

2027 -2026

University of Mosul College of Pharmacy

Syllabuses For Under Graduate Students
2027 -2026

Dept. of Pharmaceutics= Phind

Dept. of Pharmacognosy= Phcog

Dept. of Clinical Pharmacy= Phclp

Dept. of Pharmaceutical Chemistry= Phpch

Dept. of Clinical Laboratory Sciences= Phcls

Dept. of Pharmacology and Toxicology=Phpht

2027 -2026

First-year/Total units **31**

First Semester

Course number	Course title	Credit hours/week		Units	Code	
		Theory	Practical			
111	Analytical Chemistry	3	2	4	Phpch26_111-	الكيمياء التحليلية
112	Human Anatomy & Histology	3	2	4	Phcls26_112-	علم التشريح البشري والانسجة
113	Biostatistics	2	----	2	Phcls26_113-	الإحصاء الحيوي
114	Medical Terminology	1	----	1	Phpht26_114-	المصطلحات الطبية
115	Medical Physics	1	2	2	Phcls26_115-	فيزياء طبية
116	Democracy & Human Rights	2	----	2	Phcls26_116-	الديموقراطية وحقوق الانسان
Total				15		

Second Semester

Course number	Course title	Credit hours/week		Units	Code	
		Theory	Practical			
128	Physiology I	3	2	4	Phpht26_128-	علم وظائف الأعضاء I
129	Organic Chemistry I	3	2	4	Phpch26_129-	I الكيمياء العضوية
1210	Pharmaceutical Calculation	3	2	4	Phind26_1210-	الحسابات الصيدلانية
1211	Computer Sciences I	1	2	2	Phcls26_1211-	حاسوب
1212	Arabic Language I	2	---	2	Phcls26_1212-	I اللغة العربية
Total				16		

منهج المرحلة الأولى تم تغييره بالكامل استنادا الى توصية اللجنة الوزارية التخصصية لتحديث المناهج والتي اقترتها لجنة العمداء.

ملاحظة: تم تحديث المنهج للمرحلة الثانية أيضا بحيث تكون دفعة ٢٠٢٥-٢٠٢٦ متخرجة حسب المنهج المحدث لكل المراحل.

2027 -2026

Second year/Total units 41

First Semester

Course number	Course title	Credit hours/week		Units	Code	
		Theory	Practical			
211	Crimes of the Baath Regime in Iraq	2	---	2	Phcls26_211-	جرائم نظام البعث في العراق
212	Medical Microbiology I	3	2	4	Phcls26_212-	علم الاحياء المجهرية I
213	Organic Chemistry II	3	2	4	Phpch26_213-	كيمياء عضوية II
214	Physical Pharmacy I	3	2	4	Phind26_214-	صيدلة فيزيائية I
215	Physiology II	2	2	3	Phpht26_215-	علم وظائف الاعضاء II
216	Computer Sciences II	1	2	2	Phcls26_216-	حاسوب
217	Arabic Language II	2	---	2	Phcls26_217-	II اللغة العربية
Total				21		

Second Semester

Course number	Course title	Credit hours/week		Units	Code	
		Theory	Practical			
227	Medical Microbiology II	2	2	3	Phcls26_227-	II علم الاحياء المجهرية
228	Nutrition	2	---	2	Phcls26_228-	التغذية
229	Pharmacognosy	2	2	3	Phcog26_229-	I العقاقير والنباتات الطبية
2210	Physical Pharmacy II	3	2	4	Phind26_2210-	II الصيدلة الفيزيائية
2211	Physiology III	2	---	2	Phpht26_2211-	III علم وظائف الأعضاء
2213	Personal & Professional Development	2	---	2		التطوير الشخصي والمهني
2212	Biochemistry I	3	2	4	Phcls26_2212-	أكيمياء حيوية
Total				20		

منهج المرحلة الثانية تم تغييره بالكامل استنادا الى توصية اللجنة الوزارية التخصصية لتحديث المناهج والتي اقترتها لجنة العمداء.

ملاحظة: تم تحديث المنهج للمرحلة الثانية بحيث تكون دفعة ٢٠٢٥-٢٠٢٦ متخرجة حسب المنهج المحدث لكل المراحل.

ملاحظة: ١. بالنسبة لمادة العقاقير فإننا بانتظار المنهاج المحدث من اللجنة المركزية

٢. بالنسبة لمادة ال Personal and Professional Development بانتظار اللجنة المركزية لتحديد الفرع المسؤول عنها ومفردات المنهج

2027 -2026

Third year/Total units 37

First Semester

Course number	Course title	Credit hours /week		Units	Code	
		Theory	Practical			
311	Biochemistry I	3	2	4	Phcls25_311-	أكيمياء حياتية
312	Inorganic Pharmaceutical Chemistry	2	2	3	Phpch25_312-	كيمياء صيدلانية لا عضوية
313	Pathophysiology	3	2	4	Phcls25_313-	علم فسلجة الامراض
314	Pharmaceutical Technology	3	2	4	Phind25_314-	أقانة صيدلانية
315	Pharmacognosy II	2	2	3	Phcog25_315-	العقاقير والنباتات الطبيةII
Total				18		

Second Semester

Course number	Course title	Credit hours /week		Units	Code	
		Theory	Practical			
326	Biochemistry II	3	2	4	Phcls25_326--	أكيمياء حياتيةII
327	Pharmacy Ethics	1	----	1	Phelp25_327--	اخلاقيات الصيدلة
328	Organic Pharm. Chemistry I	3	2	4	Phpch25_328-	الكيمياء الصيدلانية العضويةII
329	Pharmaceutical and Cosmetic Preparations	3	2	4	Phind25_329--	المستحضرات الصيدلانية والتجميلية
3210	Pharmacognosy III	2	2	3	Phcog25_3210--	العقاقير والنباتات الطبية III
3211	Pharmacology I	3	----	3	Phpht25_3211--	أعلم الادوية
Total				19		

الدروس المؤشرة باللون الأصفر يتم اتباع السيليبس الجديد المقرر استنادا الى توصية اللجنة الوزارية التخصصية لتحديث المناهج والتي اقترتها لجنة العمداء مع الانتباه الى ان مادة الصيدلة التكنولوجية للفصل الثاني تم تغيير تسميتها الى المستحضرات الصيدلانية والتجميلية

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Fourth year/Total units **34**

First Semester

Course number	Course title	Credit hours /week		Units	Code	
		Theory	Practical			
411	Biopharmaceutics	2	2	3	Phind25_411-	الصيدلة الحيوية
412	Clinical Pharmacy I	2	2	3	Phclp25_412-	I الصيدلة السريرية
413	Organic Pharm. Chemistry II	3	2	4	Phpch25_413-	الكيمياء الصيدلانية II العضوية
414	Pharmacology II	3	2	4	Phpht25_414-	II علم الدواء
415	Public Health	2	----	2	Phcls25_415-	الصحة العامة
Total				16		

Second Semester

Course number	Course title	Credit hours /week		Units	Code	
		Theory	Practical			
426	Communication Skills	2	----	2	Phclp25_426-	مهارات التواصل
427	Clinical Pharmacy II	2	2	3	Phclp25_427-	II الصيدلة السريرية
428	General Toxicology	2	2	3	Phpht25_428-	علم السموم العام
429	Industrial Pharmacy I	3	2	4	Phind25_429-	I الصيدلة الصناعية
4210	Organic Phar. Chemistry III	3	2	4	Phpch25_4210-	الكيمياء الصيدلانية III العضوية
4211	Pharmacology III	2	----	2	Phpht25_4211-	III علم الادوية
Total				18		

الدروس المؤشرة باللون الأصفر يتم اتباع السيلبيس الجديد المقر استنادا الى توصية اللجنة
الوزارية التخصصية لتحديث المناهج والتي اقترتها لجنة العمداء

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Fifth year/Total units **35**

First Semester

Course number	Course title	Credit hours /week		Units	Code	
		Theory	Practical			
511	Applied Therapeutics- I	3	----	3	Phclp25_511-	علاجات تطبيقية I
512	Clinical Chemistry	3	2	4	Phcls25_512-	الكيمياء السريرية
513	Clinical Laboratory Training	----	4	2	Phcls25_513-	التدريب المختبري السريري
514	Clinical Toxicology	2	2	3	Phpht25_514-	علم السموم السريري
515	Industrial Pharmacy- II	3	2	4	Phind25_515-	الصيدلة الصناعية II
516	Organic Phar. Chemistry- IV	2	----	2	Phpch25_516-	الكيمياء الصيدلانية العضوية IV
517	Graduation project	1	----	1	-----	
Total				19		

Second Semester

Course number	Course title	Credit hours /week		Units	Code	
		Theory	Practical			
528	Advanced Pharmaceutical Analysis	3	2	4	Phpch25_528-	التحليلات الصيدلانية المتقدمة
529	Applied Therapeutics- II	2	----	2	Phclp25_529-	علاجات تطبيقية II
5210	Drug Delivery Systems Design (Dosage Form Design)	2	----	2	Phind25_5210-	تصميم أنظمة توصيل الدواء
5211	Hospital Training	----	4	2	Phclp25_5211-	تدريب مستشفى
5212	Pharmacoeconomic	2	----	2	Phclp25_5212-	اقتصاديات الدواء
5213	Therapeutic Drug Monitoring (TDM)	2	2	3	Phclp25_5213-	المناظرة الدوائية
5214	Pharmaceutical Biotechnology	1	----	1	Phind25_5214-	التقانة الحيوية الصيدلانية
Total				16		

الدروس المؤشرة باللون الأصفر يتم اتباع السيليبس الجديد المقرر استنادا الى توصية اللجنة الوزارية التخصصية لتحديث المناهج والتي اقترتها لجنة العمداء

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First Year

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Department of Pharmaceutical Chemistry

Title of the course: *Analytical Chemistry*

Level: 1st Class, 1st Semester

Course number:111

Code: Phpch26_111--

Credit (hours/week): Theory (3) Laboratory (2) Units: 4

No.	Lesson Subject	Hours
1	Introduction to Analytical Chemistry: Types and roles in drug development and QC	3
2	Review of Basic Concepts: Concentration units, standards, solution preparation	4
3	Introduction to Pharmacopoeias: USP, BP, monographs, specifications	4
4	Case Study: Interpreting pharmacopoeial monographs and ICH Q2(R1) overview	2
5-6	Gravimetric Analysis: Precipitation, weighing, error sources	5
7-8	Volumetric Analysis I: Acid-base titrations, indicators, pH, calculations	5
9	Volumetric Analysis II: Precipitation and Complexometric titrations (Mohr, EDTA)	3
10	Redox Titrations: Principles, iodometry, permanganometry	3
11-12	Statistical Evaluation of Data: Mean, SD, confidence limits, Q-test, Grubbs test	7
13	UV-Visible Spectrophotometry: Principles, Beer's Law, applications	3
14	Electrochemical Methods: Potentiometry, Conductometry	3
15	Introduction to Chromatography: TLC, paper chromatography	3
Total Hours		45

Reference(s):

