



**PROGRAM SPECIFICATION**  
**BACHELOR OF PHARMACY (PharmD.)**

**FACULTY OF PHARMACY**

**Future UNIVERSITY**

**2025-2026**

**Program Specifications**

**(PharmD. Bylaw -Academic Year 2025/2026)**

**A. Basic Information**

1. Award / degree:	Bachelor of Pharmacy (PharmD.)
2. Program Type:	Single
3. Departments Delivering the Program 3/a-Faculty Departments	<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>
3/b-Other Faculties and/or departments participating in delivering the program:	<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>
4. Coordinator:	Ass. Prof. Dr. Iten Mamdouh – Acting Vice Dean for Education and Students Affairs
5. Internal Evaluator:	- Prof. Dr. Heba Darwish
6. External Evaluator (s):	- .....
7. Last date of program specifications approval by faculty council:	September 2024
8. Date of program Approval:	9/2019

**B. Professional Information**

**1. Program Aims towards graduate attributes:**

- 1/1. Design prevention, intervention, and educational strategies to minimize the incidence of illness in individuals and populations. **(NARS 1)**
- 1/2. Counsel individuals and communities to participate in optimizing the therapeutic outcomes **(NARS 1)**
- 1/3. Perform responsibilities and authorities following legal and professional ethics. **(NARS 2)**
- 1/4. Respect ethical code of profession, patients as well as relevant laws and legislations. **(NARS 2)**
- 1/5. Deliver contemporary pharmaceutical products and services utilizing evidence-based data. **(NARS 3)**
- 1/6. Use different quality management techniques and guidelines to assure the quality of raw materials, procedures and pharmaceutical products. **(NARS 4)**
- 1/7. Integrate and apply evidence-based knowledge of the biomedical, pharmaceutical and clinical sciences in assessing the appropriateness, effectiveness, and safety of medications **(NARS 5).**
- 1/8. Plan, design and conduct research effectively using appropriate methodologies individually or as a part of a team. **(NARS 6)**
- 1/9. Actively participate and engage as a healthcare team member by demonstrating mutual respect, understanding, and values. **(NARS 7)**
- 1/10. Demonstrate effective communication with patients, health care professionals and community. **(NARS 8)**
- 1/11. Be able to engage in innovative activities using entrepreneurial skills. **(NARS8)**
- 1/12. Demonstrate self-awareness, leadership and business administration skills. **(NARS 8)**
- 1/13. Be a life-long learner for continuous professional improvement. **(NARS 9)**
- 1/14. 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**

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

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

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

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

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

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

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

**Domain 2: Professional and Ethical Practice**

**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**

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

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

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

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

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

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

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

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

**Competency 2-3- 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.

2-3-2 Recognize and adopt 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.**

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

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

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

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

**Competency 2-5 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.

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

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

**Competency 2-6 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.

2-6-2 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**

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

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

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

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

**Competency 3-2- 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.

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

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

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

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

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

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

#### **Competency 4-1 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.

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

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

#### **Competency 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.

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

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

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

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

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

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

- Competency based NARS 2017 was adopted by the faculty council (17-9-2018).
- 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
- Program aims and the Program Learning Outcomes (PLOs) were set by the Academic standards and Educational Programs Committee to suit the PharmD. and agreed upon by the faculty council as well. Courses' specifications were done accordingly by the departments.
  - Key elements of NARS 2017 were adopted as the LOs of the program.

The following Alignment Matrices were constructed:

- Matrix 1: NARS 2017 Graduate Attributes Versus Program Aims
- Matrix 2 (a): Program Learning Outcomes Versus Courses (By departments)
- Matrix 2 (b): Program Learning Outcomes Versus Courses (By levels)
- Matrix 3: Competencies and key elements versus APPE rounds

**3/2. Benchmarks:** Not applicable.

#### **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, in addition to one year training (Internship year)
- **The internship year: One year training (36 weeks, 6 rounds)**
- **Number of Credit Hours: Theoretical: 129 Practical: 52 Total: 181**

Courses	Credit hours
University Requirements	6
Elective Faculty Requirements	8
Compulsory Faculty Requirements	167
Total	181

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

**Program Specifications**

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>	13	13	6	12	19	25
3 <sup>rd</sup>	1 <sup>st</sup>	12	12	6	12	18	24
	2 <sup>nd</sup>	12	12	5	10	17	22
4 <sup>th</sup>	1 <sup>st</sup>	13	13	6	12	19	25
	2 <sup>nd</sup>	13	13	5	10	18	23
5 <sup>th</sup>	1 <sup>st</sup>	14	14	5	10	19	24
	2 <sup>nd</sup>	12	12	5	10	17	22
Total		129	129	52	104	181	233

• 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

**Program Specifications**

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
Physiology	MD 304	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**

**Program Specifications**

Course Title	Course Code	Credit Hours			Prerequisite	Examination Marks				Total Marks	Final Exam Hours
		Lect.	Pract./ Tut.	Total		Period	Pract./ Tut.	Wr.	Oral		
General Microbiology and Immunology *	PM 401	2	1	3	Medical Terminology	15	25	50	10	100	2
Pharmaceutical Organic Chemistry III	PC 306	2	1	3	Pharmaceutical Organic Chemistry-II	15	25	50	10	100	2
Pharmacognosy II	PG 303	1	1	2	Pharmacognosy I	15	25	50	10	100	1
Biochemistry I	PB 301	2	1	3	Anatomy and Histology	15	25	50	10	100	2
Physiology	MD 304	2	-	2	Registration	25	--	75	--	100	2
Pharmaceutics I	PT 303	2	1	3	Physical Pharmacy	15	25	50	10	100	2
University Elective*		2	-	2	Registration	25	--	75	--	100	2
<b>Total</b>		<b>13</b>	<b>5</b>	<b>18</b>						<b>700</b>	

\*General Microbiology and Immunology was offered in third semester instead of Instrumental Analysis was based on approval of faculty council

**Second Level/ Fourth Semester**

**Program Specifications**

Course Title	Course Code	Credit Hours			Prerequisite	Examination Marks				Total Marks	Final Exam Hours
		Lect.	Pract./Tut	Total		Period.	Pract./Tut.	Wr.	Oral		
Biochemistry II	PB 402	3	1	4	Biochemistry I	15	25	50	10	100	2
Instrumental Analysis *	PC 305	2	1	3	Pharmaceutical Analytical Chemistry II	15	25	50	10	100	2
Phytochemistry I	PG 404	2	1	3	Pharmacognosy II	15	25	50	10	100	2
Pathology and Pathophysiology	MD 405	2	1	3	- Anatomy & Histology - Physiology	15	25	50	10	100	2
Pharmaceutics II	PT 404	2	1	3	Physical Pharmacy	15	25	50	10	100	2
Biostatistics	PO 401	1	0	1	Medical Terminology	25	--	75	--	100	1
Scientific Writing & Communication skills	PD 403	1	1	2	Registration	15	25	60	--	100	1
<b>Total</b>		<b>13</b>	<b>6</b>	<b>19</b>						<b>700</b>	

**Third Level/ Fifth Semester**

**Program Specifications**

Course Title	Course Code	Credit Hours			Prerequisite	Examination Marks				Total Marks	Final Exam Hours
		Lect.	Pract./Tut	Total		Period.	Pract./Tut.	Wr.	Oral		
Pharmaceutical Microbiology	PM 502	2	1	3	General Microbiology and Immunology	15	25	50	10	100	2
Parasitology and Virology	PM 503	2	1	3	General Microbiology & Immunology	15	25	50	10	100	2
Phytochemistry II	PG 505	2	1	3	Phytochemistry I	15	25	50	10	100	2
Pharmaceutics III	PT 505	2	1	3	Physical Pharmacy	15	25	50	10	100	2
Medicinal Chemistry I	PC 507	2	1	3	Pharmaceutical organic chemistry III	15	25	50	10	100	2
Pharmacology I	PO 502	2	1	3	Physiology	15	25	50	10	100	2
<b>Total</b>		<b>12</b>	<b>6</b>	<b>18</b>						<b>600</b>	

**Third Level/ Sixth Semester**

**Program Specifications**

Course Title	Course Code	Credit Hours			Prerequisite	Examination Marks				Total Marks	Final Exam Hours
		Lect.	Pract./Tut	Total		Period.	Pract./Tut.	Wr.	Oral		
Community Pharmacy Practice	PP 601	2	1	3	Pharmacology I	15	25	50	10	100	2
Medical Microbiology	PM 604	2	1	3	General Microbiology & Immunology	15	25	50	10	100	2
Pharmaceutics IV	PT 606	2	1	3	Physical Pharmacy	15	25	50	10	100	2
Pharmacology II	PO 603	3	1	4	Pharmacology I	15	25	50	10	100	2
Medicinal Chemistry II	PC 608	3	1	4	Pharmaceutical organic chemistry III	15	25	50	10	100	2
<b>Total</b>		<b>12</b>	<b>5</b>	<b>17</b>						<b>500</b>	

