy profession.   | <ul style="list-style-type: none"> <li>- <b>Pharmaceutics and Pharmaceutical Technology</b></li> <li>- Pharmacy Orientation (PT 101)</li> <li>- <b>Pharmacology, Toxicology &amp; Biochemistry Department</b></li> <li>- Psychology (MD 203)</li> <li>- <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b></li> <li>- Entrepreneurship (PD 905)</li> <li>- <b>Summer Training</b></li> </ul>  |
|  |   | 2-1-2-2 Respect patients' rights and value people diversity.   | <ul style="list-style-type: none"> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- First Aid and Basic Life Support (BLS) (MD 506)</li> <li>- Medical Devices (PPE 016)</li> <li>- Family Planning and Women's Health (PP 013)</li> <li>- Pharmaceutical Legislations and Practice Ethics (PP 301)</li> </ul> </li> </ul>   |
|  | 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 | 2-1-3-1 Identify self and professional limitations.  | <ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Skin Care and cosmetology (PTE 004)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmacology 3 (PO 603)</li> <li>- Pharmacology 4 (PO 704)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Medical Devices (PPE 016)</li> <li>- Family Planning and Women's Health (PP 013)</li> <li>- Pharmacotherapy: Endocrine &amp; renal diseases (PP 808)</li> <li>- Pharmacotherapy: Neuropsychiatric diseases (PP 911)</li> </ul> </li> </ul> |

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|  |  |   | <ul style="list-style-type: none"> <li>• <b>Summer Training</b></li> </ul>   |
|  |  | <p>2-1-3-2 Accept the conditions of referral to or guidance from other members of the health care team.</p> | <ul style="list-style-type: none"> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmacology 2 (PO 502)</li> <li>- Pharmacology 3 (PO 603)</li> <li>- Veterinary Pharmacology (POE 009)</li> </ul> </li> </ul> |

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| <p>2-2<br/>Standardize pharmaceutical materials, formulate and manufacture pharmaceutical products, and participate in systems for dispensing, storage, and distribution of medicines</p> | <p>2-2-1 Isolate, design, identify, synthesize, purify, analyze, and standardize synthetic/natural pharmaceutical materials</p>  | <p>2-2-1-1 Isolate, design, identify, synthesize, purify, analyze, and standardize synthetic/natural pharmaceutical materials.</p>  | <ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmaceutical Analytical Chemistry 1 (PC 101)</li> <li>- Pharmaceutical Organic Chemistry 1 (PC 102)</li> <li>- Pharmaceutical Organic Chemistry 2 (PC 204)</li> <li>- Drug Design (PCE 003)</li> <li>- Medicinal Chemistry 1 (PC 505)</li> <li>- Medicinal Chemistry 2 (PC 606)</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Quality Control of Pharmaceuticals (PT 709)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Biological Standardization (POE 007)</li> </ul> </li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Phytochemistry I (PG 404)</li> <li>- Phytochemistry II (PG 505)</li> </ul> </li> </ul> |
|   | <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>2-2-2 -1 Apply the basic requirements of quality management system in developing, manufacturing, analyzing, storing, and distributing pharmaceutical materials/ products considering various incompatibilities</p> | <ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Instrumental Analysis (PCE 002)</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmaceutical Dosage Forms II (PT 404)</li> <li>- Pharmaceutical Dosage Forms IV (PT 606)</li> <li>- Quality Control of Pharmaceuticals (PT 709)</li> <li>- Pharmaceutical Technology (PT 607)</li> </ul> </li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Industrialization of medicinal plants (PGE 013)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Hospital Pharmacy Practice (PP 603)</li> </ul> </li> <li>• <b>Summer Training</b></li> </ul>  |

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|   | 2-2-2- 2- Collect, critically analyze and relate population-based data to patient-centered care.  | <ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry</b> <ul style="list-style-type: none"> <li>- Instrumental Analysis (PCE 002)</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmaceutical Dosage Forms IV (PT 606)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Pharmacotherapy: Critical care patients (PP 014)</li> <li>- Pharmacotherapy: Respiratory diseases (PP 018)</li> <li>- Pharmacotherapy: Gastrointestinal diseases (PP 017)</li> </ul> </li> </ul>   |
| 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 | 2-2-3- 1 Recognize the principles of various tools and instruments, and select the proper techniques for synthesis and analysis of different materials and production of pharmaceuticals. | <ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmaceutical Analytical Chemistry II (PC 203)</li> <li>- Instrumental Analysis (PCE 002)</li> <li>- Applied Analytical Chemistry (PCE 001)</li> <li>- Medicinal Chemistry 1 (PC 505)</li> <li>- Medicinal Chemistry 2 (PC 606)</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmaceutical Dosage Forms I (PT 303)</li> <li>- Pharmaceutical Dosage Forms II (PT 404)</li> <li>- Pharmaceutical Dosage Forms IV (PT 606)</li> <li>- Quality Control of Pharmaceuticals (PT 709)</li> </ul> </li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Phytochemistry II (PG 505)</li> </ul> </li> </ul> |
| 2-2-4 Adopt the principles of pharmaceutical calculations, biostatistical analysis, bioinformatics, pharmacokinetics, and biopharmaceutics and their                                  | 2-2-4-1 Implement the principles of pharmaceutical calculations, bio statistical analysis, bioinformatics, pharmacokinetics, and  | <ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Applied Analytical Chemistry (PCE 001)</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmaceutical Dosage Forms I (PT 303)</li> <li>- Biopharmaceutics and Pharmacokinetics (PT 708)</li> <li>- Pharmaceutical dosage form III (PT 505)</li> <li>- Mathematics (MS 101)</li> </ul> </li> </ul>   |

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|   | applications in new drug delivery systems, dose modification, bioequivalence studies, and pharmacy practice.  | bio-pharmaceutics in modifying drug delivery systems, dose adjustment, bioequivalence studies, and pharmacy practice.  | <ul style="list-style-type: none"> <li>- Skin Care and cosmetology (PTE 004)</li> <li>- Radiopharmaceuticals (PTE 005)</li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Biostatistics (PO 805)</li> <li>- Biological Standardization (POE 007)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Hospital Pharmacy Practice (PP 603)</li> <li>- Clinical Pharmacokinetics (PP 810)</li> </ul> </li> <li>• <b>Summer Training</b></li> </ul>   |
| 2-3<br>Handle and dispose biologicals and synthetic/natural pharmaceutical materials/products effectively and safely with respect to relevant laws and legislations | 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 | 2-3-1-1 Handle, identify, and dispose biologicals, synthetic/natural materials, biotechnology-based and radio-labeled products, and other materials/products used in pharmaceutical field. | <ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmaceutical Analytical Chemistry 1 (PC 101)</li> <li>- Applied Analytical Chemistry (PCE 001)</li> <li>- Pharmaceutical Organic Chemistry 1 (PC 102)</li> <li>- Pharmaceutical Organic Chemistry 2 (PC 204)</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Skin Care and Cosmetology (PTE 004)</li> <li>- Radiopharmaceuticals (PTE 005)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmacology 1 (PO 401)</li> <li>- Biochemistry I (PB 301)</li> <li>- Biochemistry II (PB 402)</li> </ul> </li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Medicinal plants (PG 101)</li> <li>- Pharmacognosy I (PG 202)</li> <li>- Pharmacognosy II (PG 303)</li> <li>- Phytochemistry I (PG 404)</li> <li>- Marine natural products (PGE 011)</li> </ul> </li> </ul> |