- 1) Fundamentals of Analytical Chemistry – Skoog, West, Holler & Crouch
- 2) Pharmaceutical Analysis – A.H. Beckett & J.B. Stenlake
- 3) Quantitative Chemical Analysis – Daniel C. Harris
- 4) Supplementary: British Pharmacopoeia (BP), United States Pharmacopoeia (USP), ICH Q2(R1)

Objectives (Learning Outcome):

- 1) By the end of this course, students will be able to: Understand the fundamentals of classical and instrumental analytical techniques.
- 2) Apply statistical tools in interpreting analytical data.
- 3) Recognize the role of pharmacopoeias in pharmaceutical quality control.
- 4) Perform basic titrimetric and gravimetric analyses relevant to pharmaceutical compounds

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Department of Pharmaceutical Chemistry
Title of the course: *Practical Analytical Chemistry*
Level: 1st Class, 1st Semester
Course number:111
Code: Phpch26_111--

No.	Lesson Subject	Hours
1	Demonstration of some laboratory equipment.	2
2	Volumetric method of analysis	2
3	Preparation and standardization of HCl solution (known)	2
4	Preparation and standardization of HCl solution (unknown)	2
5	Preparation and standardization of NaOH solution	2
6	Determination of the percentage of acetic acid.	2
7	Analysis of sodium carbonate and sodium hydroxide mixture.	2
8	Determination of chloride by the Mohr method.	2
9	Determination of chloride by the Volhard method.	2
10	Determination of ferrous form of iron in Mohr's salt.	2
11	Determination of total hardness in tab water.	2
12	Gravimetric determination of Nickel.	4

Reference(s):

- 1) Handbook for Analytical Chemistry lab adopted by department

Objectives (Learning Outcome):

- 1) Correctly use and handle basic laboratory equipment while following safety protocols.
- 2) Prepare and standardize solutions of acids, bases, and salts with accuracy and precision.
- 3) Apply volumetric and gravimetric methods for quantitative chemical analysis.
- 4) Analyze pharmaceutical-related samples such as acetic acid, sodium carbonate–sodium hydroxide mixtures, water hardness, and ferrous iron content.

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Department of Clinical Laboratory Sciences

Title of the course: *Human Anatomy & Histology*

Level: 1st Class, 1st Semester

Course number:112

Code: Phcls26_112-

Credit (hours/week): Theory (3) Laboratory (2) Units: 4

No.	Lesson Subject	Hours
1	General anatomy :Anatomical Positions ,Body regions ,Body cavities. Introduction to Histology: Definition , basic concepts of cell, tissue , organ , system .	3
2	Overview of the Four Primary tissue types -Epithelial Tissues , Connective Tissues, Muscular Tissues, Nervous Tissue	3
3	Musculoskeletal System (- Bones & Joints):	3
4	Circulatory System (Cardiovascular System):Anatomy & Histology	3
5	Circulatory System (Lymphatic System) & Blood.	3
6	Digestive System (Part 1 - Upper GIT): Oral cavity, pharynx, esophagus, stomach	3
7	Digestive System (Part 2 - Lower GIT & Accessory Organs): Small intestine, large intestine, rectum, anus. Salivary glands, pancreas, liver, gallbladder.	3
8	Nervous System: Anatomy & Histology: Central Nervous System (brain, spinal cord) and Peripheral Nervous System (nerves, ganglia), basic organization	3
9	Respiratory System: Anatomy & Histology	3
10	Urinary System: Anatomy & Histology	3
11	Integumentary System (The Skin): - Anatomy: Layers of the skin (epidermis, dermis, hypodermis). Histology: Detailed histology of thick and thin skin, epidermal layers, , accessory structures (hair follicles, sebaceous glands, sweat glands).	3
12	Endocrine System: Anatomy pituitary, thyroid, parathyroid, adrenal, pancreas-islets of Langerhans, pineal, gonads	3
13	Endocrine System: Histology	3

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	pituitary, thyroid, parathyroid, adrenal glands, islets of Langerhans, and pineal gland	
14	Male Reproductive System:	3
15	Female Reproductive System:	3
	Total Hours	45

Reference(s):

- 1) Anatomy and Physiology for Healthcare by Paul Marshall; Beverly Gallacher; Jim Jolly; Shupikai Rinomhota
- 2) Atlas of Human Anatomy by Frank H. Netter
- 3) Basic Histology: text and Atlas, 11th ed. BY Luiz Carlos, Uchoa Junqueria
- 4) Wheaters functional histology: a text and colour atlas 6th ed. BY Yung , Barbara

Objectives (Learning Outcome):

- 1) Learning the names and functions of anatomical structures.
- 2) Provide comprehensive understanding of how abnormal anatomy can lead to disease.
- 3) To acquire a basic background in histology and to understand the properties of cells and their interactions with one another as components of tissues and organs
- 4) To be able to describe the normal structure and function of various cell types, tissues, and organs, and to differentiate their histological structures from each other through microscopic examination.

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Department of Clinical Laboratory Sciences

Title of the course: *Practical of Human Anatomy & Histology*

Level: 1st Class, 1st Semester

Course number:112

Code: Phcls26_112-

No.	Lesson Subject	Hours
1	Anatomical models & terms . Microscopic usage & cell identification	2
2	- Identification of various epithelial tissue slides. - Identification of various connective tissue slides (including cartilage and bone). - Identification of muscular tissue slides (skeletal, cardiac, smooth)	2
3	Identification of major bones on skeletal models. -Microscopic identification of compact and spongy bone, and different types of cartilage	2
4	Identification of heart chambers, major vessels on models/pro-sections Microscopic identification of heart wall, arteries, veins, and capillaries	2
5	-Identification of lymphoid organs on models/ prosections - Microscopic identification of blood cells (various types of WBCs), and general structure of lymph nodes	2
6	Identification of upper digestive tract parts on models/pro-sections Microscopic identification of oral cavity, esophagus, and stomach	2
7	Identification of lower digestive tract and accessory organs on models/pro-sections. - Microscopic identification of small intestine, large intestine, liver, and pancreas	2
8	Identification of major brain regions and spinal cord on models. Microscopic identification of nerve tissue (neurons, nerve fibers) and ganglia	2
9	Identification of respiratory system components on models/prosections Microscopic identification of trachea, bronchus, bronchioles, and lung tissue (alveoli).	2
10	Identification of urinary system organs on models/pro-sections. - Microscopic identification of kidney (nephron components), ureter, and bladder	2
11	Microscopic identification of thick and thin skin, and accessory structures	2
12	Identification of endocrine glands on anatomical models	2
13	Microscopic identification of selected endocrine glands.	2

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14	-Identification of male reproductive organs on models/pro-sections. - Microscopic identification of testes and accessory glands	2
15	-Identification of female reproductive organs on models/pro-sections. - Microscopic identification of ovary (including different follicle stages) and uterus.	2
Total Hours		30

Reference(s):

- 1) Atlas of Human Anatomy by Frank H. Netter
- 2) Basic Histology: text and Atlas, 11th ed. BY Luiz Carlos, Uchoa Junquera
- 3) Wheaters functional histology: a text and colour atlas 6th ed. BY Yung , Barbara

Objectives (Learning Outcome):

- 1) Learning the names and functions of anatomical structures.
- 2) To acquire a basic background in histology and to understand the properties of cells and their interactions with one another as components of tissues and organs
- 3) To be able to describe the normal structure and function of various cell types, tissues, and organs, and to differentiate their histological structures from each other through microscopic examination.

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Department of Clinical Laboratory Sciences

Title of the course: *Biostatistics*

Level: 1st Class, 1st Semester

Course number:113

Code: Phcls26_113-

Credit (hours/week): Theory (2) Laboratory (0) Units: 2

No.	Lesson Subject	Hours
1-2	Fundamentals of biostatistics and descriptive statistics	4
3-4	Integration and differentiation	4
5-6	Applications of the area under the curve	4
7-8	Samples and confidence intervals	3
9	Dependent and independent variables	3
10-11	Correlation and regression	3
12	One-sample tests and Two-sample tests	3
13	Analysis of variance tests	2
14	Choices in the domain of non-normal distribution	2
15	Correlation test for categorical variables	2
	Total Hours	30

Reference(s):

1. Introductory Biostatistics for the Health Sciences, by Michael R. Chernick
2. introduction statistics using SPSS, Second Edition, by Hersschel Knapp.

Objectives (Learning Outcome):

1. Enable students to apply mathematical statistics in pharmaceutical science.
2. Use biostatistics in specific pharmaceutical courses, calculate the odds ratio and relative risk of an event
3. Estimate statistical population indicators, and develop alternative hypotheses.

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Department of Pharmacology and Toxicology

Title of the course: *Medical Terminology*

Level: 1st Class, 1st Semester

Course number:114

Code: Phph26_114-

Credit (hours/week): Theory (1) Laboratory (0) Units: 1

Subject/ chapter	الساعات Hours	الأسبوع Week
Introduction and body organization	٢	٢-١
Respiratory system	١	٣
Urinary system	١	٤
Integumentary system	١	٥
The reproductive system	١	٦
The gastrointestinal tract	٢	٨-٧
The heart and cardiovascular system	٢	١٠-٩
Gynecology, pregnancy, and childbirth	١	١١
The eye	١	١٢
The nervous system and behavioral disorders	١	١٣
Musculoskeletal System	١	١٤
Lymphatic and immune system	١	١٥

References

- Edward CC, (Ed.); A Short Course in Medical Terminology; 1st Ed.;
- Introduction to Medical Terminology, 1st Edition Authors: Linda Stanhope and Kimberly Turnbull
- The unified medical dictionary: English-Arabic (المعجم الطبي الموحد). World Health Organization. Regional Office for the Eastern Mediterranean & Librairie du Liban Publishers. (2006). The unified medical dictionary: English-Arabic.
- مجمع اللغة العربية/ مصر) معجم المصطلحات الطبية

١٣. الكتب والمراجع الساندة التي يوصى بها (المجلات العلمية، التقارير):

- Basic Medical Language.
- Medical Language for Modern Health Care.
- Mastering Healthcare Terminology.
- Medical Terminology for Health Care Professionals.
- Medical terminology for dummies

١٤. المراجع الالكترونية، مواقع الانترنت:

<https://iris.who.int/handle/10665/119845>

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Department of Pharmaceutics

Title of the course: *Medical Physics*

Level: 1st Class, 1st Semester

Course number:115

Code: Phind26_115--

Credit (hours/week): Theory (1) Laboratory (2) Units: 2

No.	Lesson Subject	Hours
1	General concepts: Method of physics and standards; thermodynamics system and system properties; conservation of energy principle	1
2	Pressure; temperature and temperature scales (Celsius, Fahrenheit, Kelvin); equation of state; ideal gas and real gas; general law of gases.	1
3	Heat and energy; work and mechanical forms of work; power; the 1 st law of thermodynamics; Boyles and Charles law	1
4	Medical Devices for: Blood Glucose Monitoring ,Parenteral Infusion Devices , Cardiac Output Measurement	2
5	Implantable Cardiac Pacemakers	1
6	Electrocardiogram ECG	1
7	Electroencephalography EEG	1
8	Radiation: Kirshoffs law; planks law; Stefan- Boltzman law; Wiens law; Black body and Albedo; Heat transfer (radiation, convection, conduction).	1
9	X-Ray and X-Ray spectra; absorption of X-Ray; U.V and IR effects; medical and biological effects of radiation;	2
10	Radiotherapy, radioactive iodine	1
11	Magnetic Resonance Imaging MRI	1
12	Computed Tomography CT scan	1
13	Diffusion and rheology	1
	Total Hours	15

Reference(s):

- 1) **Physics for Biology and Medical Students, 2nd ed.**
- 2) **Medical Instruments and Devices: principles and practices:** Schreiner, Steven CRC Press, 2015.