**Summer training**

**Fourth Level/ Seventh Semester**

**Program Specifications**

Course Title	Course Code	Credit Hours			Prerequisite	Examination Marks				Total Marks	Final Exam Hours
		Lect.	Pract./ Tut	Total		Period.	Pract. /Tut.	Wr.	Oral		
Biopharmaceutics and Pharmacokinetics	PT 707	2	1	3	Pharmaceutics III	15	25	50	10	100	2
Pharmacology III	PO 704	2	1	3	Pharmacology I	15	25	50	10	100	2
Drug Design	PC 709	1	1	2	Medicinal Chemistry I	15	25	50	10	100	1
Clinical Biochemistry	PB 703	3	1	4	Biochemistry II	15	25	50	10	100	2
Pharmaceutical Technology	PT 708	3	1	4	Pharmaceutics IV	15	25	50	10	100	2
Pharmacy Legislations and Regulatory Affairs	PD 704	1	-	1	Registration	25	--	75	--	100	1
Elective course	(1+1)	1	1	2		15	25	60	--	100	1
<b>Total</b>		<b>13</b>	<b>6</b>	<b>19</b>						<b>700</b>	

**Fourth Level/ Eighth Semester**

**Program Specifications**

Course Title	Course Code	Credit Hours			Prerequisite	Examination Marks				Total Marks	Final Exam Hours
		Lect.	Pract./Tut	Total		Period.	Pract./Tut.	Wr.	Oral		
Hospital Pharmacy Practice	PP 802	2	1	3	Pharmaceutics III	15	25	50	10	100	2
Clinical Pharmacokinetics	PP 803	2	1	3	Biopharmaceutics and Pharmacokinetics	15	25	50	10	100	2
Public Health & Preventive Medicine	PM 805	2	-	2	Medical Microbiology	25	--	75	--	100	2
Fundamental & Clinical Toxicology	PO 805	3	1	4	Pharmacology III	15	25	50	10	100	2
Pharmacotherapeutics I	PP 804	3	1	4	Pharmacology II	15	25	50	10	100	2
Elective course	(1+1)	1	1	2		15	25	60	--	100	1
<b>Total</b>		<b>13</b>	<b>5</b>	<b>18</b>						<b>600</b>	

**Summer training**

**Fifth Level/ ninth semester**

**Program Specifications**

Course Title	Course Code	Credit Hours			Prerequisite	Examination Marks				Total Marks	Final Exam Hours
		Lect.	Pract./Tut	Total		Period.	Pract./Tut.	Wr.	Oral		
Biotechnology	PM 906	2	0	2	Pharmaceutical Microbiology	25	--	75	--	100	2
Drug Information	PP 905	1	1	2	Pharmacology III	15	25	50	10	100	1
Alternative & Complementary Medicine	PG 906	2	0	2	Phytochemistry II Pharmacology III	25	--	75	--	100	2
Pharmacotherapeutics II	PP 906	3	1	4	Pharmacology III	15	25	50	10	100	2
Advanced Drug Delivery Systems	PT 909	2	0	2	Physical Pharmacy	25	--	75	--	100	2
Drug Marketing & Pharmacoeconomics	PD 905	2	1	3	Community Pharmacy Practice	15	25	60	--	100	2
First Aid	MD 906	1	1	2	Pathology and Pathophysiology	15	25	60	--	100	1
<b>Elective course</b>	<b>(1+1)</b>	<b>1</b>	<b>1</b>	<b>2</b>		<b>15</b>	<b>25</b>	<b>60</b>	<b>--</b>	<b>100</b>	<b>1</b>
<b>Total</b>		<b>14</b>	<b>5</b>	<b>19</b>						<b>800</b>	

**Fifth Level/ tenth semester**

**Program Specifications**

Course Title	Course Code	Credit Hours			Prerequisite	Examination Marks				Total Marks	Final Exam. Hours
		Lect.	Pract./T ut.	Total		Period .	Pract./T ut.	Wr.	Oral		
Quality Control of Pharmaceuticals	PT 010	2	1	3	- Instrumental analysis - Pharmaceutics IV	15	25	50	10	100	2
Clinical pharmacy Practice and Ethics	PP 007	3	1	4	Hospital Pharmacy Practice	15	25	50	10	100	2
Pharmacotherapeutics III	PP 008	3	1	4	Pharmacology III	15	25	50	10	100	2
Entrepreneurship	PD 006	1	0	1	Pharmacy Legislations and Regulatory Affairs	25	--	75	--	100	1
Clinical Research, Pharmacovigilance and Pharmacoepidemiology	PP 009	2	1	3	Pharmacotherapeutics I	15	25	50	10	100	2
Elective course	(1+1)	1	1	2		15	25	60	--	100	1
<b>Total</b>		<b>12</b>	<b>5</b>	<b>17</b>						<b>600</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	27
Pharmaceutics & Pharmaceutical Technology	28
Pharmacology, Toxicology & Biochemistry	26
Pharmacognosy & Medicinal Plants	16
Microbiology & Immunology	16
Pharmacy Practice & Clinical Pharmacy	30
Mathematics	1
Medical Courses	13
Profession Development Courses	10
<b>Total</b>	<b>167</b>

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

Serial No.	Credit hours/week	Course Title	Prerequisites	Course Code
1	1+1	Applied Analytical Chemistry	PC 203	PCE 001
2	1+1	Chemistry of Medicinal Heterocycles	PC 306	PCE 002
3	1+1	Skin Care and Cosmetology	PT 404	PTE 003
4	1+1	Radiopharmaceuticals	PT 505	PTE 004
5	1+1	Biological Standardization	PO 603	POE 005
6	1+1	Substance Abuse	PO 805	POE 006
7	1+1	Veterinary Pharmacy	PO 704	POE 007
8	1+1	Clinical nutrition	PB 402	PBE 008
9	1+1	Molecular Biology	PB 402	PBE 009
10	1+1	Quality Control of Natural Products	PG 505	PGE 010
11	1+1	Forensic Pharmacognosy	PG 505	PGE 011
12	1+1	Industrialization of Medicinal Plants	PG 505	PGE 012
13	1+1	Infection and Immunity	PM 401	PME 013

14	1+1	Medical Devices	PP 804	PPE 014
15	1+1	Evidenced Based Medicine	PP 804	PPE 015
16	1+1	Pharmacotherapy of infectious disease	PO 704	PPE 016
17	1+1	Enteral and Parenteral Nutrition (Patient Assessment)	PO 704	PPE 017
18	1+1	Pharmacotherapy of Dermatological and musculoskeletal diseases	PO 704	PPE 018
19	1+1	Family Planning and Women's Health	PO 704	PPE 019
20	1+1	Graduation Project	Level 5	PGP 020

#### **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 credit. 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 (175 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, alkadienes and alkynes. Alkyl halides, Alcohols, ethers & epoxides (nomenclature, preparation and chemical reactions (SN1, SN2, E1, E2)). 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: Arenes and aromatic compounds (Kekule structure, Huckel rule, Electrophilic aromatic substitution and orientation), aryl halides, Phenols, aldehydes, ketones, carboxylic acid & acid derivatives and polynuclear compounds.

**PC 305: Instrumental Analysis (2+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.

**PC 306: Pharmaceutical Organic Chemistry III (2+1)**

Prerequisite: PC 204

This course involves: heterocyclic chemistry. The course 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.

In addition, it provides an introduction about the use of different spectroscopic tools, including UV, infrared (IR), nuclear magnetic resonance (NMR) and mass spectrometry (MS) for the structural elucidation of organic compounds.

**PC 507: Medicinal Chemistry I (2+1)**

Prerequisite: PC 306

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 includes: 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 608: Medicinal Chemistry II (3+1)**

Prerequisite: PC 306

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.

**PC 709: Drug Design (1+1)**

Prerequisite: PC 507

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 Modelling 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.

**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: Chemistry of Medicinal Heterocycles (1+1)**

Prerequisite: PC 306

The course deals with the modern aspects of the chemistry of medicinally important heterocycles and the correlation of the physical and chemical properties of these pharmacophores and drug activity. In addition, the course covers the chemistry of nucleosides and their functional groups transformations involving both the heterocyclic bases and the sugar tails.

## 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 students 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: Pharmaceutics 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, quality control tests 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: Pharmaceutics 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: Pharmaceutics III (2+1)**

Prerequisite: PT 202

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: Pharmaceutics IV (2+1)**

Prerequisite: PT 202

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 707: Biopharmaceutics and Pharmacokinetics (2+1)**

Prerequisite: PT 505

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 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 708: Pharmaceutical Technology (3+1)**

Prerequisite: PT 606

The course provides students with an introduction to industrial pharmacy. This course is designed to introduce the student to planning and construction of modern pharmaceutical facilities including layout of industrial firms, material for plant construction, environmental considerations, validation, and safety measurements in factories. The course also focuses on the unit operations in the industrial area including particle size reduction and enlargement, powder and liquid mixing, heat transfer, evaporation, extraction, drying, distillation, filtration, centrifugation, crystallization etc... as applied during the production of different dosage forms.