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|  |   |   | <ul style="list-style-type: none"> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- Medical Microbiology (PM 704)</li> <li>- Biotechnology (PME 014)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Pharmacotherapy: Oncologic Diseases and Radiopharmacy (PP 809)</li> </ul> </li> <li>• <b>Summer Training.</b></li> </ul>   |
|  | 2-3-2 Recognize and adopt ethical, legal, and safety guidelines for handling and disposal of biologicals, and pharmaceutical materials/products | 2-3-2- 1 Utilize ethical, legal, and safety guidelines for handling and disposal of biologicals, and pharmaceutical materials/products. | <ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Advanced Drug delivery system (PTE 006)</li> <li>- Radiopharmaceuticals (PTE 005)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmacology 1 (PO 401)</li> <li>- Pharmacology 2 (PO 502)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Pharmaceutical Legislation And Practice Ethics (PP 301)</li> <li>- Hospital Pharmacy Practice (PP 603)</li> </ul> </li> <li>• <b>Summer Training</b></li> </ul> |
| 2-4<br>Actively share professional decisions and proper actions to save patient's life in emergency situations including poisoning | 2-4-1 Ensure safe handling/use of poisons to avoid their harm to individuals and communities  | 2-4-1- 1 Ensure safe handling/use of poisons to avoid their harm to individuals and communities.  | <ul style="list-style-type: none"> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Forensic Pharmacognosy (PGE 012)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Fundamental and Clinical Toxicology (PO 906)</li> </ul> </li> </ul>   |
|  | 2-4-2 Demonstrate understanding of the first aid  | 2-4-2- 1  | <ul style="list-style-type: none"> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Fundamental and Clinical Toxicology (PO 906)</li> </ul> </li> </ul>   |

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| with various xenobiotics, and effectively work in forensic fields. | measures needed to save patient's life   | Demonstrate understanding of the principles of first aid measures for management of toxicities and medical emergencies. | <ul style="list-style-type: none"> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- First Aid and Basic Life Support (BLS) (MD 506)</li> <li>- Pharmacotherapy: Dermatological, Veneral and Muscoskeletal Diseases (PP 016)</li> </ul> </li> </ul>  |
|  | 2-4-3 Take actions to solve any identified medicine-related and pharmaceutical care problems | 2-4-3-1 Communicate with healthcare team to solve any identified medicine-related and pharmaceutical care problems.     | <ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmaceutical dosage form III (PT 505)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Fundamental &amp; clinical Toxicology (PO 906)</li> </ul> </li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Alternative and complementary medicine (PG 906)</li> <li>- Industrialization of medicinal plants (PGE 013)</li> </ul> </li> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- General Microbiology and Immunology (PM 301)</li> <li>- Pharmaceutical Microbiology (PM 503)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Clinical Pharmacokinetics (PP 810),</li> <li>- Clinical research, Pharmacovigilance &amp; Pharmacoepidemiology (PP 019),</li> <li>- Pharmacotherapy: Endocrine &amp; renal diseases (PP 808),</li> <li>- Pharmacotherapy: Cardiovascular diseases (PP 912),</li> <li>- Pharmacotherapy: Gastrointestinal diseases (PP 017),</li> </ul> </li> <li>• <b>Summer Training</b></li> </ul> |
|  |  | 2-4-3-2 Construct and implement   | <ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmaceutical Dosage Forms-III (PT 505)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b></li> </ul>   |

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|   |  | pharmaceutical care plans for acute and chronic diseases.  | <ul style="list-style-type: none"> <li>- Pharmacotherapy: Cardiovascular diseases (PP 912)</li> <li>- Pharmacotherapy: Critical care patients (PP 014)</li> <li>- Pharmacotherapy: Gastrointestinal diseases (PP 017)</li> <li>- Pharmacotherapy: Respiratory diseases (PP 018)</li> </ul>   |
|   | 2-4-4 Assess toxicity profiles of different xenobiotics and detect poisons in biological specimens   | 2-4-4-1- Relate different toxicity profiles and detect poisons in biological specimens.  | <ul style="list-style-type: none"> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Fundamental &amp; clinical Toxicology (PO 906)</li> </ul> </li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Forensic Pharmacognosy (PGE 012)</li> </ul> </li> </ul>  |
| 2-5<br>Contribute in pharmaceutical research studies and clinical trials needed to authorize medicinal products | 2-5-1 Fulfill the requirements of the regulatory framework to authorize a medicinal product including quality, safety, and efficacy requirements | 2-5-1- 1 Fulfill the requirements of the regulatory framework to authorize a medicinal product including quality, safety, and efficacy requirements. | <ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Quality Control of Pharmaceuticals (PT 709)</li> <li>- Pharmaceutical dosage form III (PT 505)</li> <li>- Advanced Drug delivery system (PTE 006)</li> <li>- Radiopharmaceuticals (PTE 005)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Drug Marketing &amp; Pharmacoeconomics (PD 904)</li> <li>- Medical Devices (PPE 016)</li> </ul> </li> </ul>   |
|   | 2-5-2 Retrieve, interpret, and critically evaluate evidence-based information needed in pharmacy profession                                      | 2-5-2-1 Retrieve, interpret, and critically evaluate evidence-based information needed in pharmacy profession.                                       | <ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Applied Analytical Chemistry (PCE 001)</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Biopharmaceutics and Pharmacokinetics (PT 708)</li> <li>- Pharmaceutical Dosage Form III (PT 505)</li> <li>- Pharmaceutical Technology (PT 607)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Clinical Biochemistry (PB 803)</li> </ul> </li> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- Medical Microbiology (PM 704)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Drug information (PP 707)</li> </ul> </li> </ul> |

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|  |  | .   | <ul style="list-style-type: none"> <li>- Evidenced Based Medicine (PPE 017)</li> <li>- Medical Devices (PPE 016)</li> <li>- Pharmacotherapy: Neuropsychiatric diseases (PP 911)</li> <li>- Pharmacotherapy: Cardiovascular diseases (PP 912)</li> </ul>  |
|  |  | 2-5-2-2 Develop informational and technological resources to manage medication-used system.     | <ul style="list-style-type: none"> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- Information Technology (PD 101)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Drug information (PP 707)</li> </ul> </li> </ul>   |
|  | 2-5-3 Contribute in planning and conducting research studies using appropriate methodologies | 2-5-3-1 Contribute in planning and conducting research studies using appropriate methodologies. | <ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Instrumental Analysis (PCE 002)</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Quality Control of Pharmaceuticals (PT 709)</li> <li>- Advanced Drug delivery system (PTE 006)</li> <li>- Radiopharmaceuticals (PTE 005)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Biological Standardization (POE 007)</li> <li>- Molecular Biology (PBE 010)</li> </ul> </li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Alternative and complementary medicine (PG 906)</li> <li>- Forensic Pharmacognosy (PGE 012),</li> <li>- Marine natural products (PGE 011).</li> </ul> </li> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- Information Technology (PD 101),</li> <li>- Biotechnology (PME 014).</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Clinical research, Pharmacovigilance &amp; Pharmacoepidemiology (PP 019),</li> </ul> </li> </ul> |