Objectives (Learning Outcome):

- 1) Gives students the ability to deal with the concepts of physics, emphasizes the knowledge and skills required to efficiently discharge the duties and responsibilities of the pharmacist.
- 2) students will be able to understand the physical terminology and abbreviation used to describe the lecture, and the application in medical field.

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Department of Clinical Laboratory Sciences

Title of the course: *Practical of Medical Physics*

Level: 1st Class, 1st Semester

Course number:115

Code: Phind26_115--

No.	Lesson Subject	Hours
1	Calculate ground acceleration	2
2	Calculate the density of liquids	2
3	Calculating the focal length of a convex lens in several ways	2
4	Calculate the viscosity of a liquid	2
5	Calculating atmospheric pressure	2
6	Calculate the speed of sound	2
7	Comparing the viscosity of two liquids	2
8	Comparing the densities of two liquids	4
9	Study the Decay curve and find the half-life of water	4
10	Calculating the surface tension coefficient of water and any other liquid	4
11	Optical Fiber Loss (bend) Measurement	2
12	Spectrophotometer	2
	Total Hours	30

Reference(s):

- 1) **Physics for Biology and Medical Students, 2nd ed.**
- 2) **Medical Instruments and Devices: principles and practices:** Schreiner, Steven CRC Press, 2015.

Objectives (Learning Outcome):

- 1) Gives students the ability to deal with the concepts of physics, emphasizes the knowledge and skills required to efficiently discharge the duties and responsibilities of the pharmacist.
- 2) students will be able to understand the physical terminology and abbreviation used to describe the lecture, and the application in medical field.

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Department of Clinical Laboratory Sciences
Title of the course: **Democracy & Human Rights**

Level: 1st Class, 1st Semester

Course number:116

Code: Phcls26_116-

Credit (hours/week): Theory (2) Laboratory (0) Units: 2

No.	Lesson Subject	Hours
1	تعريف الديمقراطية	2
2	نشوء الديمقراطية	2
3	المفاهيم المختلفة للديمقراطية	2
4	خصائص النظام الديمقراطي	2
5	شروط ومقومات وأركان الديمقراطية	2
6	أنواع الديمقراطية: الديمقراطية في الاسلام	2
7	نظم حكم الأكثرية	2
8	إيجابيات الديمقراطية و سلبيات الديمقراطية	2
9	مبادئ الديمقراطية المشتركة : نظم الديمقراطية	2
10	الحقوق المدنية والسياسية	2
11	أنواع حقوق الانسان في القانون الدولي	2
12	أنواع حقوق الانسان في القانون الدولي	2
13	الإعلان العالمي لحقوق الانسان	2
14	اختلاف الحقوق في الديانات	2
15	حقوق المرأة والطفل	2
16	حقوق المرأة بين الشريعة والقانون	2
Total Hours		30

المصادر

١. الأنظمة السياسية تأليف حميد حنون, الديمقراطية من الاغريق الى عالم ما بعد الحداثة تأليف هاشم الميلاني

٢. حقوق الانسان والطفل الديمقراطية للدكتور ماهر صالح

Objectives (Learning Outcome):

- 1) تعريف الطلبة بحقوق الانسان وابرز خصائصها ومصادرها والمراحل التاريخية التي مرت بها حقوق الانسان .
- 2) التعرف على كيفية ممارسة الحقوق السياسية .
- 3) التعرف على الإعلان العالمي لحقوق الانسان والمواثيق الدولية والمعاهدات التي نصت على حقوق الانسان .

2027 -2026

Department of Pharmacology & Toxicology

Title of the course: *Physiology I*

Level: 1st Class, 2nd Semester

Course number:128

Code: Phcls26_128-

Credit (hours/week): Theory (3) Laboratory (2) Units: 4

No.	Lesson Subject	Hours
1	Introduction to physiology: How is the body organized?	5
2	Homeostasis: Framework for Human Physiology	5
3	Cellular structure, protein, and metabolic pathways	7
4	Movement of Molecules across Cell Membranes	7
5	Cell signaling in physiology	6
6	Neuronal signaling and the structure of the nervous system	9
7	Sensory physiology	6
	Total Hours	45

Reference(s):

Vander's Human physiology: the mechanisms of body function. Eric P. Widmaier, Hershel Raff, Kevin T. Strang, last edition

Objectives (Learning Outcome):

- 1) To learn the principle of human physiology and the body organized.
- 2) To learn the cell structure, functions, and signaling
- 3) To learn how the nervous system works

2027 -2026

Department of Pharmacology & Toxicology

Title of the course: *Practical of Physiology I*

Level: 1st Class, 2nd Semester

Course number:128

Code: Phcls26_128-

NO	Subject	Hours
.1	Measurement of body temperature	2
.2	Tutorial and review	2
.3	Measurement of blood pressure	2
.4	Tutorial and review	2
.5	Osmosis across plasma membrane	2
.6	Tutorial and review	2
.7	Blood Glucose (Oral Glucose Tolerance Test)	2
.8	Tutorial and review	2
.9	General Physiology of Blood	2
10	Tutorial and review	2
11	Total WBC count	2
12	Differential WBC count	2
13	Tutorial and review	2
14	Examination of vision	2
15	Tutorial and review	2
	Total	30

2027 -2026

Department of Pharmaceutical Chemistry

Title of the course: *Organic Chemistry- I*

Level: 1st Class, 2nd Semester

Course number:129

Code: Phpch26_129-

Credit (hours/week): Theory (3) Laboratory (2) Units: 4

No.	Lesson Subject	Hours
1	Introduction (Structure and properties: Atomic and molecular orbitals, Hybrid orbitals, Intermolecular forces, Polarity, Structure and physical properties))	3
2	Alkanes and methane.	4
3	Alkenes and dienes.	4
4	Alkynes	3
5	Cycloalkanes.	3
6	Stereochemistry I & II	8
7	Alkyl halides.	3
8	Alcohols and ethers.	6
9	Phenols.	4
10	Aromatic Hydrocarbons (includes benzene, electrophilic aromatic substitution, arenes and their derivatives).	7
Total Hours		45

Reference(s):

1. Organic Chemistry: by John McMurry 10th Ed, 2023
2. Organic Chemistry: Structure and Function (8th Edition) by Vollhardt and Schore.
3. Organic Chemistry by Robert T. Morrison and Robert N. Boyd.

Objectives (Learning Outcome):

1. This course provides a foundational understanding of organic chemistry, focusing on the relationship between the structure of carbon-based molecules and their physical and chemical properties.
2. The curriculum progresses logically from fundamental principles of bonding to the chemistry of major hydrocarbon families, three-dimensional structure, and key functional groups, culminating with the unique chemistry of aromatic compounds.

2027 -2026

Department of Pharmaceutical Chemistry
Title of the course: *Practical of Organic chemistry- I*
Level: 1st Class, 2nd Semester
Course number:129
Code: Phpch26_129-

No.	Lesson Subject	Hours
1	Determination of melting point (Known sample).	2
2	Determination of melting point (quiz and unknown).	2
3	Determination of boiling point (known sample).	2
4	Determination of boiling point (quiz and unknown).	2
5	Re-crystallization (known sample).	2
6	Re-crystallization (quiz and unknown sample).	2
7	Distillation techniques (known samples).	2
8	Distillation techniques (quiz and unknown).	2
9	Determination of solubility class (known sample).	2
10	Determination of solubility class (quiz and unknown).	2

Reference(s):

- 1) Handbook for Practical organic chemistry Adopted by the Department

Objectives (Learning Outcome):

- 1) **Understand and apply thermal analysis methods** by determining the melting and boiling points of known and unknown compounds.
- 2) **Evaluate purity and identity of substances** through interpretation of melting/boiling point data.
- 3) **Perform recrystallization techniques** to purify solid compounds and assess the efficiency of purification.
- 4) **Conduct distillation methods** (simple and fractional) for separation and purification of liquid mixtures.
- 5) **Determine solubility classes** of pharmaceutical compounds in different solvents, and apply solubility data in drug formulation and analysis.

2027 -2026

Department of Pharmaceutics

Title of the course: *Pharmaceutical Calculation*

Level: 1st Class, 2nd Semester

Course number:1210

Code: Phind26_1210-

Credit (hours/week): Theory (3) Laboratory (2) Units: 4

No.	Lesson Subject	Hours
1	Interpretation of prescription or medication orders.	3
2	Systems of measurement	3
3-4	Density, specific gravity and specific volume	3
5-6	Percent strength, ratio strength, and other expressions of concentration	6
6-7	Calculation of doses, calculation of doses patient parameters	6
8	Reducing and enlarging formulas	3
9	Altering product strength, use of stock solutions, and problem solving by alligation	3
10-11	Isotonic and buffer solutions	6
12-13	Electrolyte solutions (milliequivalents, millimoles and milliosmoles)	6
14-15	Intravenous infusions, parenteral, admixtures, rate-of-flow calculations	6
Total Hours		45

Reference(s):

1. Pharmaceutical Calculations; 15th edition (2017) by Howard C. Ansel

Objectives (Learning Outcome):

1. Develop skills in **interpreting prescriptions and medication orders** accurately and safely.
2. Apply all types of measurement systems in pharmaceutical calculations, including **dose determinations** for different patient needs.
3. Perform calculations for **adjusting formulas**, including **reduction and enlargement** methods.
4. Calculate **percentage strength, ratio strength, density, and specific gravity/volume** for various pharmaceutical preparations.
5. Prepare and evaluate isotonic solutions for compatibility with physiological systems.
6. Calculate values related to electrolyte solutions, including milliequivalents, millimoles, and milliosmoles.
7. Apply principles of IV admixture preparation, and flow rate calculations for intravenous therapy.

2027 -2026

Department of Pharmaceutics

Title of the course: *Practical of Pharmaceutical Calculation*

Level: 1st Class, 2nd Semester

Course number:1210

Code: Phind26 1210-

No.	Lesson Subject	Hours
1.	Demonstration of different glass ware and equipment used in the field of pharmacy.	2
2.	Pharmaceutical measurements.	4
3.	Volume measurements.	4
4.	Calculations involving liquid pharmaceutical preparations.	4
5.	Calculations involving buffer and isotonic liquid preparations	4
6.	Reducing and enlarging prescription contents.	4
7.	Percentages in calculating prescription contents.	4
8.	Stock solutions and dilution technique during dispensing technique.	4
	Total Hours	30

Reference text

Labarotary Manual for Practical Pharmacology adopted by the department.