**PT 909: Advanced Drug Delivery Systems (2+0)**

Prerequisite: PT 202

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.

**PT 010: Quality Assurance of Pharmaceuticals and GMP (2+1)**

Prerequisite: PT 606; PC 305

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.

**PD 704: Pharmacy Legislations and Regulatory Affairs (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, OTC drug requirements, opening new pharmacies, opening medical stores, opening factories, opening scientific offices, medicine registration, pharmacies and medicine stores management.

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

Prerequisite: Registration

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 003: 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 004: Radiopharmaceuticals (1+1)**

Prerequisite: PT 505.

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.

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

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**A- Compulsory Courses**

**PO 401: Biostatistics (1+0)**

Prerequisite: MD 102

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 502: 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 603: Pharmacology-II (3+1)**

Prerequisite: PO 502

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. Besides, anti-hyperlipidemics and drugs used for hematologic disorders are included. 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, and antiemetics. In all these subjects, the mechanism of action, pharmacological effects, clinical use and adverse effects are described.

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

Prerequisite: PO 502

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 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 805: Fundamental & Clinical Toxicology (3+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: MD 101

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 (3+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 703 Clinical Biochemistry (3+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.

**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**

**POE005: Biological Standardization (1+1)**

Prerequisite: PO 603

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-arrythmics, 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.

**POE006: Substances Abuse (1+1)**

Prerequisite: PO 805

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.

**POE007: Veterinary Pharmacy (1+1)**

Prerequisite: PO 704

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.

**PBE008: 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.

**PBE009: 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, bark and wood 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, Subterranean organs, unorganized drugs in addition to drugs of marine and animal origin) , including identify their active constituents and adulterants describe micro- and macro-morphological characteristics, benefits and precautions of their medicinal uses., side effects and contraindications and to have an overview over their 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 (2+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 and carbohydrates of plant or animal origin and different techniques used for their preparation, identification and determination.

**PG 505: Phytochemistry II (2+1)**

Prerequisite: PG 404

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

**PG 906: Alternative & Complementary Medicine (2+0)**

Prerequisite: PO 704; PG 505

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 010: Quality Control of Natural Products (1+1)**

Prerequisite: PG 505

This course deals with identifying quality control procedures required for the assurance of the herbal preparations and valuable extracts. It gives knowledge about different pharmacopeial quality control values. It will enable the students to analyze different herbal drugs and preparation using advanced chromatographic techniques as HPLC, GC, UPLC ...etc. By the end of this course, the students will be able to evaluate and standardize different herbal preparations and natural products.

**PGE 011: Forensic Pharmacognosy (1+1)**

Prerequisite: PG 505

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 012: Industrialization of Medicinal Plants (1+1)**

Prerequisite: PG 505

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 401 General Microbiology and Immunology (2+1)**

Prerequisite: MD 202

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 502 Pharmaceutical Microbiology (2+1)**

Prerequisite: PM 401

This course describes in detail 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 503 Parasitology and Virology (2 +1)**

Prerequisite: PM 401

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 604: Medical Microbiology (2+1)**

Prerequisite: PM 401

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 604

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.

**PM 906: Biotechnology (2+0)**

Prerequisite: PM 502

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.

**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 detail 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 013: Infection and Immunity (1+1)**

Prerequisite: PM 401

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.

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

**A- Compulsory Courses**

**PP 601: Community Pharmacy Practice (2+1)**

Prerequisite: PO 502

The course provides students with competencies and knowledge for the provision of quality pharmaceutical care in a community pharmacy setting aiming at improving use of medicines and therapeutic outcomes. The course covers differentiation between minor and major ailments and responding to minor ailments with over-the-counter products. It also provides concepts of patient assessment and counseling, 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 802: Hospital Pharmacy Practice (2+1)**

Prerequisite: PT 505

The course aims to introduce students to hospital pharmacy organization, structure, management and related activities on both technical and administrative levels in accordance with national and international established guidelines. Administrative services include: the pharmacy, the pharmacy and therapeutic committee and policy making, the hospital formulary, medication

purchasing, distribution and dispensing systems. The pharmaceutical (technical) services include: preparation of Intravenous (IV) admixtures, total parenteral nutrition (TPN) fluids, renal dialysis fluids, dispensing and safe handling of radiopharmaceuticals, cytotoxic drugs, and medical gases.

**PP 803: Clinical Pharmacokinetics (2+1)**

Prerequisite: PT 707

This course provides revision 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 804: Pharmacotherapeutics I (3+1)**

Prerequisite: PO 603

This course develops the ability of students to integrate, analyze and interpret simulated patients medication records information in respect to specific clinical condition. In addition, the student can develop rational drug therapy and pharmacotherapeutic care plans to provide safe and effective therapeutic monitoring and management of the diseases concerning: cardio-vascular, pulmonary, gastrointestinal and hepatic disorders. Besides, the role of EBM in making therapeutic decisions is emphasized so that the student can design plans for monitoring the clinical response and toxicity of the pharmacotherapeutics the patient was or is on. In practical sessions, students will develop skills in pharmacy practice and patient counseling.

**PP 905: Drug Information (1+1)**

Prerequisite: PO 704

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

**PP 906 : Pharmacotherapeutics II (3+1)**

Prerequisite: PO 704

This course develops the ability of students to integrate, analyze and interpret simulated patients medication records information in respect to specific clinical condition. In addition, the student can develop rational drug therapy and pharmacotherapeutic care plans to provide safe and effective therapeutic monitoring and management of the diseases concerning neurological, psychiatric, endocrinological, renal, arthritic and infectious disorders. The role of EBM in making therapeutic decisions is emphasized so that the student can design plans for monitoring the clinical response and toxicity of the pharmacotherapeutics the patient was or is on. In practical sessions, students will develop skills in pharmacy practice and patient counseling.

**PP 007: Clinical Pharmacy Practice & Ethics (3+1)**

Prerequisite: PP 802

Definition and concepts of clinical pharmacy and pharmaceutical care, and qualification to become a clinical pharmacy. Patient history, medication reconciliation, therapeutic planning and drug-related problems. Interpretation of clinical laboratory data and physical examination. Providing Medication Therapy management services. Principles of special care populations (geriatric, pediatric, renal and hepatic patients, obesity & pregnancy & lactation). The course also introduces the student to the principles of management and supportive care of blood disorders and nutritional deficiencies. Professional ethics provides general principles and history of pharmacy ethics, general principles of medical ethics, conflicts of interests and its management pharmacist's relationship with society and family, ethics in disaster, medication error, research ethics and animal ethics.

**PP 008: Pharmacotherapeutics III (3+1)**

Prerequisite: PO 704

This course develops the ability of students to integrate, analyze and interpret simulated patients medication records information in respect to specific clinical condition. In addition, the student can develop rational drug therapy and pharmacotherapeutic care plans to provide safe and effective therapeutic monitoring and management of oncologic: haematologic and solid tumors as well as patients with acute multiple comorbidities in critical care setting (e.g. cardiovascular diseases, gastrointestinal diseases, respiratory diseases, endocrine diseases, obstetrics and gynecology, rheumatic diseases, renal diseases, CNS diseases).

**PP 009: Clinical research, Pharmacovigilance & Pharmacoepidemiology (2+1)**

Prerequisite: PP 804

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

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

Prerequisite: MD 101, 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 acquaints 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 906: First Aid (1+1)**

Prerequisite: MD 405

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 403: 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 905: Marketing & Pharmacoeconomics (2 + 1)**

Prerequisite: PP 601

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 006: Entrepreneurship (1+0)**

Prerequisite: PD 704

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 acquaint students with 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 014: Medical Devices (1+1)**

Prerequisite: PP 804

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 015: Evidenced Based Medicine (1+1)**

Prerequisite: PP 804

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.

#### **PPE 016: Pharmacotherapy of infectious disease (1+1)**

Prerequisite: PO 704

General concepts of antimicrobial drug selection, bacterial resistance and antimicrobial stewardship programs will be addressed. Principles of pharmacotherapy and management of different bacterial, fungal, viral and parasitic infections will be discussed in details: CNS infections, upper and lower respiratory infections, sepsis, human immunodeficiency virus infection (HIV), cytomegalovirus, amebiasis and malaria, superficial and invasive fungal infections.

#### **PPE 017: Enteral and Parenteral Nutrition (Patient Assessment) (1+1)**

Prerequisite: PO 704

Assessment of the nutritional status patients, protein and calorie goals are assessed on the basis of the disease status and body weight of the patient, Nutritional support regimens should be tailored on the basis of the requirements, response, and tolerance of the patient. The fluid needs of patients are determined. Appropriate nutritional assessment after the initiation of therapy, prevention of overfeeding problems, and a gradual and conservative approach to instituting nutritional support should be used to prevent potential metabolic abnormalities.