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|   |  |  | <ul style="list-style-type: none"> <li>- Drug Marketing &amp; Pharmacoeconomics (PD 904),</li> <li>- Scientific Writing &amp; Communication skills (PD 303),</li> <li>- Evidenced Based Medicine (PPE 017),</li> </ul>   |
|   |  | 2-5-3-2 Document patient-care activities clearly, concisely, and accurately using appropriate systems.   | <ul style="list-style-type: none"> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Drug information (PP 707)</li> <li>- Clinical Pharmacy Practice (PP 604)</li> <li>- Pharmacotherapy: Cardiovascular diseases (PP 912)</li> <li>- Pharmacotherapy: Gastrointestinal diseases (PP 017)</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Advanced Drug delivery system (PTE 006)</li> </ul> </li> </ul> |
| 2-6<br>Perform pharmacoeconomic analysis and develop promotion, sales, marketing, and business administration skills. | 2-6-1 Apply the principles of business administration and management to ensure rational use of financial and human resources | 2-6-1-1 Apply the principles of pharmaceutical business administration and management to ensure the rational use of financial and human resources. | <ul style="list-style-type: none"> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Drug Marketing &amp; Pharmacoeconomics (PD 904)</li> <li>- Entrepreneurship (PD 905)</li> </ul> </li> </ul>  |
|   | 2-6-2 Utilize the principles of drug promotion, sales, marketing, accounting, and pharmacoeconomic analysis                  | 2-6-2- 1 Utilize the principles of drug promotion, sales, marketing, accounting, and pharmacoeconomic analysis.                                    | <ul style="list-style-type: none"> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Drug Marketing &amp; Pharmacoeconomics (PD 904)</li> <li>- Entrepreneurship (PD 905)</li> <li>- <b>Summer training</b></li> </ul> </li> </ul>  |
| 3-1<br>Apply the principles of body functions to participate in improving   | 3-1-1 Apply the principles of body function and basis of genomics in health and  | 3-1-1- 1 Apply the principles of body function and basis of genomics in health and   | <ul style="list-style-type: none"> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Biochemistry I (PB 301)</li> <li>- Clinical Nutrition (PB 904)</li> <li>- Anatomy and Histology (MD 101)</li> </ul> </li> </ul>  |

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| health care services using evidence-based data | disease states to manage different diseases  | disease states to manage different diseases.  | <ul style="list-style-type: none"> <li>- Psychology (MD 203)</li> <li>- Molecular Biology (PBE 010)</li> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- General Microbiology and Immunology (PM 301)</li> <li>- Infection and Immunity (PME 015)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Pathology and Pathophysiology (MD 405)</li> <li>- Clinical Pharmacokinetics (PP 810)</li> <li>- Pharmacotherapy: Dermatological, Venereal and musculoskeletal diseases (PP 016)</li> </ul> </li> </ul> |
|  | 3-1-2 Apply the principles of public health and pharmaceutical microbiology to select and assess proper methods of infection control | 3-1-2-1 Apply the principles of public health and pharmaceutical microbiology to select and assess proper methods of infection control. | <ul style="list-style-type: none"> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- Public Health and Preventive Medicine (PM 805)</li> <li>- Infection and Immunity (PME 015)</li> </ul> </li> </ul>   |
|  | 3-1-3 Monitor and control microbial growth and carry out laboratory tests for identification of infections/diseases                  | 3-1-3-1 Monitor and control microbial growth and perform laboratory tests for identification of infections/diseases.                    | <ul style="list-style-type: none"> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- Parasitology &amp; Virology (PM 402)</li> <li>- Medical Microbiology (PM 704)</li> <li>- Pharmaceutical Microbiology (PM 503)</li> </ul> </li> <li>• <b>Summer Training</b></li> </ul>  |
|  | 3-1-4 Relate etiology, epidemiology, pathophysiology, laboratory diagnosis, and clinical features of infections/diseases and their   | 3-1-4- 1 Relate etiology, epidemiology, pathophysiology, laboratory diagnosis, and clinical features of infections/diseases and         | <ul style="list-style-type: none"> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Biochemistry II (PB 402)</li> <li>- Clinical Biochemistry (PB 803)</li> <li>- Pharmacology 3 (PO 603)</li> <li>- Veterinary pharmacology (POE 009)</li> </ul> </li> <li>• <b>Microbiology &amp; Immunology Department</b></li> </ul>  |

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|   | pharmacotherapeutic approaches.   | their pharmacotherapeutic approaches.  | <ul style="list-style-type: none"> <li>- Medical Microbiology (PM 704)</li> <li>- Parasitology &amp; Virology (PM 402)</li> <li>- Infection and Immunity (PME 015)</li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Pathology and Pathophysiology (MD 405)</li> <li>- Pharmacotherapy: Infectious disease II (PP 706)</li> <li>- Pharmacotherapy: Respiratory diseases (PP 018)</li> <li>- Pharmacotherapy: infectious disease-I (PP 605)</li> </ul> </li> <li>• <b>Summer Training</b></li> </ul>  |
|   |   | 3-1-4-2 - Participate in actual or simulated population health management by evaluating and adjusting interventions to improve health.   | <ul style="list-style-type: none"> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Clinical Biochemistry (PB 803)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Pharmacotherapy: Endocrine &amp; renal diseases (PP 808)</li> <li>- Pharmacotherapy: Neuropsychiatric diseases (PP 911)</li> <li>- Pharmacotherapy: Cardiovascular diseases (PP 912)</li> <li>- Pharmacotherapy: Dermatological, Venereal and musculoskeletal diseases (PP 016)</li> <li>- Pharmacotherapy: Gastrointestinal diseases (PP 017)</li> <li>- Pharmacotherapy: Respiratory diseases (PP 018)</li> </ul> </li> </ul> |
| 3-2<br>Provide counseling and education services to patients and communities about safe and rational use of medicines and medical devices | 3-2-1 Integrate the pharmacological properties of drugs including mechanisms of action, therapeutic uses, dosage, contra-indications, adverse drug reactions and drug interactions. | 3-2-1- 1 Integrate the pharmacological properties of drugs including mechanisms of action, therapeutic uses, dosage, contra-indications, adverse drug reactions and drug interactions. | <ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Drug Design (PCE 003)</li> <li>- Medicinal Chemistry 1 (PC 505)</li> <li>- Medicinal Chemistry 2 (PC 606)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmacology 1 (PO 401)</li> <li>- Pharmacology 2 (PO 502)</li> <li>- Pharmacology 3 (PO 603)</li> <li>- Pharmacology 4 (PO 704)</li> <li>- Veterinary pharmacology (POE 009)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b></li> </ul>   |