2027 -2026

Department of Clinical Laboratory Sciences

Title of the course: *Theoretical & Practical of Computer Sciences I*

Level: 1st Class, 2nd Semester

Course number:1211

Code: Phcls26_1211-

Credit (hours/week): Theory (1) Laboratory (2) Units: 2

No.	Lecture title	Theoretical Hours	Practical Hours
1.	Introduction to computer: concepts of hardware and software with their components; Concept of computing, Data and Information; Connecting input/output devices, and peripherals to CPU.	1	2
2.	Computer Components: Computer Portions, Hardware parts, I/O units, Memory types.	1	2
3.	Computer Components (Cont.): Basic CPU components, Computer ports, Personal computer, Personal computer (Features and types)	1	2
4.	Operating system and graphical user interface GUI: Operating system, Basics of common operating system, The user interface, Using mouse techniques.	1	2
5.	Operating system and graphical user interface GUI (Cont.): Use of the common icons, Status bar, Using menu and menu-selection, Concept of folders and directions, Opening and closing of different windows, Creating short cuts.	1	2
6.	Word processing: Word processing basics, Basic features of word processors, Opening and closing of documents, Text creation and manipulation, Formatting of text and paragraphs, Using templates for document creation.	1	2
7.	Word processing (Cont.): Creating and managing tables, Utilizing styles and themes, Spell check and grammar tools, Using headers and footers.	1	2
8.	Spreadsheet: Introduction to spreadsheet software, Creating and formatting worksheets. Sorting and filtering data, Using formulas and functions.	1	2
9.	Spreadsheet (Cont.): Using formulas and functions, Using pivot tables for data analysis, Data validation and error checking, Data visualization: Creating charts and graphs.	1	2
10.	Presentation software: Introduction to presentation software, Overview of popular presentation tools, Creating a new presentation, Using templates and themes, Inserting and formatting text and images, Transition and animation effects.	1	2
11.	Presentation software (Cont.): Using Speaker notes and timers, Advanced features: Hyperlinks and action buttons, troubleshooting common presentation issues, future trends in presentation technology.	1	2
12.	Introduction to Internet and web browsers: Computer networks basic; LAN, WAN; Concept of Internet and its applications; Connecting to Internet.	1	2

2027 -2026

13.	Introduction to Internet and web browsers (Cont.): World wide web; Web browsing software's, Search engines; Understanding URL; Domain name; IP addresses.	1	2
14.	Communications and emails: Basics of electronic mail; Getting an email account; Sending and receiving emails; Accessing sent emails; Using emails; Document collaboration.	1	2
15.	Introduction to Cloud Computing and Services: Definition of cloud computing and its concept, Cloud-based office suites (Office 365 and Google workspace), Google Docs, Google sheets, Google drive, Google meet.	1	2

Suggested Books:

1. Graham Brown, David Watson, "Cambridge IGCSE information and communication technology", 3rd Edition (2020).
2. Alan Evans, Kendall Martin, Mary Anne Poatsy, "Technology in Action Complete 16th Edition (2020).
3. Ahmed Banafa, "Introduction to Artificial Intelligence (AI)", 1st Edition (2024).
4. Microsoft Office 2019 Step by Step 1st Edition by Curtis Frye & Joan Lambert.
5. 2016 "الخصر علي الخضر بحاث، "اساسيات الحاسوب"
6. 2005 "مدخل الى عالم الذكاء الاصطناعي" الدكتور عادل عبد النور،

2027 -2026

Department of Clinical Laboratory Sciences

Title of the course: *Arabic Language I*

Level: 1st Class, 2nd Semester

Course number:1212

Code: Phcls26_1212-

Credit (hours/week): Theory (2) Units: 2

المنهاج الموحد المقترح لمادة اللغة العربية لغير الاختصاص في الجامعات العراقية والأهلية

القرآن والحديث النبوي الشريف

الصف الأول - الفصل الأول

- من سورة البقرة الآيات من (٢٦٠-٢٦٣)
- من الحديث النبوي الشريف: قال رسول الله صلى الله عليه وآله وسلم: « إنما بعثت لأتمم مكارم الأخلاق »

الأدب العربي

- الاختيارات الشعرية في العصر الجاهلي المعلقة اختياراً
- قصيدة عنترة بن شداد

يا غيل أين من الغنية مهزبي

إن كان ربي في السماء فضاها

الصرف

- الميزان الصرفي .
- الجموع في العربية .
- أسناد الفعل للضمائر .
- تصريف الأفعال من حيث:
 - الصحة والاعتلال
 - والتجرد والزيادة
 - المشتقات

مهارات لغوية

- الحروف الهجائية (الشمسية والقمرية).
- أحكام كتابة علامات الترقيم.
- أحكام كتابة الهمزة (الأولى والمتوسطة والمتطرفة، وهمزنا الوصل والقطع).



المعاجم العربية

- المدارس المعجمية .
- معالي الالفاظ الغربية في القرآن الكريم كالقظة "تفهم" ، "فرشاً" ، "تقيراً" ، والاعتماد في ذلك على كتاب المفردات للراغب الاصفهاني
- منهج مدرستي (العين) و(الأساس) ، والتميزين على استخراج الالفاظ.
- من الأخطاء اللغوية الشائعة .

المنهاج الموحد المقترح لمادة اللغة العربية لغير الاختصاص في الجامعات العراقية والاهلية

الصف الأول - الفصل الثاني

القرآن الكريم والحديث النبوي الشريف

- من سورة الحج من اية (١-٥)
- من الحديث النبوي الشريف: قال رسول الله صلى الله عليه وآله وسلم: «خيركم من تعلم القرآن وعلمه».

الادب العربي

- سبعة أبيات من بالية ابن الرومي
- عدوك من صديقك مستفاد
- فلا تستكثرن من الصحاب
- القيم الإنسانية في الشعر الجاهلي
- الإسلام والشعر .

النحو العربي

- اقسام الكلام وعلامات اعرابها
- المعرب والمبني / المعرفة والنكرة
- المبتدأ والخبر
- النواسخ
- الفاعل والفاعل عنه .



البلاغة العربية

- مقدمة عامة في البلاغة العربية
- تعريفها لغة واصطلاحاً
- مدخل في تعريف علوم البلاغة
- بيان علاقتها باللغة العربية
- علم البيان : (تعريفه وأنواعه)
- التثنية : (تعريفه وأنواعه وتطبيقاته)
- الحقيقة والمجاز .
- المجاز اللغوي (تعريفه وعلاقاته وتطبيقاته).
- الاستعارة (تعريفها وأنواعها وتطبيقاتها)
- المجاز العقلي (تعريفه وعلاقاته وتطبيقاته) .
- الكناية (تعريفها وأنواعها وتطبيقاتها)
- من الأخطاء اللغوية الشائعة .



2027 -2026



Second Year

2027 -2026

Department of Clinical Laboratory Sciences

Title of the course: **Crimes of the Baath Regime in Iraq**

Level: 2nd Class, 1st Semester

Course number:211

Code: Phcls26_211-

Credit (hours/week): Theory (2) Laboratory (0) Units: 2

No.	Lesson Subject	Hours
1-2	تعريف الجريمة لغة واصطلاحاً	4
3-4	انتهاكات حقوق الإنسان	4
5-6	الجرائم النفسية واثارها	4
7-8	انتهاكات القوانين العراقية انتهاكات حقوق الإنسان وجرائم سلطة حزب البعث	4
9-10	قرارات الانتهاكات السياسية والعسكرية لنظام البعث فرية الاتهام بالتخطيط للانقلاب على كل من يعارض النظام البعثي لتطهير المعارضين له في الجيش	4
11-12	الجرائم البيئية التلوث الحربي والإشعاعي وانفجار الالغام	4
13-15	التلوث بالمواد المشعة استعمال الاسلحة المحرمة دولياً	6
Total Hours		30

المصادر:

-تقارير الأمم المتحدة في إدانة نظام البعث -انتهاكات حقوق الإنسان للفترة 1991 – 2003
-د. رائد عبيس ود. عباس عطيه، الناشر المركز العراقي لتوثيق جرائم التطرف، الطبعة الأولى
أرشيف المركز العراقي لتوثيق جرائم التطرف في العتبة العباسية المقدسة.
أرشيف مؤسسة السجناء السياسيين.

Objectives (Learning Outcome):

- تبصّر هذا الجيل بفتح فكري يكشف له عن شيء من جرائم هذا النظام التي لا يجوز شرعاً ، ولا قانوناً أن تبقى حبيسة الأقبية عن العراقيين الأحرار.
- بيان ما لدى منظومة التحقيق والحقيقة من مكانز كشفية عن شيء من جرائم النظام البعثي.
- توثيق جرائم نظام البعث وفق قانون المحكمة الجنائية العراقية العليا عام ٢٠٠٥

2027 -2026

Department of Clinical Laboratory Sciences

Title of the course: *Medical Microbiology - I*

Level: 2nd Class, 1st Semester

Course number:212

Code: Phcls26_212-

Credit (hours/week): Theory (3) Laboratory (2) Units: 4

No.	Lesson Subject	Hours
1	Introduction to microbiology	1
2	Bacterial classification and structure	1
3	Bacterial pathogenicity	2
4	Bacterial genetic	2
5	Bacterial growth physiology and biofilm	2
6	Normal Flora	2
7	Antimicrobial resistance	1
8	Gram positive: Staphylococcus	2
9	Gram positive: Streptococcus	2
10	Gram positive: Bacillus	1
11	Gram positive: Clostridium	3
12	Gram positive: Corynebacterium	1
13	Gram negative : Neisseria	1
14	Gram negative : Enteroba. E. coli	2
15	Gram negative : Salmonella and Shigella	2
16	Gram negative : Klebsiella and proteus	1
17	Non-enteric Pseudomonas and vibrio	2
18	Brucella, Bordetella and Hemophilus	2
19	H. pylori and Campylobacter	2
20	Treponema, Yersinia and Actinomycetes	3
21	Mycobacteria	2
22	Antimicrobial stewardship	2
23	Recombinant biotechnology	2
24	Phage and toxins	1
25	Probiotics, prebiotics and postbiotics	3
	Total Hours	45

Reference(s):

- 1) Lippincotts illustrated review microbiology, 2nd ed.
- 2) A color Atlas of microbiology by Ronald John Olds
- 3) Jawetz, Melnick, & Adelberg's. Medical Microbiology 26th ed.