#### **PPE 018: Pharmacotherapy of Dermatological and musculoskeletal diseases (1+1)**

Prerequisite: PO 704

This course integrates the pathophysiology, causes, clinical presentation, diagnosis, construction of pharmaceutical care plans, the pharmacotherapy and management of most popular skin, and musculoskeletal disorders: drug induced dermatologic disorders, photosensitivity, photoaging, burn injuries, psoriasis, acne vulgaris, contact dermatitis, gout and hyperuricemia, systemic lupus erythematosus Osteoporosis, osteoarthritis, and rheumatoid arthritis)

**PPE 019: Family Planning and Women's Health (1+1)**

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, and hormone therapy in menopause and recommend appropriate pharmacotherapy.

**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.
- 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-

### Program Specifications

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 under probation (obtaining cGPA less than 2 for four consecutive semesters), 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 after registration or 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

- a. **First Year (Freshman):** Students are required to complete less than 36 credit hrs.
- b. **Second Year (Sophomore):** Students are required to complete from 36 to less than 73 credit hrs.
- c. **Third Year (Junior):** Students are required to complete from 73 to less than 108 credit hrs.
- d. **Fourth Year (Senior1):** Students are required to complete from 108 to less than 145 credit hrs.
- e. **Fifth Year (Senior 2):** Students are required to complete from 145 to less than 181 credit hrs.

#### Requirements for Graduation

To graduate, a student must pass all required courses and achieve a minimum cumulative GPA of 2.00. Students are required to complete 300 hours of Practical/Field Training.

#### 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%	
B	3.2	From 77.5% to less than 82.5%	Very Good
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	3	1	4	15	25	50	10	100	2
2	2	1	3	15	25	50	10	100	2
3	2	1	3	15	25	60	--	100	2
4	1	1	2	15	25	50	10	100	1
5	1	1	2	15	25	60	--	100	1
6	2	--	2	20	--	70	10	100	2
7	2	--	2	25	--	75	--	100	2
8	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:**

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

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

**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. Design prevention, intervention, and educational strategies to minimize the incidence of illness in individuals and populations.
	1/2. 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	1/3. Perform responsibilities and authorities following legal and professional ethics
	1/4. Respect ethical code of profession, patients as well as relevant laws and legislations.
3. Utilize evidence-based data to deliver contemporary pharmaceutical products and pharmacy services	1/5. Deliver contemporary pharmaceutical products and services utilizing evidence-based data.
4. Assure the quality of pharmaceutical materials and products	1/6. Use different quality management techniques and guidelines to assure the quality of raw materials, procedures and pharmaceutical products
5. Apply integrated evidence-based pharmaceutical and clinical information in assessing the appropriateness, effectiveness, and safety of medications	1/7. Integrate and apply evidence-based knowledge of the biomedical, pharmaceutical and clinical sciences in assessing the appropriateness, effectiveness, and safety of medications

**Program Specifications**

6. Contribute effectively in planning and conducting research using appropriate methodologies	1/8. Plan, design and conduct research effectively 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	1/9. 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	1/10. Demonstrate effective communication with patients, health care professionals and community
	1/11. Be able to engage in innovative activities using entrepreneurial skills
	1/12. 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	1/13. Be a life-long learner for continuous professional improvement
	1/14. Demonstrate capabilities of performance appraisal and self-assessment.

**Matrix (1)**

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

NARS Graduate 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	X	X												
2			X	X										
3					X									
4						X								
5							X							
6								X						
7									X					
8										X	X	X		
9													X	X

**Program Specifications**

**Matrix 2 (a)**

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

Competencies of pharmacy graduates (NARS 2017)	Key Elements (Program LOs) (NARS 2017)	Courses of Departments
<p>1-1</p> <p>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>	<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>- Pharmaceutical Organic Chemistry 3 (PC 306)</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>- Medical Terminology (MD 202)</li> <li>- Biostatistics (PO 401)</li> <li>- Physiology (MD 304)</li> <li>- Pharmacology 1 (PO 502)</li> <li>- Biochemistry I (PB 301)</li> <li>- Biological Standardization (POE 005)</li> <li>- Psychology (MD 203)</li> </ul> </li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Medicinal plants PG101</li> <li>- Pharmacognosy -I PG202</li> <li>- Pharmacognosy-II PG303</li> </ul> </li> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- General Microbiology and Immunology PM 401</li> <li>- Medical Microbiology PM 604</li> <li>- Parasitology &amp; Virology (PM 503)</li> <li>- Infection and Immunity (PME 013)</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> </ul> </li> </ul>

**Program Specifications**

		<ul style="list-style-type: none"> <li>- Entrepreneurship (PD 006)</li> <li>- Clinical Pharmacy Practice and ethics (PP 007)</li> <li>- Pharmacotherapy of infectious disease (PPE 016)</li> <li>- Pharmacotherapy of Dermatological and musculoskeletal diseases (PPE 018)</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>- Scientific Thinking (SCT 101)</li> <li>- Environmental Sciences (ENV 101)</li> </ul> </li> </ul>
	<p>1-1-2- Utilize the proper pharmaceutical and medical terms, abbreviations and symbols in pharmacy practice</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 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> <li>- Pharmaceutics I (PT 303)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Anatomy and histology (MD 101)</li> <li>- Medical Terminology (MD 202)</li> <li>- Biochemistry II (PB 402)</li> <li>- Pharmacology II (PO 603)</li> <li>- Substance Abuse (POE 006)</li> </ul> </li> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- Pharmaceutical Microbiology (PM 502)</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>- Hospital Pharmacy Practice (PP 802)</li> <li>- First Aid (MD 906)</li> <li>- Enteral and Parenteral Nutrition (Patient Assessment) (PPE 017)</li> </ul> </li> </ul>

**Program Specifications**

	<p>1-1-3- Integrate knowledge from fundamental sciences to handle, identify, extract, design, prepare, analyze, and assure quality of synthetic/natural pharmaceutical materials/products</p>	<ul style="list-style-type: none"> <li>● <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmaceutical Organic Chemistry 1 (PC 102)</li> <li>- Pharmaceutical Organic Chemistry 2 (PC 204)</li> <li>- Pharmaceutical Organic Chemistry 3 (PC 306)</li> <li>- Pharmaceutical Analytical Chemistry II (PC 203) <ul style="list-style-type: none"> <li>- Instrumental Analysis (PC 305)</li> </ul> </li> <li>- Drug design PC 709</li> <li>- Medicinal Chemistry 1 PC 507</li> <li>- Medicinal Chemistry 2 PC 608</li> <li>- Chemistry of Medicinal Heterocycles (PCE 002)</li> </ul> </li> <li>● <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmaceutics I (PT 303)</li> <li>- Pharmaceutics II (PT 404)</li> <li>- Pharmaceutics IV (PT 606)</li> </ul> </li> <li>● <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Medicinal plants (PG101)</li> <li>- Pharmacognosy –I (PG202)</li> <li>- Pharmacognosy II (PG 303)</li> <li>- Phytochemistry I ( PG 404)</li> <li>- Phytochemistry-II (PG 505)</li> <li>- Quality control of natural products (PGE 010)</li> <li>- Forensic pharmacognosy (PGE 011)</li> </ul> </li> <li>● <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- Biotechnology (PM 906)</li> <li>- Pharmaceutical Microbiology (PM 502)</li> </ul> </li> </ul>
	<p>1-1-4- Articulate knowledge from fundamental sciences to explain drugs' actions and evaluate their appropriateness, effectiveness, and safety in individuals and populations.</p>	<ul style="list-style-type: none"> <li>● <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmaceutical Organic Chemistry 3 (PC 306)</li> <li>- Drug design pc 709</li> <li>- Medicinal Chemistry 1 PC 507</li> <li>- Medicinal Chemistry 2 PC 608</li> </ul> </li> <li>● <b>Pharmaceutics and Pharmaceutical Technology</b></li> </ul>

**Program Specifications**

		<ul style="list-style-type: none"> <li>- Pharmaceutics II (PT 404)</li> <li>- Pharmaceutics IV (PT 606)</li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b></li> <li>- Pharmacology 1 (PO 502)</li> <li>- Pharmacology 2 (PO603)</li> <li>- Substance Abuse (POE 006)</li> <li>- Veterinary Pharmacy (POE 007)</li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b></li> <li>- Alternative &amp; complementary medicine PG 906</li> <li>- Quality control of natural products PGE 010</li> <li>- Industrialization of medicinal plants (PGE 012)</li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b></li> <li>- Community Pharmacy Practice (PP 601)</li> <li>- Pharmacotherapeutics III (PP 008)</li> <li>- Pharmacotherapy of infectious disease (PPE 016)</li> <li>- Pharmacotherapy of Dermatological and musculoskeletal diseases (PPE 018)</li> <li>- Family Planning and Women's Health (PPE 019)</li> </ul>
	<p>1-1-5- Retrieve information from fundamental sciences to solve therapeutic problems</p>	<ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b></li> <li>- Drug design pc 709</li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b></li> <li>- Biopharmaceutics and Pharmacokinetics PT 707</li> <li>- Pharmaceutics 3 PT505, Mathematics MS (101)</li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b></li> <li>- Veterinary Pharmacy POE 007</li> <li>- Biochemistry II PB 402</li> <li>- Molecular Biology PBE009</li> <li>- Clinical Biochemistry PB 703</li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b></li> <li>- Alternative &amp; complementary medicine PG 906,</li> </ul>