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|  |   |  | <ul style="list-style-type: none"> <li>- Community Pharmacy Practice (PP 502)</li> <li>- Drug information (PP 707)</li> <li>- Family Planning and Women's Health (PP 013)</li> <li>- Pharmacotherapy: Critical Care patients (PP 014)</li> <li>- Clinical Pharmacokinetics (PP 810)</li> </ul> <ul style="list-style-type: none"> <li>• <b>Summer Training</b></li> </ul>  |
|  | 3-2-2 Apply the principles of clinical pharmacology and pharmacovigilance for the rational use of medicines and medical devices                   | 3-2-2-1 Implement the principles of clinical pharmacology and pharmacovigilance for the rational use of medicines and medical devices.                                   | <ul style="list-style-type: none"> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry:</b> <ul style="list-style-type: none"> <li>- Pharmacology 3 (PO 603)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Clinical research, Pharmacovigilance &amp; Pharmacoepidemiology (PP 019)</li> <li>- Medical Devices (PPE 016)</li> </ul> </li> <li>• <b>Summer Training</b></li> </ul>   |
|  | 3-2-3 Provide evidence-based information about safe use of complementary medicine including phytotherapy, aromatherapy, and nutraceuticals        | 3-2-3-1 Provide evidence-based information about safe use of complementary medicine including phytotherapy, aromatherapy, and nutraceuticals.                            | <ul style="list-style-type: none"> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Phytochemistry I (PG 404)</li> <li>- Phytochemistry II (PG 505)</li> <li>- Alternative and Complementary medicine (PG 906)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Evidenced Based Medicine (PPE 017)</li> </ul> </li> <li>• <b>Summer Training</b></li> </ul>  |
|  | 3-2-4 Provide information about toxic profiles of drugs and other xenobiotics including sources, identification, symptoms, and management control | 3-2-4- 1 Share information about toxic profiles of drugs and other xenobiotics including sources, identification, symptoms, and management control with healthcare team. | <ul style="list-style-type: none"> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Fundamental &amp; clinical Toxicology (PO 906)</li> <li>- Substance Abuse (POE 008)</li> </ul> </li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Forensic Pharmacognosy (PGE 012)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Pharmacotherapy: Infectious disease I (PP 605)</li> <li>- Pharmacotherapy: Infectious disease II (PP 706)</li> </ul> </li> </ul> |

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|  | <p>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</p> | <p>3-2-5-1 Educate and counsel patients, other health care professionals, and communities about safe and proper use of medicines including OTC preparations and medical devices.</p> | <ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Skin Care and cosmetology (PTE 004)</li> </ul> </li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Alternative and complementary medicine (PG 906)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Community Pharmacy Practice (PP 502)</li> <li>- Medical Devices (PPE 016)</li> <li>- Family Planning and Women’s Health (PP 013)</li> <li>- Pharmacotherapy: Critical Care patients (PP 014)</li> </ul> </li> <li>• <b>Summer Training</b></li> </ul>  |
|  | <p>3-2-6 Maintain public awareness on social health hazards of drug misuse and abuse</p>  | <p>3-2-6- 1 Promote public awareness on drug misuse and abuse.</p>   | <ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Radiopharmaceuticals (PTE 005)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Substance abuse (POE 008).</li> </ul> </li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Forensic Pharmacognosy (PGE 012)</li> </ul> </li> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- Pharmaceutical Microbiology (PM 503)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Pharmacotherapy: Infectious disease I (PP 605)</li> <li>- Pharmacotherapy: Infectious disease II (PP 706)</li> </ul> </li> <li>• <b>Summer Training</b></li> </ul> |
|  |   | <p>3-2-6- 2- Detect, report and manage medication errors and adverse drug reactions.</p>   | <ul style="list-style-type: none"> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry</b> <ul style="list-style-type: none"> <li>- Pharmacology 2 (PO 502)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Clinical Pharmacy Practice (PP 604)</li> <li>- Pharmacotherapy: Oncologic Diseases and Radiopharmacy (PP 809)</li> </ul> </li> </ul>  |

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|   |   | 3-2-6- 3 Advocate and assure that patients' best interests are represented in an efficient and cost-effective manner | <ul style="list-style-type: none"> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Clinical Pharmacy Practice (PP 604)</li> <li>- Pharmacotherapy: Neuropsychiatric disease (PP 911)</li> <li>- Pharmacotherapy: Pediatric and Geriatric diseases (PP 015)</li> </ul> </li> </ul>  |
| 4-1<br>Express leadership, time management, critical thinking, problem solving, independent and team working, creativity and entrepreneurial skills | 4-1-1 Demonstrate responsibility for team performance and peer evaluation of other team members, and express time management skills | 4-1-1- 1 Demonstrate responsibility for creating and achieving shared goals regardless of position.                  | <ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Quality Control of Pharmaceuticals (PT 709)</li> <li>- Pharmaceutical dosage form III (PT 505)</li> <li>- Advanced Drug delivery system (PTE 006)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Molecular Biology (PBE 010)</li> </ul> </li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Marine natural products (PGE 011)</li> </ul> </li> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- Human Rights and Fighting Corruption (PD 202)</li> <li>- Public Health and Preventive Medicine (PM 805)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Medical Devices (PPE 016)</li> </ul> </li> <li>• <b>Graduation Project</b></li> <li>• <b>University Requirements</b> <ul style="list-style-type: none"> <li>- Sociology (SOC 101)</li> <li>- Environmental Sciences (ENV 101)</li> <li>- Scientific Thinking (SCT 101)</li> </ul> </li> </ul> |
|   | 4-1-2 Retrieve and critically analyze information, identify and solve problems, and work autonomously and effectively in a team     | 4-1-2-1 Work autonomously and effectively in a team, express peer evaluation   | <ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Instrumental Analysis (PCE 002)</li> <li>- Drug Design (PCE 003)</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmaceutical Dosage Forms I (PT 303)</li> <li>- Pharmaceutical Dosage Forms II (PT 404)</li> </ul> </li> </ul>   |