Objectives (Learning Outcome):

- 1) Understanding bacteria in terms of their presence in the environment and their nutritional requirements for growth and reproduction
- 2) Methods of transmission of bacteria and the diseases they cause
- 3) Treatments and resistance to antibiotics and environmental factors

2027 -2026

Department of Clinical Laboratory Sciences

Title of the course: *Practical of Medical Microbiology - I*

Level: 2nd Class, 1st Semester

Course number:212

Code: Phcls26_212-

No.	Lesson Subject	Hours
1	Biosafety: Lab safety rules for students	2
2	Laboratory Devices	2
3	Shapes of bacteria :cocci,bacilli,spirilla Arrangements	2
4	Shapes of bacteria :cocci,bacilli,spirilla Arrangements	2
5	Identification methods:1-Isolation in pure form	2
6	Preparing a bacterial smear	2
7	Staining procedures Wet , dry smear	2
8	Staining reaction :G +,Ziehl-Neelsen stain	2
9	Culture media	2
10	Morphology & Characteristics of bacterial colony	2
11	Metabolism ; classify different species : O ₂ requirement ,need for CO ₂ , Capacity for pigments ,Power of hemolysis	2
12	Biochemical tests	2
13	Biochemical tests	2
14	Biochemical tests.	2
15	Biochemical tests	2
	Total Hours	30

Reference(s):

- 1) Lippincotts illustrated review microbiology, 2nd ed.
- 2) A color Atlas of microbiology by Ronald John Olds

Objectives (Learning Outcome):

- 1) Understanding bacteria in terms of their presence in the environment and their nutritional requirements for growth and reproduction
- 2) Methods of transmission of bacteria and the diseases they cause
- 3) Treatments and resistance to antibiotics and environmental factors

2027 -2026

Department of Pharmaceutical Chemistry

Title of the course: *Organic Chemistry - II*

Level: 2nd Class, 1st Semester

Course number:213

Code: Phpch26_213-

Credit (hours/week): Theory (3) Laboratory (2) Units: 4

No.	Lesson Subject	Hours
1	Carboxylic acids: properties and reactions. Functional derivatives of carboxylic acids.	10
2	Amines I and II.	6
3	Aldehydes and ketones (include also aldol and Claisen condensation); Classification, reactions and properties.	10
4	Heterocyclic system: Classes of heterocyclic systems; general structures; properties; Occurrence in nature and in medicinal products.	3
5	Five-membered ring heterocyclic compounds: pyrrole; furan and thiophen.	3
6	Source of pyrrole, furan and thiophen.	2
7	Electrophilic substitution in pyrrole, furan and thiophen: Reactivity and orientation.	4
8	Six-membered ring heterocyclic compounds: Structure & reactions of pyridine.	3
9	Saturated five-membered heterocyclic compounds.	4
	Total Hours	45

Reference(s):

- 1) Organic Chemistry: by John McMurry 10th Ed, 2023
- 2) Organic Chemistry: Structure and Function (8th Edition) by Vollhardt and Schore.
- 3) Essentials of Organic Chemistry_ For Students of Pharmacy, Medicinal Chemistry, Biological Chemistry; Paul M Dewick.

Objectives (Learning Outcome):

- 1) This course builds upon foundational organic chemistry principles to explore the chemistry of more complex and biologically significant molecules.
The curriculum is centered on two major themes: the reactivity of oxygen- and nitrogen-containing functional groups (especially carbonyls) and an introduction to the vast and important field of heterocyclic chemistry.

2027 -2026

Department of Pharmaceutical Chemistry

Title of the course: *Practical of Organic Chemistry - II*

Level: 2nd Class, 1st Semester

Course number:213

Code: Phpch26_213-

No.	Lesson Subject	Hours
1	Identification of alcohols (known sample, quiz and unknown).	4
2	Identification of phenols (known samples).	2
3	Identification of phenols (quiz and unknown).	2
4	Identification of aldehydes and ketones (explanation of concepts and quiz).	2
5	Identification of aldehydes and ketones (known sample).	2
6	Identification of aldehydes and ketones (quiz and unknown).	2
7	Identification of carboxylic acid (known sample).	2
8	Identification of carboxylic acid (quiz and unknown).	2
9	Identification of amine (known)	2
10	Identification of amine (unknown)	2
11	Identification of organic compound (general known)	2
12	Identification of organic compound (general quiz)	2
13	Cannizzaro reaction	2

Reference(s):

- 1) Handbook for Practical organic Chemistry Adopted by the Department

Objectives (Learning Outcome):

- 1) **Identify functional groups in organic compounds** (alcohols, phenols, aldehydes, ketones, carboxylic acids, and amines) using classical chemical tests.
- 2) **Differentiate between known and unknown samples** through systematic qualitative analysis and confirmatory reactions.
- 3) **Correlate functional group properties** with chemical reactivity, solubility, and pharmaceutical relevance.
- 4) **Apply logical sequence of experiments** to identify unknown organic compounds using stepwise analysis and quizzes.

2027 -2026

Department of Pharmaceutics

Title of the course: *Physical Pharmacy-I*

Level: 2nd Class, 1st Semester

Course number:214

Code: Phind26_214--

Credit (hours/week): Theory (3) Laboratory (2) Units: 4

No.	Lesson Subject	Hours
1-3	States of matter (Chapter 2) • Binding forces between molecules • States of matter • The gaseous state • The liquid state • Solids and crystalline state • The liquid crystalline state • The supercritical fluid state • Thermal analysis • Phase equilibria and phase rule • Solid dispersions	9
4-5	Nonelectrolytes (Chapter 5) • Physical properties of substances • Types of solutions • Concentration expressions • Ideal and real solutions • Colligative properties • Molecular weight determination.	6
6-7	Electrolyte solutions (Chapter 6) • Properties of solutions of electrolytes • Theory of dissociation • Theory of strong electrolytes • Ionic strength • The Debye- Hückel theory • Coefficients for expressing colligative properties	6
8-11	Solubility and distribution phenomena (Chapter 9) • Introduction • Solvent-solute interactions • Solubility of liquids in liquids • Solubility of solids in liquids • Determining thermodynamic and kinetic solubility • Poor aqueous solubility • Measuring solubility • Distribution of solutes between immiscible solvents	12
12-13	Ionic equilibria (Chapter 7) • Introduction	6

2027 -2026

	• Brønsted–Lowry theory • Ionization and dissociation • Classification of solvents • Lewis electronic theory • Acid-base equilibria • Calculation of pH and acidity constants	
14-15	Buffered and isotonic solutions (Chapter 8) • The buffer equation • Buffer capacity • Buffers in pharmaceutical and biological systems	6
	Total Hours	45

Reference(s):

- 5) Martin's Physical Pharmacy and Pharmaceutical Sciences; 7th edition; 2017.
- 6) Aulton's Pharmaceutics; The Design and Manufacture of Medicines; 6th edition, 2022.

Objectives (Learning Outcome):

- 5) Understand the states of matter, molecular interactions, and phase equilibria, including the phase rule and thermal analysis techniques.
- 6) Analyze the properties of non-electrolyte solutions, including colligative behavior and methods for molecular weight determination.
- 7) Study the behavior of electrolyte solutions, applying theories of dissociation, ionic strength, and colligative property expressions.
- 8) Explore solubility and distribution phenomena, focusing on solute-solvent interactions and partitioning between immiscible phases.
- 9) Apply principles of ionic equilibria, acid-base theories, pH calculations, and the effect of ionic strength on solution behavior.
- 10) Understand the formulation and function of buffered and isotonic solutions in maintaining pH and physiological compatibility.

2027 -2026

Department of Pharmaceutics

Title of the course: *Practical of Physical Pharmacy-I*

Level: 2nd Class, 1st Semester

Course number:214

Code: Phind26_214-

No.	Lesson Subject	Hours
1.	Introduction to physical pharmacy	2
2.	Expression of concentrations in pharmaceutical preparations	4
3.	Two-component systems containing liquid phases	4
4.	Three-component systems	4
5.	Tie linear for three-component systems	4
6.	Partition coefficient: Measurements and evaluation	2
7.	Solubility methods	4
8.	Buffer solutions	4
9.	Determination of solubility product constant of slightly soluble salts	2
	Total Hours	30

Reference

Laboratory Manual for Practical Pharmacology adopted by the department.

2027 -2026

Department of Pharmacology and Toxicology

Title of the course: *Physiology- II*

Level: 2nd Class, 1st Semester

Course number:215

Code: Phpht26_215-

Credit (hours/week): Theory (2) Laboratory (2) Units: 3

No.	Lesson Subject	Hours
1	Muscle	6
2	Cardiovascular	6
3	The Immune system	6
4	Regulation of organic metabolism and energy balance	4
5	Reproduction	8
	Total Hours	30

Reference(s):

Vander's Human physiology: the mechanisms of body function. Eric P. Widmaier, Hershel Raff, Kevin T. Strang, last edition

Objectives (Learning Outcome)

1. To learn how muscles work.
2. To learn the functions of cardiovascular system
3. To learn the immune system functions
4. To learn the energy production and regulation in the body
5. To learn how human reproduction

2027 -2026

Department of Pharmacology and Toxicology

Title of the course: *Practical Physiology- II*

Level: 2nd Class, 1st Semester

Course number:215

Code: Phpht26_215-

NO	Subject	Hours
1.	Effect of pH, Temperature, Extracellular K ⁺ , and Glucose on muscle function: Organ Bath Responses	2
2.	Tutorial and review	2
3.	Total RBC Count	2
4.	Tutorial and review	2
5.	Blood Group	2
6.	Tutorial and review	2
7.	Hematocrit Determination	2
8.	Bleeding and Clotting Time	2
9.	Tutorial and review	2
10	Hemoglobin	2
11	Tutorial and review	2
12	Insulin regulation of blood glucose	2
13	Tutorial and review	2
14	Experiments on respiratory system	2
15	Tutorial and review	2
16	Total	30

Reference text

Laboratory Manual for Practical Physiology adopted by the department.