**Program Specifications**

		<ul style="list-style-type: none"> <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 601)</li> <li>- Clinical Pharmacokinetics (PP 803)</li> <li>- Pharmacotherapeutics-I (PP 804)</li> <li>- Drug information (PP 905)</li> <li>- Clinical research, Pharmacovigilance &amp; Pharmacoepidemiology (PP 009)</li> <li>- Medical Device (PPE 014)</li> </ul>
	<p>1-1-6- Utilize scientific literature, and collect and interpret information to enhance professional decision</p>	<ul style="list-style-type: none"> <li>● <b>Pharmaceutical Chemistry Department</b></li> <li>- Drug design (PC 709).</li> <li>- Applied Analytical Chemistry (PCE 00)</li> <li>● <b>Pharmaceutics and Pharmaceutical Technology</b></li> <li>- Skin care and Cosmetology (PTE 003)</li> <li>- Pharmaceutical Technology PT (708)</li> <li>● <b>Pharmacology, Toxicology &amp; Biochemistry Department</b></li> <li>- Clinical nutrition (PBE 008)</li> <li>- Pharmacology 3 (PO 704)</li> <li>- Fundamental &amp; clinical Toxicology (PO 805)</li> <li>- Molecular Biology (PBE009)</li> <li>- Clinical Biochemistry (PB 703)</li> <li>- Substance abuse (POE 006)</li> <li>● <b>Pharmacognosy &amp; Medicinal Plants Department</b></li> <li>- Quality control of natural products PGE 010</li> <li>● <b>Microbiology &amp; Immunology Department</b></li> <li>- Information Technology PD 101</li> <li>- Human Rights and Fighting Corruption PD 202</li> <li>- General Microbiology and Immunology PM 401</li> <li>- Medical Microbiology PM 604</li> <li>- Biotechnology (PM 906)</li> </ul>

**Program Specifications**

		<ul style="list-style-type: none"> <li>- Pharmaceutical Microbiology ( PM 502)</li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b></li> <li>- Entrepreneurship (PD 006)</li> <li>- Pharmacotherapeutics-I (PP 804)</li> <li>- Drug information (PP 905)</li> <li>- Pharmacotherapeutics III (PP 008)</li> <li>- Clinical research, Pharmacovigilance &amp; Pharmacoepidemiology (PP 009)</li> <li>- Drug Marketing &amp; Pharmacoeconomics (PD 905)</li> <li>- Evidenced Based Medicine (PPE 015)</li> <li>• <b>Summer training</b></li> </ul>
	<p>1-1-7- Identify and critically analyze newly emerging issues influencing pharmaceutical industry and patient health care</p>	<ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b></li> <li>- Quality Assurance of Pharmaceuticals and GMP PT 010</li> <li>- Skin care and Cosmetology (PTE 003)</li> <li>- Pharmaceutical Technology PT (708)</li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b></li> <li>- Pharmacology 3 (PO 704)</li> <li>- Clinical Nutrition (PBE 008)</li> <li>- Substance abuse (POE 006)</li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b></li> <li>- Quality control of natural products PGE 010</li> <li>- Industrialization of medicinal plants PGE 012</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>- Clinical Pharmacy Practice and ethics (PP 007)</li> <li>- Scientific Writing &amp; Communication skills (PD 403)</li> <li>- Family Planning and Women's Health (PPE 019)</li> <li>- Pharmacotherapeutics II (PP 906)</li> </ul>

<p>2-1</p> <p>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</p>	<p>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.</p>	<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>- Pharmacy Legislation and Regulatory Affairs (PD 704)</li> <li>- Skin care and Cosmetology (PTE 003)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Fundamental &amp; clinical Toxicology (PO 805)</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 802)</li> <li>- Clinical Pharmacokinetics (PP 803)</li> <li>- Clinical Pharmacy Practice and ethics (PP 007)</li> <li>- Clinical research, Pharmacovigilance &amp; Pharmacoepidemiology (PP 009)</li> <li>- Pharmacotherapeutics 1 (PP 804)</li> </ul> </li> <li>• <b>Summer training</b></li> </ul>
	<p>2-1-2 Adopt ethics of health care and pharmacy profession respecting patients' rights and valuing people diversity</p>	<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>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 006)</li> <li>- Clinical Pharmacy Practice and ethics (PP 007)</li> <li>- First Aid (MD 906)</li> <li>- Medical Device (PPE 014)</li> <li>- Family Planning and Women's Health (PPE 019)</li> <li>- Pharmacotherapeutics II (PP 906)</li> </ul> </li> <li>• <b>Summer training</b></li> </ul>

**Program Specifications**

	<p>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</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 003)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Pharmacotherapeutics III (PP 008)</li> <li>- Medical Device (PPE 014)</li> <li>- Family Planning and Women's Health (PPE 019)</li> </ul> </li> <li>• <b>Summer training</b></li> </ul>
<p>2-2 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>	<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>- Pharmaceutical Organic Chemistry 3 (PC 306)</li> <li>- Drug design pc 709</li> <li>- Medicinal Chemistry 1 PC 507</li> <li>- Medicinal Chemistry 2 PC 608</li> <li>- Chemistry of Medicinal Heterocycles (PCE 002)</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Quality Assurance of Pharmaceuticals and GMP (PT 010)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Biological Standardization (POE 005)</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> <li>- Quality control of natural products (PGE 010)</li> </ul> </li> </ul>
	<p>2-2-2 Apply the basic requirements of quality management system in developing, manufacturing, analyzing, storing, and</p>	<ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Instrumental Analysis (PC 305)</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmaceutics II (PT 404)</li> </ul> </li> </ul>

**Program Specifications**

	<p>distributing pharmaceutical materials/ products considering various incompatibilities</p>	<ul style="list-style-type: none"> <li>- Pharmaceutics IV (PT 606)</li> <li>- Quality Assurance of Pharmaceuticals and GMP PT 010</li> <li>- Pharmaceutical Technology PT (708)</li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Industrialization of medicinal plants PGE 012</li> <li>- Quality control of natural products PGE 010</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Hospital Pharmacy Practice (PP 802)</li> </ul> </li> <li>• <b>Summer Training</b></li> </ul>
	<p>2-2-3 Recognize the principles of various tools and instruments, and select the proper techniques for synthesis and analysis of different materials and production of pharmaceuticals</p>	<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 (PC 305)</li> <li>- Applied Analytical Chemistry (PCE 001)</li> <li>- Medicinal Chemistry 1 ( PC 507)</li> <li>- Medicinal Chemistry 2 (PC 608)</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmaceutics I (PT 303)</li> <li>- Pharmaceutics IV (PT 606)</li> <li>- Quality Assurance of Pharmaceuticals and GMP (PT 010)</li> <li>- Pharmaceutical Technology (PT 708)</li> </ul> </li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Quality control of natural products (PGE 010)</li> </ul> </li> </ul>
	<p>2-2-4 Adopt the principles of pharmaceutical calculations, biostatistical analysis, bioinformatics, pharmacokinetics, and bio-pharmaceutics and their applications in new drug delivery systems, dose modification, bioequivalence studies, and pharmacy practice.</p>	<ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Applied Analytical Chemistry PCE001</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmaceutics I (PT 303)</li> <li>- Radiopharmaceuticals (PTE 004)</li> <li>- Pharmaceutics 3 (PT 505)</li> </ul> </li> </ul>

**Program Specifications**

		<ul style="list-style-type: none"> <li>- Skin care and Cosmetology (PTE 003)</li> <li>- Mathematics MS (101)</li> <li>- Biopharmaceutics and Pharmacokinetics (PT 707)</li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Biostatistics (PO 401)</li> <li>- Biological Standardization (POE 005)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Hospital Pharmacy Practice (PP 802)</li> <li>- Clinical Pharmacokinetics (PP 803),</li> <li>- Pharmacotherapy of infectious disease (PPE 016)</li> <li>- Enteral and Parenteral Nutrition (Patient Assessment) (PPE 017)</li> </ul> </li> <li>• <b>Summer training</b></li> </ul>
<p>2-3</p> <p>Handle and dispose biologicals and synthetic/natural pharmaceutical materials/products effectively and safely with respect to relevant laws and legislations</p>	<p>2-3-1 Handle, identify, and dispose biologicals, synthetic/natural materials, biotechnology-based and radio-labeled products, and other materials/products used in pharmaceutical field</p>	<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 PCE001</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>- Radiopharmaceuticals (PTE 004),</li> <li>- Skin care and Cosmetology (PTE 003)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmacology 1 (PO 502)</li> <li>- Fundamental &amp; clinical Toxicology (PO 805)</li> <li>- Biochemistry II PB 402</li> <li>- Biochemistry I PB 301</li> </ul> </li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b></li> </ul>