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|  |  | <p>and demonstrate time management skills.</p> | <ul style="list-style-type: none"> <li>- Biopharmaceutics and Pharmacokinetics (PT 708)</li> <li>- Quality Control of Pharmaceuticals (PT 709)</li> <li>- Pharmaceutical Technology (PT 607)</li> <li>- Advanced Drug delivery system (PTE 006), Physical Pharmacy (PT 202)</li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmacology 2 (PO 502),</li> <li>- Biochemistry I (PB 301),</li> <li>- Pharmacology 3 (PO 603)</li> <li>- Pharmacology 4 (PO 704),</li> <li>- Biological Standardization (POE 007)</li> <li>- Substance Abuse (POE 008)</li> <li>- Veterinary pharmacology (POE 009).</li> </ul> </li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Alternative And Complementary Medicine (PG 906),</li> <li>- Industrialization Of Medicinal Plants (PGE 013),</li> <li>- Marine natural products (PGE 011).</li> </ul> </li> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- Human Rights and Fighting Corruption (PD 202),</li> <li>- Medical Microbiology (PM 704),</li> <li>- Biotechnology (PME 014),</li> <li>- Public Health and Preventive Medicine (PM 805),</li> <li>- Infection and Immunity (PME 015).</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Clinical Pharmacokinetics (PP 810),</li> <li>- Medical Devices (PPE 016),</li> <li>- Evidenced Based Medicine (PPE 017),</li> </ul> </li> <li>• <b>University Requirements</b> <ul style="list-style-type: none"> <li>- English KET (ENG KET),</li> <li>- English PET (ENG PET).</li> </ul> </li> </ul> |
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|  |   |   | <ul style="list-style-type: none"> <li>• <b>Summer training.</b></li> </ul>   |
|  |   | 4-1-2-2 Define clear roles and responsibilities for team members to optimize outcomes for specific patient-care encounters.                               | <ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Radiopharmaceuticals (PTE 005)</li> <li>- Advanced Drug delivery system (PTE 006)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Pharmacotherapy: Oncologic Diseases and Radiopharmacy (PP 809)</li> <li>- Pharmacotherapy: Pediatric and Geriatric diseases (PP 015)</li> <li>- Pharmacotherapy: Critical care patients (PP 014)</li> </ul> </li> </ul>  |
|  | 4-1-3 Demonstrate creativity and apply entrepreneurial skills within a simulated entrepreneurial activity.  | 4-1-3- 1 Show creativity by applying entrepreneurial skills in simulated entrepreneurial projects.  | <ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmaceutical Technology PT (607)</li> <li>- Radiopharmaceuticals (PTE 005)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Entrepreneurship (PD 905)</li> </ul> </li> </ul>  |
| 4-2 Effectively communicate verbally, non-verbally and in writing with individuals and communities | 4-2-1 Demonstrate effective communication skills verbally, non-verbally, and in writing with professional health care team, patients, and communities | 4-2-1- 1 Demonstrate effective communication skills verbally, non-verbally, and in writing with professional health care team, patients, and communities. | <ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Applied Analytical Chemistry (PCE 001)</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Skin Care and cosmetology (PTE 004)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Clinical Nutrition (PB 904)</li> <li>- Molecular Biology (PBE 010)</li> <li>- Clinical Biochemistry (PB 803)</li> <li>- Pharmacology 2 (PO 502)</li> <li>- Pharmacology 3 (PO 603)</li> <li>- Veterinary Pharmacology (POE 009)</li> </ul> </li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Alternative and complementary medicine (PG 906).</li> </ul> </li> </ul> |

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|  |  |   | <ul style="list-style-type: none"> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- Public Health and Preventive Medicine (PM 805).</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Community Pharmacy Practice (PP 502)</li> <li>- Drug information (PP 707)</li> <li>- Scientific Writing &amp; Communication skills (PD 303)</li> <li>- Evidenced Based Medicine (PPE 017)</li> </ul> </li> <li>• <b>Graduation Project</b></li> <li>• <b>Summer training</b></li> <li>• <b>University Requirements</b> <ul style="list-style-type: none"> <li>- Sociology (SOC 101)</li> <li>- Environmental Sciences (ENV 101)</li> <li>- Scientific Thinking (SCT 101)</li> </ul> </li> </ul> |
|  |  | 4-2-1-2 Assess a patients' health literacy and modify communication strategies to meet the patients' needs.     | <ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Skin Care and Cosmetology (PTE 004)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Clinical Pharmacy Practice (PP 604)</li> <li>- Pharmaceutical Legislations and Practice Ethics (PP 301)</li> </ul> </li> </ul>   |
|  | 4-2-2 Use contemporary technologies and media to demonstrate effective presentation skills | 4-2-2 – 1 Show effective presentation skills through the use of modern information technology and media skills. | <ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmaceutical organic chemistry 2 ( PC 204)</li> <li>- Pharmaceutical Analytical Chemistry II (PC 203)</li> <li>- Drug Design (PCE 003)</li> <li>- Medicinal Chemistry 1 (PC 505)</li> <li>- Medicinal Chemistry 2 (PC 606)</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmaceutical Dosage Forms II (PT 404)</li> <li>- Pharmaceutical Dosage Forms IV (PT 606)</li> <li>- Pharmaceutical Technology (PT 607)</li> <li>- Advanced Drug delivery system (PTE 006)</li> </ul> </li> </ul>   |

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|  |  |  | <ul style="list-style-type: none"> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmacology 4 (PO 704)</li> <li>- Biochemistry II (PB 402)</li> <li>- Clinical Nutrition (PB 904)</li> <li>- Substance Abuse (POE 008)</li> <li>- Molecular Biology (PBE 010)</li> <li>- Fundamental and clinical toxicology (PO 906)</li> </ul> </li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Medicinal plants (PG 101)</li> <li>- Pharmacognosy I (PG 202)</li> <li>- Pharmacognosy II (PG 303)</li> <li>- Phytochemistry I (PG 404)</li> <li>- Phytochemistry II (PG 505)</li> </ul> </li> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- Medical Microbiology (PM 704)</li> <li>- Biotechnology (PME 014)</li> <li>- Infection and Immunity (PME 015).</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Entrepreneurship (PD 905)</li> <li>- First Aid and Basic Life Support (BLS) (MD 506)</li> <li>- Scientific Writing &amp; Communication skills (PD 303)</li> </ul> </li> <li>• <b>University Requirements</b> <ul style="list-style-type: none"> <li>- English KET (ENG KET)</li> <li>- English PET (ENG PET)</li> <li>- Sociology (SOC 101)</li> <li>- Environmental Sciences (ENV 101)</li> <li>- Scientific Thinking (SCT 101)</li> </ul> </li> </ul> |
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| <p>4-3<br/>Express self-awareness and be a life-long learner for continuous professional improvement</p> | <p>4-3-1 Perform self-assessment to enhance professional and personal competencies</p>    | <p>4-3-1- 1 Perform self-assessment to enhance professional and personal competencies.</p>   | <ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Applied Analytical Chemistry (PCE 001)</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Advanced Drug delivery system (PTE 006)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Clinical Nutrition (PB 904)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- First Aid and Basic Life Support (BLS) (MD 506)</li> <li>- Evidence Based Medicine (PPE 017)</li> </ul> </li> <li>• <b>University Requirements</b> <ul style="list-style-type: none"> <li>- English KET (ENG KET)</li> <li>- English PET ( ENG PET)</li> <li>- Sociology (SOC 101)</li> <li>- Environmental Sciences (ENV 101)</li> <li>- Scientific Thinking (SCT 101)</li> </ul> </li> </ul> |
|  | <p>4-3-2 Practice independent learning needed for continuous professional development</p> | <p>4-3-2- 1 Develop self-learning skills as part of continuous professional development to stay updated on all arising issues.</p> | <ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Applied Analytical Chemistry (PCE 001)</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmaceutical Technology (PT 607)</li> <li>- Mathematics (MS 101)</li> <li>- Advanced Drug delivery system (PTE 006)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Fundamental &amp; clinical Toxicology (PO 906)</li> <li>- Substance Abuse (POE 008)</li> <li>- Molecular Biology (PBE 010)</li> </ul> </li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Alternative &amp; complementary medicine (PG 906)</li> <li>- Industrialization of medicinal planta (PGE 013)</li> <li>- Marine natural products (PGE 011)</li> </ul> </li> </ul>                                     |