2027 -2026

Department of Clinical Laboratory Sciences

Title of the course: *Theoretical & Practical of Computer SciencesII*

Level: 2nd Class, 1st Semester

Course number:216

Code: Phcls26_216-

Credit (hours/week): Theory (1) Laboratory (2) Units: 2

No.	Lecture title	Theoretical Hours	Practical Hours
1.	Security and networking: What is a network? Types of networks. Basic network components.	1	2
2.	Security and networking (Cont.): Network security basics. Understanding network threats.	1	2
3.	E-commerce: Concepts of electronic banking services, this includes online banking: ATM and debit card services, phone banking, SMS banking, electronic alert, Mobile banking.	1	2
4.	Computer troubleshooting: Identifying and solving common hardware and software problems that computer users encounter	1	2
5.	Computer troubleshooting (Cont.): Basic troubleshooting techniques and tools for diagnosing and solving issues.	1	2
6.	Introduction AI: Definition of AI, History of AI, AI Techniques and approaches.	1	2
7.	Introduction AI (Cont.): Key characteristics of AI, Benefits of AI, challenges and ethical considerations.	1	2
8.	The role of AI in modern smartphone: AI-driven mobile technologies, Virtual assistants (Siri, Google assistant, Alexa).	1	2
9.	The role of AI in modern smartphone (Cont.): Adaptive learning, Real-time translation services.	1	2
10.	Applications and tools of AI: Overview of AI applications in various industries, education, healthcare.	1	2
11.	Applications and tools of AI (Cont.): Transportation, Marketing and Advertising	1	2
12.	Applications and tools of AI (Cont.): Finance, Robotics and Automation Technologies.	1	2
13.	AI and society: how AI affect social, AI and international relations, AI and the future of humanity.	1	2
14.	Ethical challenges in AI: AI ethics, privacy and surveillance, the impact of AI on the job market.	1	2
15.	The future of AI: (future trends in AI, recent research and emerging technologies	1	2

Suggested Books:

1. Graham Brown, David Watson, "Cambridge IGCSE information and communication technology", 3rd Edition (2020).
2. Alan Evans, Kendall Martin, Mary Anne Poatsy, "Technology in Action Complete 16th Edition (2020).
3. Ahmed Banafa, "Introduction to Artificial Intelligence (AI)", 1st Edition (2024).
4. Microsoft Office 2019 Step by Step 1st Edition by Curtis Frye & Joan Lambert.
5. 2016 الخضر علي الخضر بحاث، "اساسيات الحاسوب"
6. 2005 الدكتور عادل عبد النور، "مدخل الى عالم الذكاء الاصطناعي"

2027 -2026

Department of Clinical Laboratory Sciences

Title of the course: **Arabic Language II**

Level: 2nd Class, 1st Semester

Course number:217

Code: Phcls26_217-

Credit (hours/week): Theory (2) Units: 2

المناهج الموحدة المقترحة لمادة اللغة العربية لغير الاختصاص في الجامعات العراقية والاهلية

الصف الثاني - الفصل الأول

القرآن الكريم والحديث النبوي الشريف

- من سورة الاسراء الآيات من (٢٩-٢٣)
- من الحديث النبوي الشريف: قال رسول الله صلى الله عليه وآله وسلم: «إن الله يحب إذا عمل أحدكم عملاً أن يتقنه»

- أبيات من قصيدة الشريف الرضي في رثاء والدته.

أبكك لو نقع الغليل بكائي
وأقول لو ذهب العقل بدائي

الأدب العربي

- دالية أبي العلاء المعري

غير مجد في ملء واعتقاد

نوح بك ولا ترنم شاد

- أبيات لكل من :

أ- الجواهري.

ب السياب مقاطع من انشودة المطر، أو غريب على الخليج.

- فنون النثر

النحو العربي

- الفعل المضارع نصبه وجرمه

- المجزورات

- المنصوبات



مهارات لغوية

- أحكام كتابة التاء (المفتوحة والمربوطة).
- أحكام كتابة الألف (الممدودة والمقصورة).
- كتابة الضاد والظاء.

المعاجم العربية

- مراحل جمع اللغة .
- معجمات الألفاظ والدلالة.
- من الأخطاء اللغوية الشائعة.



المنهاج الموحد المقترح لمادة اللغة العربية لغير الاختصاص في الجامعات العراقية والاهلية

الصف الثاني - الفصل الثاني

القرآن الكريم والحديث النبوي الشريف

- من سورة يوسف : (٧-١)

من الحديث النبوي الشريف: «لا تحاسدوا ، ولا تناجشوا، ولا تباغضوا، ولا تبايزوا، ولا يبيع بعضكم على بيع بعض، وكونوا عباد الله إخواناً، المسلم أخو المسلم: لا يظلمه، ولا يحقره، ولا يخذله، التفوى هاهنا ويشير إلى صدره ثلاث مرّات يحسب امرئ من الشر أن يحقر أخاه المسلم، كل المسلم على المسلم حرام: دمه، وماله، وعرضه»

الآداب العربي

- أبيات من ميمية المتنبّي:

واحر قلباه ممن قلبه شيم

ومن بجسمي وحالي عنده سقم

- أبيات من جيمية ابن القارض:

ما بين معترك الأحداق والمهجع

- أبيات لكل من :

أ- مصطفى جمال الدين (رائيته) بغداد ما اشتبكت عليك الأعصر....

ب محمد مهدي الجواهري من قصيدة (سلام على ياسقات النخيل)



الصرف

- تصريف الأسماء:
- أ- الاسم من حيث التنكير والتأنيث.
- ب- الاسم من حيث التجرد والزيادة
- ج - الاسم من حيث الإفراد والتثنية والجمع.

التحو العرربي

- العدد وأحكامه
- التوابع

المعاجم العربية

- منهج مدرستي (المقاييس) و(الصحاح)، والتمرين على استخراج الألفاظ.

البلاغة العربية

- علم البديع وأثره في بلاغة الكلام
- أ- المحسنات المعنوية (التورية، والطباق، والمقابلة، وحسن التعليل، تأكيد المدح بما يشبه الذم).
- ب- المحسنات اللفظية (الجناس، والسجع، والاقتباس، والتضمين).
- من الأخطاء اللغوية الشائعة .

الاستاذ الدكتور
نصيف جاسم محمد الحفاجي
رئيس اللجنة
٢٠٢٤/١١/٥



2027 -2026

Department of Clinical Laboratory Sciences

Title of the course: **Medical Microbiology - II**

Level: 2nd Class, 2nd Semester

Course number:227

Code: Phcls26_227-

Credit (hours/week): Theory (2) Laboratory (2) Units: 3

No.	Lesson Subject	Hours
1	Introduction to human parasite & taxonomy	1
2	Protozoa/Sarcodina : intestinal (<i>Entamoeba histolytica</i>)	1
3	Commensally intestinal amoeba: (<i>Entamoeba coli</i>)	1
4	Protozoa/Mastigophora : Intestinal flagellates: (<i>Giardia lamblia</i>)	1
5	Genital flagellates: (<i>Trichomonas vaginalis</i>)	1
6	Blood and tissue flagellates: (<i>Leishmania</i> spp. & <i>Trypanosoma</i> spp.)	1
7	Protozoa/ Sporozoa (Apicomplexa) : Blood Sporozoa: (<i>Plasmodium</i> Spp.)	1
8	Tissue Sporozoa: (<i>Toxoplasma gondii</i>)	1
9	Protozoa/ Ciliophora : (<i>Balantidium coli</i>)	1
10	Metazoa: Platyhelminthes (flatworms): Cestoda (tapeworms) : (<i>Taenia</i> spp.)	1
11	(<i>Hymenolepis</i> spp.)	1
12	(<i>Echinococcus</i> spp.)	1
13	Trematoda (flukes) : Blood flukes (<i>Schistosoma</i> spp.)	1
14	Hepatic flukes: (<i>Fasciola hepatica</i>)	1
15	Metazoa: Nematelminthes (roundworms): Nematoda : (<i>Ascaris lumbricoides</i> , <i>Trichuris trichuria</i>)	1
16	(<i>Enterobius vermicularis</i>)	1
17	(<i>Ancylostoma duodenale</i>)	1
18	Introduction to Virology & General characteristics of virus	1
19	Viral replication	1
20	Propagation of viruses & one step growth curve	1
21	Antiviral drugs	1
22	Genetic interaction & Classifications of viruses	1
23	DNA viruses	1
24	RNA viruses	1
25	Classify fungi causing human infections. Opportunistic Mycosis – Candidiasis, Aspergillosis	2
26	Infections of keratinized tissues e.g. Skin, hair & nails.– Pityriasis Vesicolor, white piedra, black piedra, tinea nigra, Malassezia species, dermatophytes	2
27	Fungi causing systemic diseases. - Histoplasmosis, Blastomycosis, Coccidioidomycosis	2
	Total Hours	30

2027 -2026

Reference(s):

- 1) Medical Microbiology 24th ed. 2007 by E. Jawetz
- 2) Medical parasitology, 5th ed. By Dr. D.R. Arora & Dr. Brij Bala Arora. 2018
- 3) Lab manual for practical virology and parasitology, - Atlas of Helminthes and Protozoa

Objectives (Learning Outcome):

- 1) Providing students with information about parasitic and viral diseases affecting human health, their most important causes and vectors, and methods detecting , treating and controlling them.
- 2) Providing students with information about fungi causing systemic diseases and methods of detecting treating and controlling them.



2027 -2026

Department of Clinical Laboratory Sciences

Title of the course: *Practical of Medical Microbiology - II*

Level: 2nd Class, 2nd Semester

Course number:227

Code: Phcls26_227-

No.	Lesson Subject	Hours
1	Introduction and classification of the human parasites	2
2	protozoa : Intestinal: <i>Entamoeba histolytica</i>	2
3	Commensal amoeba; <i>Entamoeba coli</i> ;	2
4	Protozoa/Mastigophora : Intestinal flagellates: <i>Giardia lamblia</i>	2
5	Flagellate of blood and tissues: <i>Leishmania</i> spp	2
6	Protozoa/ Sporozoa :Blood Sporozoa: Malarial parasite: <i>Plasmodium</i> Spp.	2
7	Tissue Sporozoa: <i>Toxoplasma gondii</i>	2
8	Metazoa: Platyhelminthes: Cestoda : (<i>Taenia</i> spp.)	2
9	(<i>Hymenolepis</i> spp.)	2
10	<i>Echinococcus</i> spp.	2
11	Trematoda : <i>Schistoma</i> spp.	2
12	Metazoa: Nematelminthes : Nematoda : <i>Entrobis vermicularis</i>	2
13	<i>Ascaris lumbricoides</i>	2
14	<i>Ancylostoma duodenale</i>	2
15	Methods for diagnosis of fungal infections	2
	Total Hours	30

Reference(s):

- 1) Medical parasitology, 5th ed. By Dr. D.R. Arora & Dr. Brij Bala Arora. 2018
- 2) Lab manual for practical virology and parasitology, - Atlas of Helminthes and Protozoa

Objectives (Learning Outcome):

- 1) Providing students with information about parasitic and viral diseases affecting human health, their most important causes and vectors, and methods detecting , treating and controlling them.
- 2) Providing students with information about fungi causing systemic diseases and methods of detecting treating and controlling them.

2027 -2026

Department of Pharmaceutical Chemistry

Title of the course: **Nutrition**

Level: 2nd Class, 2nd Semester

Course number:228

Code: Phcls26_228-

Credit (hours/week): Theory (2) Laboratory (0) Units: 2

No.	Lesson Subject	Hours
1	Introduction: Fundamentals of Nutrition Importance of nutrition in healthcare, The pharmacist's role in nutritional counseling)	2
2	Nutrition Across the Life Cycle -1. Infancy –childhood-adolescence-adulthood -2. Nutritional Aspects of Pregnancy and Lactation	4
3	Nutrition and Aging, Osteoporosis	4
4	Nutritional Assessment	2
5	Eating Disorders: Anorexia, Bulimia, Obesity.	2
6	Importance of Vitamins	2
7	Importance of Trace Elements	2
8	Nutritional and Metabolic Effects of Alcohol	2
9	Dietary Supplements	2
10	Nutrition in Chronic Diseases • Nutritional management in diabetes, hypertension, dyslipidemia	2
11	Dietary Fiber , Doping agents	2
12	Toxicants Occurring Naturally in Foods and Additives -Food Allergies and Intolerances	1
13	Popular Diets and Their Impacts • Keto, Mediterranean, vegetarian diets. • Pros, cons, and drug-nutrient implications	1
14	Drug-Nutrient Interactions	1
15	Pharmacist's Role in Nutritional Education	1
	Total Hours	30

Reference(s):

- 1) **Introduction to Clinical Nutrition** ,Vishwanath Sardesai; CRC Pres(2003)
- 2) **Nutrition in Pharmacy Practice** Cynthia L. Lieu
- 3) **Krause's Food & The Nutrition Care Process** , J Soldavini
- 4) **Nutrition in Clinical Practice** David L Katz ,4th edition

Objectives (Learning Outcome):

- 1) Understanding how nutrition impacts health and disease,
- 2) Applying nutrition principles to drug therapy and patient care, critically evaluating nutritional information and products,
- 3) Counseling patients on diet and supplements, and collaborating with other health professionals on nutrition-related issues.
- 4) To equip pharmacists to act as accessible, knowledgeable sources of nutrition advice for the public and to integrate this knowledge into their practice to prevent and manage chronic diseases.