		<ul style="list-style-type: none"> <li>- Medicinal plants PG101</li> <li>- Pharmacognosy-I PG202</li> <li>- Pharmacognosy –II PG 303</li> <li>- Phytochemistry –I PG404</li> <li>- Phytochemistry-II PG 505</li> <li>- Quality control of natural products PGE 010</li> <li>• <b>Microbiology &amp; Immunology Department</b></li> <li>- Medical Microbiology PM 604</li> <li>- Biotechnology (PM 906)</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	<ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b></li> <li>- Pharmacy Legislation and Regulatory Affairs (PD 704)</li> <li>- Radiopharmaceuticals (PTE 004)</li> <li>- Advanced Drug Delivery System (PT 909)</li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b></li> <li>- Pharmacology 2 (PO 603)</li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b></li> <li>- Quality control of natural products PGE 010,</li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b></li> <li>- Hospital Pharmacy Practice (PP 802)</li> <li>• <b>Summer training</b></li> </ul>
2-4 Actively share professional decisions and proper actions to save patient’s life in emergency situations including poisoning with various xenobiotics, and	2-4-1 Ensure safe handling/use of poisons to avoid their harm to individuals and communities	<ul style="list-style-type: none"> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b></li> <li>- Fundamental &amp; clinical Toxicology (PO 805)</li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b></li> <li>- Forensic pharmacognosy (PGE 011)</li> </ul>
	2-4-2 Demonstrate understanding of the first aid measures needed to save patient’s life	<ul style="list-style-type: none"> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b></li> <li>- Drug information (PP 905)</li> <li>- First Aid (MD 906)</li> </ul>

**Program Specifications**

<p>effectively work in forensic fields.</p>	<p>2-4-3 Take actions to solve any identified medicine-related and pharmaceutical care problems.</p>	<ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmaceutics 3 (PT 505)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmacology 1 (PO 502)</li> <li>- Pharmacology 3 (PO 704)</li> <li>- Fundamental &amp; clinical Toxicology (PO 805)</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 plants PGE 012</li> </ul> </li> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- General Microbiology and Immunology PM 401</li> <li>- Pharmaceutical Microbiology (PM 502)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Hospital Pharmacy Practice (PP 802)</li> <li>- Clinical Pharmacokinetics (PP 803)</li> <li>- Clinical Pharmacy Practice and ethics (PP 007)</li> <li>- Clinical research, Pharmacovigilance &amp; Pharmacoepidemiology (PP 009)</li> <li>- Pharmacotherapy of infectious disease (PPE 016)</li> <li>- Enteral and Parenteral Nutrition (Patient Assessment) (PPE 017)</li> <li>- Pharmacotherapy of Dermatological and musculoskeletal diseases (PPE 018)</li> <li>- Pharmacotherapeutics I PP 804</li> </ul> </li> <li>• <b>Summer Training</b></li> </ul>
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Program Specifications

	2-4-4 Assess toxicity profiles of different xenobiotics 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 805)</li> </ul> </li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Forensic pharmacognosy PGE 011</li> </ul> </li> </ul>
2-5 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	<ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Radiopharmaceuticals (PTE 004)</li> <li>- Quality Assurance of Pharmaceuticals and GMP PT 010</li> <li>- Pharmaceutics 3 (PT505), Advanced Drug Delivery System (PT 909)</li> <li>- Pharmaceutical Technology (PT 708)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Drug Marketing &amp; Pharmacoeconomics (PD 905)</li> <li>- Medical Device (PPE 014)</li> </ul> </li> </ul>
	2-5-2 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 PCE001</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Biopharmaceutics and Pharmacokinetics PT 707</li> <li>- Pharmaceutics 3 (PT505)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Clinical Biochemistry PB 703</li> <li>- Veterinary Pharmacy (POE 007)</li> </ul> </li> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- Information Technology PD 101</li> <li>- Medical Microbiology (PM 604)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Drug information (PP 905)</li> </ul> </li> </ul>

**Program Specifications**

		<ul style="list-style-type: none"> <li>- Pharmacotherapeutics-II (PP 906)</li> <li>- Clinical Pharmacy Practice and ethics (PP 007)</li> <li>- Pharmacotherapeutics III (PP 008)</li> <li>- Evidenced Based Medicine (PPE 015)</li> <li>- Enteral and Parenteral Nutrition (Patient Assessment) (PPE 017)</li> <li>- Pharmacotherapy of Dermatological and musculoskeletal diseases (PPE 018)</li> </ul>
	<p>2-5-3 Contribute in planning and conducting research studies using appropriate methodologies</p>	<ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmaceutical Organic Chemistry 3 (PC 306)</li> <li>- Instrumental Analysis (PC 305)</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Radiopharmaceuticals (PTE 004)</li> <li>- Quality Assurance of Pharmaceuticals and GMP PT 010</li> <li>- Advanced Drug Delivery System (PT 909)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmacology 2 (PO 603)</li> <li>- Molecular Biology (PBE009)</li> <li>- Biological Standardization (POE 005)</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 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 (PM 906)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Drug information (PP 905)</li> </ul> </li> </ul>

**Program Specifications**

		<ul style="list-style-type: none"> <li>- Clinical research, Pharmacovigilance &amp; Pharmacoepidemiology (PP 009)</li> <li>- Drug Marketing &amp; Pharmacoeconomics (PD 905)</li> <li>- Scientific Writing &amp; Communication skills (PD 403)</li> <li>- Evidenced Based Medicine (PPE 015)</li> </ul>
2-6 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	<ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmacy Legislation and Regulatory Affairs (PD 704)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Drug Marketing &amp; Pharmacoeconomics (PD 905)</li> <li>- Entrepreneurship (PD 006)</li> </ul> </li> </ul>
	2-6-2 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 905)</li> <li>- Entrepreneurship (PD 006)</li> </ul> </li> <li>• <b>Summer training</b></li> </ul>
3-1 Apply the principles of body functions to participate in improving health care services using evidence-based data	3-1-1 Apply the principles of body function and basis of genomics in health and disease states to manage different diseases.	<ul style="list-style-type: none"> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Anatomy and histology (MD 101)</li> <li>- Physiology (MD 304)</li> <li>- Psychology (MD 203)</li> <li>- Biochemistry I (PB 301)</li> <li>- Clinical Nutrition (PBE 008)</li> <li>- Molecular Biology (PBE009)</li> </ul> </li> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- General Microbiology and Immunology PM 401</li> <li>- Infection and Immunity (PME 013)</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 803)</li> </ul> </li> </ul>

**Program Specifications**

		<ul style="list-style-type: none"> <li>- Pharmacotherapeutics-I (PP 804)</li> <li>- Pharmacotherapeutics III (PP 008)</li> <li>- Enteral and Parenteral Nutrition (Patient Assessment) (PPE 017)</li> <li>- Pharmacotherapy of Dermatological and musculoskeletal diseases (PPE 018)</li> </ul>
	3-1-2 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> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Pharmacotherapy of infectious disease (PPE 016)</li> </ul> </li> </ul>
	3-1-3 Monitor and control microbial growth and carry out 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 503)</li> <li>- Pharmaceutical Microbiology (PM 502)</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 pharmacotherapeutic approaches	<ul style="list-style-type: none"> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmacology 3 (PO 704)</li> <li>- Biochemistry II PB 402</li> <li>- Clinical Biochemistry (PB 703)</li> <li>- Veterinary Pharmacy (POE 007)</li> </ul> </li> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- Medical Microbiology PM 604</li> <li>- Parasitology &amp; Virology (PM 503)</li> <li>- Infection and Immunity (PME 013)</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>- Pharmacotherapeutics-I (PP 804)</li> <li>- Pharmacotherapeutics-II (PP 906)</li> <li>- Pharmacotherapy of infectious disease (PPE 016)</li> <li>- Pharmacotherapy of Dermatological and musculoskeletal diseases (PPE 018)</li> </ul> </li> </ul>

<p>3-2 Provide counseling and education services to patients and communities about safe and rational use of medicines and medical devices</p>	<p>3-2-1 Integrate the pharmacological properties of drugs including mechanisms of action, therapeutic uses, dosage, contra-indications, adverse drug reactions and drug interactions.</p>	<ul style="list-style-type: none"> <li>• <b>Summer training</b></li> <li>• <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Drug design PC 709</li> <li>- Medicinal Chemistry 1 PC 507</li> <li>- Medicinal Chemistry 2 PC 608</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmacology 1 (PO 502)</li> <li>- Pharmacology 2 (PO 603)</li> <li>- Veterinary Pharmacy (POE 007)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Community Pharmacy Practice (PP 601)</li> <li>- Drug information (PP 905)</li> <li>- Pharmacotherapeutics III (PP 908)</li> <li>- Pharmacotherapy of Dermatological and musculoskeletal diseases (PPE 018)</li> <li>- Family Planning and Women's Health (PPE 019)</li> <li>- Clinical Pharmacokinetics (PP 803)</li> </ul> </li> <li>• <b>Summer training</b></li> </ul>
	<p>3-2-2 Apply the principles of clinical pharmacology and pharmacovigilance for the rational use of medicines and medical devices</p>	<ul style="list-style-type: none"> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Clinical research, Pharmacovigilance &amp; Pharmacoepidemiology (PP 009)</li> <li>- Medical Device (PPE 014)</li> </ul> </li> <li>• <b>Summer training</b></li> </ul>
	<p>3-2-3 Provide evidence-based information about safe use of complementary medicine including phytotherapy, aromatherapy, and nutraceuticals</p>	<ul style="list-style-type: none"> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Phytochemistry- I (PG 40)</li> <li>- Phytochemistry-II (PG 505)</li> <li>- Alternative &amp; 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 015),</li> </ul> </li> <li>• <b>Summer training</b></li> </ul>