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|  |  |  | <ul style="list-style-type: none"> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- Information Technology (PD 101)</li> <li>- Biotechnology (PME 014)</li> <li>- Parasitology &amp; Virology (PM 402)</li> <li>- Infection and Immunity (PME 015)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Evidenced Based Medicine (PPE 017)</li> </ul> </li> <li>• <b>University Requirements</b> <ul style="list-style-type: none"> <li>- English KET (ENG KET)</li> <li>- English PET ( ENG PET)</li> <li>- Sociology (SOC 101)</li> <li>- Enviromental Sciences (ENV 101)</li> <li>- Scientific Thinking (SCT 101)</li> </ul> </li> <li>• <b>Summer training</b></li> </ul> |
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|                               |   |
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| <p><b>Summer training</b></p> | <p>1-1-6-1, 2-1-1-1, 2-1-2-1, 2-1-3-1, 2-2-2-1, 2-2-4-1, 2-3-1-1, 2-3-2-1, 2-4-3-1, 2-6-2-1, 3-1-3-1, 3-1-4-1, 3-2-1-1, 3-2-2-1, 3-2-3-1, 3-2-5-1, 3-2-6-1, 4-1-2-1, 4-2-1-1, 4-3-2-1</p> |
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**Matrix (3):**

**Program Learning Outcomes Versus Courses (By Levels)**

## Competencies 1 and 2

| Level   | Code                                   | Course | 1.1.1.1   | 1.1.1.2 | 1.1.1.3                               | 1.1.2.1 | 1.1.2.2 | 1.1.3.1 | 1.1.4.1 | 1.1.4.2 | 1.1.5.1 | 1.1.6.1 | 1.1.7.1 | 1.1.7.2 | 2.1.1.1 | 2.1.1.2 | 2.1.1.3 | 2.1.2.1 | 2.1.2.2 | 2.1.3.1 | 2.1.3.2 | 2.2.1.1 | 2.2.2.1 | 2.2.2.2 | 2.2.3.1 | 2.2.4.1 | 2.3.1.1 | 2.3.2.1 | 2.4.1.1 | 2.4.2.1 | 2.4.3.1 | 2.4.3.2 | 2.4.4.1 | 2.5.1.1 | 2.5.2.1 | 2.5.2.2 | 2.5.3.1 | 2.5.3.2 | 2.6.1.1 | 2.6.2.1 |  |  |  |  |  |  |  |
|---------|--|--------|-----------|---------|---------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--|--|--|--|--|--|--|
|         |  |        | Level One | PC 101  | Pharmaceutical Analytical Chemistry-I | ✓       |         |         | ✓       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         | ✓       |         |         |         |         | ✓       |         |         |         |         |         |         |         |         |         |         |  |  |  |  |  |  |  |
| PC 102  | Pharmaceutical Organic Chemistry-I     | ✓      |           |         |                                       |         |         | ✓       |         |         |         |         |         |         |         |         |         |         |         |         |         | ✓       |         |         |         |         | ✓       |         |         |         |         |         |         |         |         |         |         |         |         |         |  |  |  |  |  |  |  |
| PT 101  | Pharmacy Orientation                   | ✓      |           |         |                                       |         | ✓       |         |         |         |         |         |         |         | ✓       |         |         | ✓       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |  |  |  |  |  |  |  |
| PG 101  | Medicinal Plants                       | ✓      |           |         |                                       |         |         | ✓       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         | ✓       |         |         |         |         |         |         |         |         |         |         |         |         |         |  |  |  |  |  |  |  |
| MD 101  | Anatomy and Histology                  |        |           |         |                                       | ✓       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |  |  |  |  |  |  |  |
| PD 101  | Information Technology                 |        |           |         |                                       |         |         |         |         |         |         |         | ✓       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         | ✓       | ✓       |  |  |  |  |  |  |  |
| MS 101  | Mathematics                            | ✓      |           |         |                                       |         |         |         |         |         |         | ✓       |         |         |         |         |         |         |         |         |         |         |         |         |         |         | ✓       |         |         |         |         |         |         |         |         |         |         |         |         |         |  |  |  |  |  |  |  |
| ENG KET | English KET                            | ✓      |           |         |                                       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |  |  |  |  |  |  |  |
|         |  |        |           |         |                                       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |  |  |  |  |  |  |  |
| PC 203  | Pharmaceutical Analytical Chemistry-II |        |           |         |                                       | ✓       |         |         | ✓       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         | ✓       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |  |  |  |  |  |  |  |
| PC 204  | Pharmaceutical Organic Chemistry-II    | ✓      |           |         |                                       |         |         |         | ✓       |         |         |         |         |         |         |         |         |         |         |         |         |         | ✓       |         |         |         |         | ✓       |         |         |         |         |         |         |         |         |         |         |         |         |  |  |  |  |  |  |  |
| PT 202  | Physical Pharmacy                      | ✓      |           |         |                                       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |  |  |  |  |  |  |  |













### Competencies 3 and 4

| Level   | Code                               | Course                                 | 3.1.1.1   | 3.1.2.1 | 3.1.3.1                               | 3.1.4.1 | 3.1.4.2 | 3.2.1.1 | 3.2.2.1 | 3.2.3.1 | 3.2.4.1 | 3.2.5.1 | 3.2.6.1 | 3.2.6.2 | 3.2.6.3 | 4.1.1.1 | 4.1.2.1 | 4.1.2.2 | 4.1.3.1 | 4.2.1.1 | 4.2.1.2 | 4.2.2.1 | 4.3.1.1 | 4.3.2.1 |  |
|---------|------------------------------------|--|-----------|---------|---------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--|
|         |                                    |  | Level One | PC 101  | Pharmaceutical Analytical Chemistry-I |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |  |
| PC 102  | Pharmaceutical Organic Chemistry-I |  |           |         |                                       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |  |
| PT 101  | Pharmacy Orientation               |  |           |         |                                       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |  |
| PG 101  | Medicinal Plants                   |  |           |         |                                       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         | ✓       |         |         |  |
| MD 101  | Anatomy and Histology              | ✓                                      |           |         |                                       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |  |
| PD 101  | Information Technology             |  |           |         |                                       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         | ✓       |  |
| MS 101  | Mathematics                        |  |           |         |                                       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         | ✓       |  |
| ENG KET | English KET                        |  |           |         |                                       |         |         |         |         |         |         |         |         |         |         | ✓       | ✓       |         |         | ✓       |         | ✓       | ✓       | ✓       |  |
|         |                                    |  |           |         |                                       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |  |
|         | PC 203                             | Pharmaceutical Analytical Chemistry-II |           |         |                                       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         | ✓       |         |  |
|         | PC 204                             | Pharmaceutical Organic Chemistry-II    |           |         |                                       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         | ✓       |         |  |
|         | PT 202                             | Physical Pharmacy                      |           |         |                                       |         |         |         |         |         |         |         |         |         |         |         |         | ✓       |         |         |         |         |         |         |  |
|         | PG 202                             | Pharmacognosy-I                        |           |         |                                       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         | ✓       |         |         |  |
|         | MD 202                             | Medical Terminology                    |           |         |                                       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         | ✓       |         |  |
|         | MD 203                             | Psychology                             |           | ✓       |                                       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |  |
|         | PD 202                             | Human rights and fighting corruption   |           |         |                                       |         |         |         |         |         |         |         |         |         |         | ✓       | ✓       |         |         |         |         |         |         |         |  |
|         | ENG PET                            | English PET                            |           |         |                                       |         |         |         |         |         |         |         |         |         |         | ✓       | ✓       |         |         | ✓       |         | ✓       | ✓       | ✓       |  |
| Le      | PB 301                             | Biochemistry-I                         | ✓         |         |                                       |         |         |         |         |         |         |         |         |         |         |         | ✓       |         |         |         |         |         |         |         |  |