2027 -2026

Department of Pharmacognosy

Title of the course: *Pharmacognosy*

Level: 2nd Class, 2nd Semester

Course number:229

Code: Phcog25_229-

Credit (hours/week): Theory (2) Laboratory (2) Units: 3

No.	Lecture title	Hours
1.	General Introduction: The Scope of Pharmacognosy, definitions and basic principles	3
2.	Drugs from natural sources, crud drugs, official and non-official drugs	1
3.	Classification of natural products	2
4.	Plant nomenclature and taxonomy	2
5.	Production of crude drugs: Cultivation, collection, drying and storage	3
6.	Deterioration of crude natural products	1
7.	Pharmacological activities of natural products	3
8.	Chemistry of natural drug products	5
9.	Quality control: Evaluation of natural products; macroscopical evaluation; physical evaluation; chemical evaluation; biological evaluation; spectroscopical evaluation	4
10.	Phytochemical investigation of herbal products: Extraction of the plant material; Separation and isolation of constituents; characterization of the isolated compounds	5
11.	Separation technique: Introduction; Mechanisms of separation and classification based on the type of technique; paper chromatography; Thin layer chromatography; Ion-exchange chromatography; Gel filtration chromatography; Column chromatography; Gas chromatography; HPLC; Electrophoresis; Affinity chromatography	7
12.	Traditional plant medicines as a source of new drugs. Bioassay-guided fractionation	4
13.	Tissue culture of medicinal plant: Introduction and history; laboratory of the plant tissue culture; aseptic techniques Application of the plant tissue culture; environmental and biological control; plant growth regulators.	5

Reference text

Trease, and Evans, W.C., Pharmacognosy, 16th edition, 2009, Elsevier Health Sciences.

ملاحظة: بانتظار المنهاج المحدث

2027 -2026

Department of Pharmacognosy

Title of the course: *Practical Pharmacognosy-I*

Level: 2nd Class, 2nd Semester

Course number:229

Code: Phcog25_229-

No.	Lab. Title	Hours
1.	Micro measurement and magnification	2
2.	Microscopical identification of crude drugs and cell contents	4
3.	Extraction and separation techniques	4
4.	Chromatography	4
5.	Paper chromatography (circular and horizontal paper chromatography)	4
6.	Introduction to tin-layer chromatography	2
7.	TLC on microscope slides	4
8.	Partition chromatography for the separation of volatile oils	4
9.	Effect of activity of adsorbents on R _f values	2

Reference text

Special curriculum prepared for this purpose.

2027 -2026

Department of Pharmaceutics

Title of the course: *Physical Pharmacy- II*

Level: 2nd Class, 2nd Semester

Course number:2210

Code: Phind25_2210-

Credit (hours/week): Theory (3) Laboratory (2) Units: 4

No.	Lesson Subject	Hours
1-2	Complexation (Chapter 10) • Classification of complexes • Metal complexes • Organic molecular complexes • Inclusion compounds • Methods of analysis	4
2-4	Diffusion (Chapter 11) • Introduction • Steady state diffusion • Fick's first law of diffusion • Fick's second law • Diffusion through membranes • Permeability • Diffusion driving forces • Lag time • Apparatus and methods for assessing drug diffusion	6
4-6	Chemical kinetics and stability (Chapter 14) • Introduction • Rates, orders and molecularity of reactions • Temperature effects • Other factors effects • Stability of pharmaceuticals • Accelerated stability and stress testing	7
6-8	Interfacial phenomena (Chapter 15) • Classification of interfaces • Liquid interfaces • Surface and interfacial tensions • Surface free energy • Measurement of interfacial tension • Spreading coefficient • Adsorption at liquid interfaces • Surface active agents • Systems of Hydrophile–Lipophile Classification • Adsorption at solid interfaces • The solid gas interface • The solid liquid interface • Wetting and wetting agents • Applications of surface-active agents • Foam and antifoaming agents	6

2027 -2026

	• Electric properties of interfaces	
8-10	Rheology (Chapter 16) • Newtonian systems • Non-Newtonian systems • Thixotropy • Determination of rheological properties • Viscoelasticity • Pharmaceutical areas in which rheology is Significant	6
10-12	Colloidal dispersions (Chapter 17) • Introduction to disperse systems • Types of colloidal systems • Optical properties of colloids • Kinetic properties of colloids • Electrical properties of colloids • Solubilization using colloids • Pharmaceutical applications of colloids	6
12-14	Micromeritics (Chapter 19) • Particle size and size distribution • Methods of determining particle size • Particle shape and surface area • Methods for determining surface area • Derived properties of powders (porosity, packing arrangements, densities of particles, bulkiness and flow properties)	5
14-15	Pharmaceutical polymers (Chapter 21) • Introduction (history, general concepts, synthesis) • Copolymers and polymer blends • Thermoplastic and thermoset polymers • Polymer properties (crystalline and amorphous polymers, thermal transitions, glass transition temperature, plasticized polymers, molecular weight, mechanical properties, • Polymers for pharmaceutical applications • Polymers in drug delivery	5
	Total Hours	45

Reference(s):

- 1) Martin's Physical Pharmacy and Pharmaceutical Sciences; 7th edition; 2017.
- 2) Aulton's Pharmaceutics; The Design and Manufacture of Medicines; 6th edition, 2022.

Objectives (Learning Outcome):

- 1) Understand **complexation phenomena**, classification of complexes, and methods used for their analysis.
- 2) Explore the principles of **drug diffusion**, including Fick's laws, diffusion through membranes, and factors affecting permeability.
- 3) Analyze **chemical kinetics** of drug degradation and perform **stability studies** using reaction rate laws and accelerated testing.
- 4) Study **interfacial phenomena**, surface tension, spreading, and the role of **surfactants** in wetting and formulation stability.
- 5) Examine the **rheological properties** of pharmaceutical systems, including thixotropy and methods of flow characterization.
- 6) Learn about **colloidal systems**, **micromeritics**, and **polymer science** with focus on particle behavior, formulation impact, and pharmaceutical applications.

2027 -2026

Department of Pharmaceutics

Title of the course: *Practical of Physical Pharmacy- II*

Level: 2nd Class, 2nd Semester

Course number:2210

Code: Phind26_2210-

No.	Lesson Subject	Hours
1.	Solubilization of components of pharmaceutical preparations.	4
2.	Solubilization of Aspirin.	4
3.	Surface tension: measurements and calculations	2
4.	Rate kinetics: Application in stability of pharmaceutical stability	4
5.	Determination of critical micelles concentration	4
6.	Viscosity: Measurements and calculations	6
7.	Determination of particle size by optical microscopy and Sedimentation	6
	Total Hours	30

Reference text

Laboratory Manual for Practical Pharmacology adopted by the department.

2027 -2026

Department of Pharmacology and Toxicology

Title of the course: *Physiology- III*

Level: 2nd Class, 2nd Semester

Course number:2211

Code: Phpht26_2211-

Credit (hours/week): Theory (2) Laboratory (0) Units: 2

No.	Lesson Subject	Hours
1	The endocrine system	8
2	Digestion and absorption of food	8
3	The Kidneys and the regulation of water and inorganic ions	8
4	Respiratory physiology	6
	Total Hours	30

Reference(s):

Vander's Human physiology: the mechanisms of body function. Eric P. Widmaier, Hershel Raff, Kevin T. Strang, last edition

Objectives (Learning Outcome)

1. To learn how gland work and organize body functions.
2. To learn how the body deals with food
3. To learn how the body eliminates waste by kidneys
4. To learn how the lungs work and organize body functions

2027 -2026

Department of Clinical Laboratory Sciences

Title of the course: *Personal & Professional Development*

Level: 2nd Class, 2nd Semester

Course number:2213

Code: Phcls26_2213-

Credit (hours/week): Theory (2) Units: 2



2027 -2026

Department of Clinical Laboratory Sciences

Title of the course: *Biochemistry-I*

Level: 2nd Class, 2nd Semester

Course number: 2212

Code: Phcls26_2212-

Credit (hours/week): Theory (3) Laboratory (2) Units: 4

No.	Lesson Subject	Hours
1	Familiarity with what biochemistry studies	3
2	Amino Acids: Structure, classification, properties, and forms of amino acids.	3
3	Chemical reactions, zwitterion, isoelectric pH, non-proteogenic amino acids, and clinical importance	3
4	Peptide bond, structure and function of some important peptides in human	3
5	Order of protein structure, bonds in proteins of different order of structure	3
6	Determination of the amino acids sequence in primary order proteins,	3
7	Determination of the N and C termini.	3
8	Chemistry, classification of carbohydrates	3
9	Clinical importance and classification, saturated and unsaturated fatty acids	3
10	Enzymes structure, nomenclature, and classification	3
11	General principles, factors affecting the rate of enzyme catalyzed reaction	3
12	The competitive and noncompetitive inhibitors, irreversible inhibition	3
13	The ideal enzyme-catalyzed step for regulation of a metabolic pathway,	3
14	The basic principles of endocrine hormone action	3
15	The roles of stimulus, hormone release, signal generation, and response	3
	Total Hours	45

Reference(s):

- 1) Harper's Illustrated Biochemistry, 32 ed,
- 2) Lippincott Illustrated Reviews: Biochemistry ,7th ed.
- 3) Lehninger Principles of Biochemistry, 8th ed.

Objectives (Learning Outcome):

- 1) Providing students with the principles of biochemistry related to important biological molecules and preparing them to discuss the metabolism of these molecules.
- 2) Providing students with the necessary technical skills in the field of biochemistry.