Program Specifications

	<p>3-2-4 Provide information about toxic profiles of drugs and other xenobiotics including sources, identification, symptoms, and management control</p>	<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 805)</li> <li>- Substance abuse (POE 006)</li> </ul> </li> <li>● <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Forensic pharmacognosy PGE 011</li> </ul> </li> <li>● <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Pharmacotherapy of infectious disease (PPE 016)</li> </ul> </li> </ul>
	<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>	<ul style="list-style-type: none"> <li>● <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmacy Legislation and Regulatory Affairs (PD 704)</li> <li>- Skin care and Cosmetology (PTE 003)</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 601)</li> <li>- Pharmacotherapeutics-I (PP 804)</li> <li>- Pharmacotherapeutics-II (PP 906)</li> <li>- Medical Device (PPE 014)</li> <li>- Pharmacotherapy of Dermatological and musculoskeletal diseases (PPE 018)</li> <li>- Family Planning and Women's Health (PPE 019)</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>	<ul style="list-style-type: none"> <li>● <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Radiopharmaceuticals (PTE 004)</li> </ul> </li> <li>● <b>Pharmacognosy &amp; Medicinal Plants Department</b> <ul style="list-style-type: none"> <li>- Forensic pharmacognosy PGE 011</li> </ul> </li> <li>● <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- Pharmaceutical Microbiology (PM 502)</li> </ul> </li> <li>● <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Pharmacotherapy of infectious disease (PPE 016)</li> </ul> </li> <li>● <b>Summer training</b></li> </ul>

<p>4-1</p> <p>Express leadership, time management, critical thinking, problem solving, independent and team working, creativity and entrepreneurial skills</p>	<p>4-1-1 Demonstrate responsibility for team performance and peer evaluation of other team members, and express time management skills</p>	<ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Quality Assurance of Pharmaceuticals and GMP PT 010</li> <li>- Pharmaceutics 3 (PT 505)</li> <li>- Advanced Drug Delivery System (PT 909)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Molecular Biology (PBE009)</li> <li>- Clinical Nutrition (PBE 008)</li> <li>- Substance abuse (POE 006)</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 Device (PPE 014)</li> <li>- Pharmacotherapeutics 1 (PP 804)</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>- Scientific Thinking (SCT 101)</li> <li>- Environmental Sciences (ENV 101)</li> </ul> </li> </ul>
	<p>4-1-2 Retrieve and critically analyze information, identify and solve problems, and work autonomously and effectively in a team</p>	<ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmaceutical Organic Chemistry 3 (PC 306)</li> <li>- Drug design PC 709</li> <li>- Instrumental Analysis (PC 305)</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Pharmaceutics I (PT 303)</li> <li>- Pharmaceutics II (PT 404)</li> <li>- Radiopharmaceuticals (PTE 004)</li> <li>- Biopharmaceutics and Pharmacokinetics PT 707</li> <li>- Quality Assurance of Pharmaceuticals and GMP PT 010</li> <li>- Advanced Drug Delivery System (PT 909)</li> </ul> </li> </ul>

**Program Specifications**

		<ul style="list-style-type: none"> <li>- Pharmaceutical Technology PT (708)</li> <li>- Physical Pharmacy (PT 202)</li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmacology 1 (PO 502)</li> <li>- Pharmacology 2 (PO 603)</li> <li>- Pharmacology 3 (PO 704)</li> <li>- Biochemistry I PB 301</li> <li>- Biological Standardization (POE 005)</li> <li>- Substance abuse (POE 006)</li> <li>- Veterinary Pharmacy (POE 007)</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>- Quality control of natural products PGE 010</li> <li>- Industrialization of medicinal plants PGE 012</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 604</li> <li>- Biotechnology (PM 906)</li> <li>- Public health and Preventive medicine (PM 805)</li> <li>- Infection and Immunity (PME 013)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Clinical Pharmacokinetics (PP 803)</li> <li>- Pharmacotherapeutics-II (PP 906)</li> <li>- Medical Device (PPE 014)</li> <li>- Evidenced Based Medicine (PPE 015)</li> <li>- Enteral and Parenteral Nutrition (Patient Assessment) (PPE 017)</li> </ul> </li> <li>• <b>Summer training</b></li> </ul>
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	<p>4-1-3 Demonstrate creativity and apply entrepreneurial skills within a simulated entrepreneurial activity.</p>	<ul style="list-style-type: none"> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Radiopharmaceuticals (PTE 004)</li> <li>- Pharmaceutical Technology PT (708)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Substance abuse (POE 006)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Entrepreneurship (PD 006)</li> <li>- Drug Marketing &amp; Pharmacoeconomics (PD 905)</li> </ul> </li> </ul>
<p>4-2 Effectively communicate verbally, non-verbally and in writing with individuals and communities</p>	<p>4-2-1 Demonstrate effective communication skills verbally, non-verbally, and in writing with professional health care team, patients, and communities</p>	<ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Applied Analytical Chemistry PCE001</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Skin care and cosmetology (PTE 003)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Fundamental &amp; clinical Toxicology (PO 805)</li> <li>- Molecular Biology (PBE009)</li> <li>- Clinical Nutrition (PBE 008)</li> <li>- Clinical Biochemistry (PB 703)</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>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 601)</li> <li>- Pharmacotherapeutics-I (PP 804)</li> <li>- Drug information (PP 905)</li> <li>- Scientific Writing &amp; Communication skills (PD 403)</li> </ul> </li> </ul>

**Program Specifications**

		<ul style="list-style-type: none"> <li>- Enteral and Parenteral Nutrition (Patient Assessment) (PPE 017)</li> <li>- Family Planning and Women's Health (PPE 019)</li> <li>• <b>University Requirements</b></li> <li>- English KET (ENG KET)</li> <li>- English PET (ENG PET)</li> <li>- Sociology (SOC 101)</li> <li>- Scientific Thinking (SCT 101)</li> <li>- Environmental Sciences (ENV 101)</li> <li>• <b>Summer training</b></li> </ul>
	<p>4-2-2 Use contemporary technologies and media to demonstrate effective presentation skills</p>	<ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b></li> <li>- Pharmaceutical Organic Chemistry 2 (PC 204)</li> <li>- Pharmaceutical Analytical Chemistry II (PC 203)</li> <li>- Drug design (PC 709)</li> <li>- Medicinal Chemistry 1 (PC 507)</li> <li>- Medicinal Chemistry 2 (PC 608)</li> <li>- Chemistry of Medicinal Heterocycles (PCE 002)</li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b></li> <li>- Pharmaceutics IV (PT 606)</li> <li>- Advanced Drug Delivery System (PT 909)</li> <li>- Pharmaceutical Technology PT (708)</li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b></li> <li>- Biochemistry II (PB 402)</li> <li>- Clinical Nutrition (PBE 008)</li> <li>- Substance abuse (POE 006)</li> <li>- Veterinary Pharmacy (POE 007)</li> <li>- Molecular Biology (PBE009)</li> <li>• <b>Pharmacognosy &amp; Medicinal Plants Department</b></li> <li>- Medicinal plants (PG101)</li> <li>- Pharmacognosy-I (PG 202)</li> </ul>

**Program Specifications**

		<ul style="list-style-type: none"> <li>- Pharmacognosy-II (PG 303)</li> <li>- Phytochemistry 1 (PG 404)</li> <li>- Phytochemistry 2 (PG 505)</li> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- Medical Microbiology PM 604</li> <li>- Infection and Immunity (PME 013)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Entrepreneurship (PD 006)</li> <li>- First Aid (MD 906)</li> <li>- Scientific Writing &amp; Communication skills (PD 403)</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>- Scientific Thinking (SCT 101)</li> <li>- Environmental Sciences (ENV 101)</li> </ul> </li> </ul>
<p>4-3</p> <p>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>	<ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Applied Analytical Chemistry PCE001</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Advanced Drug Delivery System (PT 909)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Pharmacotherapeutics-II (PP 906)</li> <li>- First Aid (MD 906)</li> <li>- Evidenced Based Medicine (PPE 015)</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>- Scientific Thinking (SCT 101)</li> <li>- Environmental Sciences (ENV 101)</li> </ul> </li> </ul>