**Program Specifications**

|             |         |   |                             |   |   |   |   |   |  |  |  |  |   |   |   |   |   |   |   |   |   |
|-------------|---------|---|-----------------------------|---|---|---|---|---|--|--|--|--|---|---|---|---|---|---|---|---|---|
|             | PM 301  | General Microbiology and Immunology                 | ✓                           | ✓ |   |   |   |   |  |  |  |  |   |   |   |   |   |   |   |   |   |
|             | PG 303  | Pharmacognosy-II                                    |                             |   |   |   |   |   |  |  |  |  |   |   |   |   |   |   | ✓ |   |   |
|             | PT 303  | Pharmaceutical dosage forms-I                       |                             |   |   |   |   |   |  |  |  |  |   | ✓ |   |   |   |   |   |   |   |
|             | MD 304  | Physiology  | ✓                           |   |   |   |   |   |  |  |  |  |   |   |   |   |   |   |   |   |   |
|             | PD 303  | Scientific writing and communication skills         |                             |   |   |   |   |   |  |  |  |  |   |   |   | ✓ |   | ✓ |   |   |   |
|             | PP 301  | Pharmaceutical legislation and practice ethics      |                             |   |   |   |   |   |  |  |  |  |   |   |   |   |   | ✓ |   |   |   |
|             | SOC 101 | Sociology (University elective)                     |                             |   |   |   |   |   |  |  |  |  |   | ✓ |   | ✓ |   | ✓ | ✓ | ✓ |   |
|             | ENV 101 | Environmental Sciences (University elective)        |                             |   |   |   |   |   |  |  |  |  |   | ✓ |   | ✓ |   | ✓ | ✓ | ✓ |   |
|             | SCT 101 | Scientific Thinking (SCT 101) (University elective) |                             |   |   |   |   |   |  |  |  |  |   | ✓ |   | ✓ |   | ✓ | ✓ | ✓ |   |
|             |         |   |                             |   |   |   |   |   |  |  |  |  |   |   |   |   |   |   |   |   |   |
|             |         | PO 401  | Pharmacology-I              |   |   |   |   | ✓ |  |  |  |  |   |   |   |   |   |   |   |   |   |
|             |         | PG 404  | Phytochemistry-I            |   |   |   |   |   |  |  |  |  |   |   |   |   |   |   |   | ✓ |   |
|             |         | PM 402  | Parasitology and virology   |   |   | ✓ | ✓ |   |  |  |  |  |   |   |   |   |   |   |   |   | ✓ |
|             |         | MD 405  | Pathology & Pathophysiology | ✓ |   |   | ✓ |   |  |  |  |  |   |   |   |   |   |   |   |   |   |
| PT 404      |         | Pharmaceutical dosage forms-II                      |                             |   |   |   |   |   |  |  |  |  |   |   |   |   |   |   |   | ✓ |   |
| PB 402      |         | Biochemistry-II                                     |                             |   |   | ✓ |   |   |  |  |  |  |   |   |   |   |   |   |   | ✓ |   |
|             |         |   |                             |   |   |   |   |   |  |  |  |  |   |   |   |   |   |   |   |   |   |
| Level Three | PO 502  | Pharmacology-II                                     |                             |   |   |   | ✓ |   |  |  |  |  | ✓ |   | ✓ |   | ✓ |   |   |   |   |
|             | PM 503  | Pharmaceutical Microbiology                         |                             |   | ✓ |   |   |   |  |  |  |  | ✓ |   |   |   |   |   |   |   |   |
|             | PC 505  | Medicinal Chemistry-I                               |                             |   |   |   | ✓ |   |  |  |  |  |   |   |   |   |   |   | ✓ |   |   |
|             | PG 505  | Phytochemistry-II                                   |                             |   |   |   |   |   |  |  |  |  | ✓ |   |   |   |   |   | ✓ |   |   |
|             | PT 505  | Pharmaceutical dosage forms-III                     |                             |   |   |   |   |   |  |  |  |  |   |   |   |   |   |   | ✓ |   |   |
|             | PP 502  | Community pharmacy practice                         |                             |   |   |   | ✓ |   |  |  |  |  | ✓ |   |   |   |   |   | ✓ |   |   |
|             | MD 506  | First aid and basic life support (BLS)              |                             |   |   |   |   |   |  |  |  |  |   |   |   |   |   |   | ✓ | ✓ |   |
|             |         |   |                             |   |   |   |   |   |  |  |  |  |   |   |   |   |   |   |   |   |   |

**Program Specifications**

|            |        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|------------|--------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|            | PO 603 | Pharmacology-III  |   |   |   | ✓ |   | ✓ | ✓ |   |   |   |   |   |   | ✓ |   | ✓ |   |   |   |   |   |
|            | PC 606 | Medicinal Chemistry-II                                  |   |   |   |   |   | ✓ |   |   |   |   |   |   |   |   |   |   |   | ✓ |   |   |   |
|            | PT 606 | Pharmaceutical dosage forms-IV                          |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | ✓ |   |   |
|            | PP 603 | Hospital pharmacy Practice                              |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|            | PT 607 | Pharmaceutical technology                               |   |   |   |   |   |   |   |   |   |   |   |   |   |   | ✓ |   | ✓ |   | ✓ |   | ✓ |
|            | PP 604 | Clinical Pharmacy Practice                              |   |   |   |   |   |   |   |   |   |   |   |   | ✓ | ✓ |   |   |   | ✓ |   |   |   |
|            | PP 605 | Pharmacotherapy: infectious disease-I                   |   |   |   |   |   | ✓ |   |   |   | ✓ |   | ✓ |   |   |   |   |   |   |   |   |   |
| Level Four | PM 704 | Medical Microbiology                                    |   |   | ✓ | ✓ |   |   |   |   |   |   |   |   |   |   | ✓ |   |   |   | ✓ |   |   |
|            | PT 708 | Biopharmaceutics and Pharmacokinetics                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | ✓ |   |   |   |   |   |   |
|            | PP 706 | Pharmacotherapy: infectious disease-II                  |   |   |   | ✓ |   |   |   |   | ✓ |   | ✓ |   |   |   |   |   |   |   |   |   |   |
|            | PP 707 | Drug information  |   |   |   |   |   |   | ✓ |   |   |   |   |   |   |   |   |   |   | ✓ |   |   |   |
|            | PT 709 | Quality Control of Pharmaceuticals                      |   |   |   |   |   |   |   |   |   |   |   |   |   | ✓ | ✓ |   |   |   |   |   |   |
|            | PO 704 | Pharmacology-IV   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | ✓ |   |   |   | ✓ |   |   |
|            |        | <b>Elective course</b>                                  |   |   |   |   |   |   |   | ✓ |   |   |   |   |   |   |   |   |   |   |   |   |   |
|            |        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|            |        | PO 805  | Biostatistics                                 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|            |        | PP 808  | Pharmacotherapy: endocrine and renal diseases |   |   |   |   |   |   | ✓ |   |   |   |   |   |   |   |   |   |   |   |   |   |
|            | PP 809 | Pharmacotherapy: oncological diseases and radiopharmacy |   |   |   |   |   |   |   |   |   |   |   | ✓ |   |   |   | ✓ |   |   |   |   |   |
|            | PP 810 | Clinical Pharmacokinetics                               | ✓   |   |   |   |   |   |   | ✓ |   |   |   |   |   |   | ✓ |   |   |   |   |   |   |
|            | PB 803 | Clinical Biochemistry                                   |   |   |   | ✓ | ✓ |   |   |   |   |   |   |   |   |   |   |   |   | ✓ |   |   |   |
|            | PM 805 | Public health and preventive medicine                   |   | ✓ |   |   |   |   |   |   |   |   |   |   |   | ✓ | ✓ |   |   | ✓ |   |   |   |
|            |        | <b>Elective course</b>                                  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| Le         | PO 906 | Fundamental and clinical toxicology                     |   |   |   |   |   |   |   |   |   | ✓ |   |   |   |   |   |   |   |   | ✓ | ✓ |   |