	<p>4-3-2 Practice independent learning needed for continuous professional development</p>	<ul style="list-style-type: none"> <li>• <b>Pharmaceutical Chemistry Department</b> <ul style="list-style-type: none"> <li>- Applied Analytical Chemistry PCE001</li> </ul> </li> <li>• <b>Pharmaceutics and Pharmaceutical Technology</b> <ul style="list-style-type: none"> <li>- Biopharmaceutics and Pharmacokinetics PT 707</li> <li>- Advanced Drug Delivery System (PT 909)</li> <li>- Pharmaceutical Technology PT (708)</li> <li>- Mathematics MS (101)</li> </ul> </li> <li>• <b>Pharmacology, Toxicology &amp; Biochemistry Department</b> <ul style="list-style-type: none"> <li>- Pharmacology 3 (PO 704)</li> <li>- Fundamental &amp; clinical Toxicology (PO 805)</li> <li>- Clinical Nutrition (PBE 008)</li> <li>- Substance abuse (POE 006)</li> <li>- Veterinary Pharmacy (POE 007)</li> <li>- Molecular Biology (PBE009)</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 012)</li> </ul> </li> <li>• <b>Microbiology &amp; Immunology Department</b> <ul style="list-style-type: none"> <li>- Information Technology PD 101</li> <li>- Biotechnology (PM 906)</li> <li>- Parasitology &amp; Virology (PM 503)</li> <li>- Infection and Immunity (PME 013)</li> </ul> </li> <li>• <b>Pharmacy Practice &amp; Clinical Pharmacy Practice</b> <ul style="list-style-type: none"> <li>- Pharmacotherapeutics-II (PP 906)</li> <li>- First Aid (MD 906)</li> <li>- Evidenced Based Medicine (PPE 015)</li> </ul> </li> <li>• <b>University Requirements</b></li> </ul>
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**Program Specifications**

		<ul style="list-style-type: none"> <li>- English KET (ENG KET)</li> <li>- English PET (ENG PET)</li> <li>- Sociology (SOC 101)</li> <li>- Scientific Thinking (SCT 101)</li> <li>- Environmental Sciences (ENV 101)</li> <li>• <b>Summer training</b></li> </ul>
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<b>Summer training</b>	<b>1-1-6, 2-1-1, 2-1-2, 2-1-3, 2-2-2, 2-2-4, 2-3-1, 2-3-2, 2-4-3, 2-6-2, 3-1-3, 3-1-4, 3-2-1, 3-2-2, 3-2-3, 3-2-5, 3-2-6, 4-1-2, 4-2-1, 4-3-2</b>
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**Matrix 2 (b)**

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

**Competencies 1 and 2**

Level	Code	Course	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6	1.1.7	2.1.1	2.1.2	2.1.3	2.2.1	2.2.2	2.2.3	2.2.4	2.3.1	2.3.2	2.4.1	2.4.2	2.4.3	2.4.4	2.5.1	2.5.2	2.5.3	2.6.1	2.6.2
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		✓	✓											✓											

**Program Specifications**

	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	✓																
Level Two	PC 305	Instrumental Analysis		✓								✓	✓						✓
	PC 306	Pharmaceutical Organic Chemistry-III	✓	✓	✓						✓								✓
	PG 303	Pharmacognosy-II	✓	✓										✓					
	PB 301	Biochemistry-I	✓											✓					
	MD 304	Physiology	✓																
	PT 303	Pharmaceutics-I		✓	✓									✓	✓				
	ENV 101	Enviromental Sciences (University Elective)	✓																
	SCT 101	Scientific Thinking (University Elective)	✓																











**Competencies 3 and 4**

Level	Code	Course	3.1.1	3.1.2	3.1.3	3.1.4	3.2.1	3.2.2	3.2.3	3.2.4	3.2.5	3.2.6	4.1.1	4.1.2	4.1.3	4.2.1	4.2.2	4.3.1	4.3.2
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																✓		

**Program Specifications**

	MD 202	Medical Terminology																
	MD 203	Psychology	✓															
	PD 202	Human rights and fighting corruption									✓	✓						
	ENG PET	English PET									✓			✓	✓	✓	✓	
Level Two	PC 305	Instrumental Analysis											✓					
	PC 306	Pharmaceutical Organic Chemistry-III											✓					
	PG 303	Pharmacognosy-II													✓			
	PB 301	Biochemistry-I	✓										✓					
	MD 304	Physiology	✓															
	PT 303	Pharmaceutics-I												✓				
	ENV 101	Environmental Sciences (University Elective)										✓			✓	✓	✓	✓
	SCT 101	Scientific Thinking (University Elective)										✓			✓	✓	✓	✓
	SOC 101	Sociology (University Elective)										✓			✓	✓	✓	✓

Program Specifications

	PB 402	Biochemistry-II				✓											✓	
	PM 401	General microbiology and immunology	✓															
	PG 404	Phytochemistry-I							✓								✓	
	MD 405	Pathology & Pathophysiology	✓			✓												
	PT 404	Pharmaceutics-II											✓				□	
	PO 401	Biostatistics																
	PD 403	Scientific writing & communication skills															✓	✓
Level Three	PM 502	Pharmaceutical Microbiology			✓							✓						
	PM 503	Parasitology and Virology			✓	✓												✓
	PG 505	Phytochemistry-II							✓								✓	
	PT 505	Pharmaceutics-III										✓						
	PC 507	Medicinal Chemistry-I					✓										✓	
	PO 502	Pharmacology-I					✓						✓					
	PP 601	Community Pharmacy Practice					✓					✓					✓	

Program Specifications

	PM 604	Medical Microbiology				✓							✓		✓			
	PT 606	Pharmaceutics-IV													✓			
	PO 603	Pharmacology-II				✓							✓					
	PC 608	Medicinal Chemistry-II				✓									✓			
Level Four	PT 707	Biopharmaceutics & Pharmacokinetics											✓				✓	
	PO 704	Pharmacology-III				✓							✓				✓	
	PC 709	Drug Design					✓						✓		✓			
	PB 703	Clinical Biochemistry				✓									✓			
	PT 708	Pharmaceutical Technology											✓	✓		✓	✓	
	PD 704	Pharmacy legislations and regulatory affairs									✓							
		Elective course																
		PP 802	Hospital Pharmacy Practice															
		PP 803	Clinical Pharmacokinetics	✓				✓			☐			✓				
		PM 805	Public Health and preventive medicine		✓								✓	✓		✓		
	PO 805	Fundamental and clinical Toxicology								✓					✓		✓	
	PP 804	Pharmacotherapeutics-I	✓			✓					✓		✓		✓			

Program Specifications

Elective course																				
Level Five	PM 906	Biotechnology												✓					✓	
	PP 905	Drug Information					✓									✓				
	PG 906	Alternative and complementary Medicine							✓		✓			✓		✓			✓	
	PP 906	Pharmacotherapeutics-II					✓				✓			✓				✓	✓	
	PT 909	Advanced Drug Delivery Systems											✓	✓				✓	✓	✓
	PD 905	Drug marketing and Pharmacoeconomics														✓				
	MD 906	First Aid																✓	✓	✓
		<b>1 course faculty elective</b>																		
		PT 010	Quality Assurance of Pharmaceuticals and GMP													✓	✓			
		PP 007	Clinical Pharmacy Practice and Ethics																	
		PP 008	Pharmacotherapeutics-III	✓				✓												
		PD 006	Entrepreneurship														✓		✓	
	PP 009	Clinical Research, Pharmacovigilance and Pharmacoepidemiology																	✓	
		<b>Elective course</b>																		

Program Specifications

Faculty Electives	PCE 001	Applied analytical chemistry														✓		✓	✓
	PCE 002	Chemistry of Medicinal Heterocycles																✓	
	PTE 003	Skin care and cosmetology								✓							✓		
	PTE 004	Radiopharmaceuticals									✓		✓	✓					
	POE 005	Biological standardization											✓						
	POE 006	Substance abuse								✓			✓	✓	✓			✓	✓
	POE 007	Veterinary pharmacy				✓	✓						✓					✓	✓
	PBE 008	Clinical Nutrition	✓										✓				✓	✓	✓
	PBE 009	Molecular biology	✓										✓				✓	✓	✓
	PGE 010	Quality control of natural products												✓					
	PGE 011	Forensic Pharmacognosy									✓		✓						
	PGE 012	Industrialization of medicinal plants												✓					✓
	PME 013	Infection and immunity	✓			✓								✓				✓	✓

**Program Specifications**

PPE 014	Medical devices							✓			✓		✓	✓					
PPE 015	Evidence based medicine								✓					✓				✓	✓
PPE 016	Pharmacotherapy of infectious disease		✓		✓					✓		✓							
PPE 017	Enteral and Parenteral Nutrition (Patient Assessment)	✓												✓		✓			
PPE 018	Pharmacotherapy of Dermatological and Musculoskeletal Diseases	✓			✓	✓					✓								
PP 019	Family Planning and Women's health					✓					✓					✓			
<b>Summer Training</b>				✓	✓	✓	✓	✓			✓	✓		✓		✓			✓

**Matrix 3**

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

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

Program Specifications

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				✓							✓

**Program Specifications**

	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			✓		✓	✓	✓		✓	✓	✓

**Program Specifications**

	4.1.3											✓
4.2	4.2.1	✓	✓					✓				✓
	4.2.2								✓			✓
4.3	4.3.1							✓	✓		✓	✓
	4.3.2								✓			✓