**Matrix (3):**

**Matrix between Competencies, key elements, and APPE Rounds**

| Competency | Key elements | APPE ROUNDS  |                                   |                   |                         |                                 |                     |                                |   |  |   |                                |
|------------|--------------|--|-----------------------------------|-------------------|-------------------------|---------------------------------|---------------------|--------------------------------|---|--|---|--------------------------------|
|            |              | Inpatient/<br>outpatient<br>Hospital<br>Pharmacy<br>(CR1-HP) | Community<br>Pharmacy<br>(CR1-CP) | Oncology<br>(CR2) | Cardiovascular<br>(CR3) | Intensive<br>Care Unit<br>(CR4) | Nephrology<br>(CR5) | Clinical<br>Nutrition<br>(CR6) | Pharmaceutical<br>sales and<br>Marketing of<br>Drugs<br>(PR1) | Pharmaceutical<br>Manufacturing<br>(PR2) | Quality<br>Control<br>and<br>Assurance<br>(PR3) | Graduation<br>Project<br>(GPR) |
| 1.1.       | 1.1.1        |  |                                   |                   | ✓                       |                                 |                     |                                | ✓   |  | ✓   |                                |
|            | 1.1.2        |  |                                   |                   |                         |                                 |                     |                                |   |  |   |                                |
|            | 1.1.3        |  |                                   | ✓                 |                         |                                 |                     |                                |   |  |   |                                |
|            | 1.1.4        | ✓  | ✓                                 |                   |                         |                                 |                     |                                |   |  |   |                                |
|            | 1.1.5        | ✓  | ✓                                 | ✓                 |                         |                                 |                     | ✓                              |   |  |   |                                |
|            | 1.1.6        |  |                                   |                   |                         |                                 |                     |                                |   |  |   | ✓                              |
|            | 1.1.7        |  |                                   | ✓                 |                         | ✓                               | ✓                   | ✓                              |   |  |   |                                |
| 2.1        | 2.1.1        | ✓  | ✓                                 | ✓                 | ✓                       | ✓                               | ✓                   | ✓                              |   | ✓  | ✓   |                                |
|            | 2.1.2        |  |                                   | ✓                 |                         |                                 |                     |                                | ✓   |  |   |                                |
|            | 2.1.3        | ✓  | ✓                                 |                   |                         |                                 |                     | ✓                              |   |  |   |                                |

|     |       |  |  |   |   |   |   |   |   |   |   |   |
|-----|-------|--|--|---|---|---|---|---|---|---|---|---|
| 2.2 | 2.2.1 |  |  |   |   |   |   |   |   |   |   |   |
|     | 2.2.2 |  |  |   |   | ✓ | ✓ |   |   | ✓ | ✓ |   |
|     | 2.2.3 |  |  |   |   |   |   |   |   | ✓ | ✓ |   |
|     | 2.2.4 |  |  |   |   |   |   |   |   | ✓ |   | ✓ |
| 2.3 | 2.3.1 |  |  | ✓ |   |   |   |   |   | ✓ |   | ✓ |
|     | 2.3.2 |  |  |   |   |   |   |   |   | ✓ |   |   |
| 2.4 | 2.4.1 |  |  |   |   |   |   |   |   |   |   |   |
|     | 2.4.2 |  |  |   |   |   |   |   |   |   |   |   |
|     | 2.4.3 |  |  |   | ✓ | ✓ | ✓ |   |   |   |   |   |
|     | 2.4.4 |  |  |   |   |   |   |   |   |   |   | ✓ |
| 2.5 | 2.5.1 |  |  |   |   |   |   |   |   |   |   |   |
|     | 2.5.2 |  |  |   | ✓ |   |   |   |   |   |   | ✓ |
|     | 2.5.3 |  |  |   | ✓ |   |   |   |   |   |   | ✓ |
| 2.6 | 2.6.1 |  |  |   |   |   |   |   | ✓ |   |   |   |
|     | 2.6.2 |  |  |   |   |   |   |   | ✓ |   |   |   |
| 3.1 | 3.1.1 |  |  |   |   |   |   | ✓ |   |   |   |   |

|     |       |   |   |   |   |   |   |   |   |   |   |   |
|-----|-------|---|---|---|---|---|---|---|---|---|---|---|
|     | 3.1.2 |   |   |   |   |   |   |   |   |   |   |   |
|     | 3.1.3 |   |   |   |   |   |   |   |   |   |   |   |
|     | 3.1.4 |   |   |   | ✓ |   |   |   |   |   |   |   |
| 3.2 | 3.2.1 | ✓ | ✓ |   |   | ✓ | ✓ |   |   |   |   |   |
|     | 3.2.2 |   |   |   |   |   |   |   |   |   |   |   |
|     | 3.2.3 |   |   |   |   |   |   |   |   |   |   |   |
|     | 3.2.4 |   |   |   |   |   |   |   |   |   |   |   |
|     | 3.2.5 | ✓ | ✓ |   |   | ✓ | ✓ |   |   |   |   |   |
|     | 3.2.6 |   |   | ✓ | ✓ |   |   |   |   |   |   |   |
| 4.1 | 4.1.1 |   |   |   |   |   |   |   | ✓ | ✓ | ✓ |   |
|     | 4.1.2 |   |   | ✓ |   | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |   |
|     | 4.1.3 |   |   |   |   |   |   |   |   |   | ✓ |   |
| 4.2 | 4.2.1 | ✓ | ✓ |   |   |   |   | ✓ |   |   |   | ✓ |
|     | 4.2.2 |   |   |   |   |   |   |   | ✓ |   |   | ✓ |
| 4.3 | 4.3.1 |   |   |   |   |   |   | ✓ | ✓ |   | ✓ | ✓ |
|     | 4.3.2 |   |   |   |   |   |   |   | ✓ |   |   | ✓ |