2027 -2026

Department of Clinical Laboratory Sciences

Title of the course: *Practical Biochemistry-I*

Level: 2nd Class, 2nd Semester

Course number: 2212

Code: Phcls26_2212-

No.	Lesson Subject	Hours
1	Proteins: Basic information	2
2	The qualitative color reaction of proteins	2
3	The qualitative color reaction of proteins	2
4	methods used in protein precipitation	2
5	Basic information: Carbohydrates	2
6	The qualitative color reaction of carbohydrates (Part 1: Effect of acids on carbohydrates)	2
7	The qualitative color reaction of carbohydrates (Part 2: Effect of alkali on carbohydrates)	2
8	Identification of unknown substance of carbohydrates	2
9	Lipids: Differentiation between the saturated and unsaturated fatty acids	2
10	Enzymes: LDH activity	2
11	Salivary Amylase	2
12	Enzymes kinetics,	2
13	Enzyme inhibitors Reversible	2
14	Enzyme inhibitors Irreversible	2
15	Identification of unknown: Carbohydrate -lipid-protein	2
	Total Hours	30

Reference(s):

- 1) Lippincott Illustrated Reviews: Biochemistry ,7th ed.
- 2) Manual of Biochemistry I Lab

Objectives (Learning Outcome):

- 1) Providing students with the principles of biochemistry related to important biological molecules.
- 2) Providing students with the necessary technical skills in the field of biochemistry.

2027 -2026



Third Year

2027 -2026

Department of Clinical Laboratory Sciences

Title of the course: *Biochemistry-I*

Level: 3rd Class, 1st Semester

Course number: 311

Code: Phcls26_311-

Credit (hours/week): Theory (3) Laboratory (2) Units: 4

No.	Lecture title	Hours
1.	Introduction to the macromolecules biochemistry: Definitions and terms; proteins, enzymes, DNA; Clinical value	2
2.	Amino acids: Structures of A.A (table of standard A.A abbreviation and side chain); Classification, properties, isomerism	3
3.	Amino acids: Chemical reactions, Zwitter ions, titration curve calculating isoelectric point values. Examples and questions. Non standards A.A: Structures, existence and clinical value	3
4.	Peptides: Peptide bond, resonance forms, isomers, physical properties and chemical reactions. Essential poly peptides in human body, structures, roles and clinical values	3
5.	Proteins: Structure and conformations of proteins, Primary structure, Secondary structure (α helix, β sheet), tertiary structure, quaternary structure. Classification, synthesis, cellular functions (Enzymes, cell signaling, and ligand transport, structural proteins), protein in nutrition	3
6.	Denaturation of proteins and protein sequencing: Determining A.A composition, N- terminal A.A analysis, C- terminal A.A analysis, Edman degradation, prediction protein sequence from DNA/ RNA sequences. Methods of protein study: Protein purification, cellular localization, proteomics and bioinformatics, structure predication and simulation	3
7.	Carbohydrates: Chemistry and classification, biomedical importance, classification of CHO, Stereochemistry of monosaccharides, metabolism of CHO; Physiologically important monosaccharides, glycosides, disaccharides, polysaccharides	3
8.	Lipids: Introduction, classification of lipids, fatty acids (F.A), nomenclature of F.A, saturated F.A, unsaturated F.A, physical and physiological properties of F.A, metabolism of lipids. Phospholipids, lipid peroxidation and antioxidants, separation and identification of lipids, amphipathic lipids	3
9.	Enzymes: Structures and mechanism, nomenclature, classification, mechanisms of catalysis, thermodynamics, specificity, lock and key model, induced fit model, transition state stabilization, dynamics and function, allosteric modulation. Biological function, cofactors, coenzymes, involvement in disease	3
10.	Kinetics: General principles, factors effecting enzyme rates (substrate conc., pH, temperature, etc), single-substrate reaction (Michaelis-Menten kinetics), kinetic constants. Examples of kinetic questions and solutions.	2

To be continued

2027 -2026

Biochemistry-I

No.	Lecture title	Hours
11.	Enzyme inhibition: Reversible inhibitors, competitive and non competitive inhibition, mixed-type inhibition, Irreversible inhibition. Inhibition kinetics and binding affinities (k_i), questions and solutions	1
12.	Control of activity and uses of inactivators; multi-substrate reactions, ternary-complex mechanisms, ping-pong mechanisms, non-Michaelis-Menten kinetics, pre-steady-state kinetics, chemical mechanisms	1
13.	Nucleic Acid: Chemical structure, nucleic acid components, nucleic acid bases, nucleotides and deoxynucleotides (Properties, base pairing, sense and antisense, super-coiling, alternative structures, quadruple structures	3
14.	Biological functions of DNA: Genes and genomes, transcription and translation, replication	2
15.	Biochemistry of extracellular and intracellular communication: Plasmamembrane structure and function; Biomedical importance, membrane proteins associated with lipid bilayer, membranes protein composition, dynamic structures of membranes, a symmetric structures of membranes	3
16.	Artificial membranes model, the fluid mosaic model, membrane selectivity, physiological functions of plasma membranes	1
17.	Biochemistry of the endocrine system: Classification of hormones, biomedical importance, the target cell concept and hormone receptors, biochemistry of hormone signal transduction	3
18.	Special topics: Nutrition, digestion, and absorption. Biomedical importance, digestion and absorption of carbohydrates, lipids, proteins, vitamins and minerals; energy balance. Biochemistry of hemostasis and clot formation	3

Reference text

Robert Murray, David Bender, Kathleen M. Botham, Peter J. Kennelly, Victor Rodwell, P. Anthony Weil, Harpers Illustrated Biochemistry, 29th edition, 2012.

2027 -2026

Department of Clinical Laboratory Sciences

Title of the course: *Practical Biochemistry-I*

Level: 3rd Class, 1st Semester

Course number: 311

Code: Phcls26_311-

No.	Lab. Title	Hours
1.	Effects of acids on carbohydrates: Molish test; Bials test; Anthron test; Seliwanoffs test; Mucic acid test	2
2.	Classification of carbohydrates according to reducing properties: Benedicts test; Fehlings test; Barfoed test	2
3.	Classification of carbohydrates according to reducing properties: Iodine test; Ozasone test	2
4.	Determination of unknown carbohydrates sample	2
5.	Color reactions of proteins: Biuret test; Ninhydrin test	2
6.	Color reactions of proteins: Millons test; Hopkins-Cole test; unoxidized sulfur test	2
7.	Solubility of proteins (effects of acid, neutral salts, heavy metals, and alkaloidal reagents)	2
8.	Determination of unknown sample of proteins	2
9.	Experiments on solubility of lipids	2
10.	Acrolin test for lipids; Soap; Studying properties of soap	2
11.	Determination of saponification number	2
12.	Properties of lipids: Iodine test for lipids	2
13.	Properties of enzymes: Effects of heat on enzymes	2
14.	Properties of enzymes: Effect of concentration of enzyme (salivary amylase) on reaction velocity	2
15.	Properties of enzymes: Effect of pH on enzymatic activity	2

Reference text

Laboratory Manual for Practical Biochemistry adopted by the department.

2027 -2026

Department of Pharmaceutical Chemistry

Title of the course: *Inorganic Pharmaceutical Chemistry*

Level: 3rd Class, 1st Semester

Course number:312

Code: Phpch26_312-

Credit (hours/week): Theory (2) Laboratory (2) Units: 3

No.	Lesson Subject	Hours
1	Alkali Metals: Lithium, Sodium, Potassium: Electron configuration, chemical properties of metals, Advantages and disadvantages using lithium-based drugs, Sodium as an essential ion in the human body, Active transport of sodium ions, Drugs, diet and toxicity of sodium ions, Potassium and its clinical application.	2
2	Alkaline Earth Metals: Magnesium, Calcium: Electron configuration of metals, Major uses and Chemical properties, Magnesium Biological importance and clinical applications and preparations. Calcium: the key to many human functions.	2
3	Group 13: Aluminium, Boron and Gallium: General chemistry of group 13 elements, Pharmaceutical applications of boric acid, Bortezomib, Biological importance of Aluminium and its adjuvants, Antacids, Aluminium-based therapeutics, Phosphate binders, Antiperspirant. Gallium Introduction, Chemistry, Pharmacology of gallium-based drugs and their uses	4
4	The Carbon Group: General chemistry of group 14 elements, Silicon-based drugs versus carbon-based analogues, Introduction of silicon groups, Silicon isosters, Organosilicon drugs.	2
5	Transition Metals and d-Block Metal Chemistry: Electronic configurations, platinum anticancer agents, Iron and its role in biological systems, clinical applications. Copper-containing drugs, Silver: the future of antimicrobial agents?, Gold: the fight against rheumatoid arthritis and zinc and its role in biological systems, clinical applications and toxicity.	4
6	Chelation Therapy: What is heavy-metal poisoning? What is chelation? Chelation therapy, Calcium disodium edetate, Dimercaprol (BAL), Dimercaptosuccinic acid (DMSA), 2,3-	2

2027 -2026

	Dimercapto-1-propanesulfonic acid (DMPS), and Lipoic acid (ALA).	
7	Protective adsorbents	2
8	Topical agents	2
9	Dental agents	2
10	Organometallic Chemistry: What is organometallic chemistry and metallocenes? Ferrocene derivatives as potential antimalarial agent and antibreast cancer, Titanocenes in titanium-based anticancer agents and Vanadocene dichloride as anticancer agents, Further vanadium-based drugs: insulin mimetics.	2
11	Radioactive Compounds and Their Clinical Application, Radiopharmacy: dispensing and protection, Therapeutic use of radiopharmaceuticals.	4
12	Radiopharmaceuticals for imaging	2
	Total Hours	30

Reference(s):

- 1) Essentials of Inorganic Chemistry For Students of Pharmacy, Pharmaceutical Sciences and Medicinal Chemistry by KATJA A. STROHFELDT, School of Pharmacy, University of Reading, UK
- 2) Inorganic Medicinal and Pharmaceutical Chemistry by Block, Roche Soine and Wilson, latest edition

Objectives (Learning Outcome):

- 1) This course examines the clinical application of inorganic compounds, focusing on the relationship between chemical structure and therapeutic or diagnostic function.
- 2) Students will study the roles of key metals in medicine, including platinum anticancer agents and chelation therapy.
- 3) A significant component is dedicated to radiopharmacy, covering the principles, safe handling, and application of radiopharmaceuticals in advanced medical imaging and treatment.

2027 -2026

Department of Pharmaceutical Chemistry

Title of the course:

Practical of Inorganic Pharmaceutical Chemistry

Level: 3rd Class, 1st Semester

Course number:312

Code: Phpch26 312-

No.	Lab title	Hours
1	To prepare and submit calcium carbonate (CaCO_3).	2
2	To prepare and submit magnesium carbonate (MgCO_3)	2
3	To prepare and submit Zinc sulphate (ZnSO_4).	2
4	To prepare and submit Potash alum ($\text{K}_2\text{SO}_4 \cdot \text{Al}_2(\text{SO}_4)_3 \cdot 24 \text{H}_2\text{O}$)	2
5	To prepare and submit Boric acid (H_3BO_3)	2
6	To prepare and submit aluminum hydroxide.	2
7	To perform limit test for iron in given sample.	2
8	To perform limit test for chloride in given sample.	2
9	To perform limit test for sulphate in given sample.	2
10	To perform identification test for boric acid.	2
11	To perform the identification test of ammonium chloride.	2
12	Acid neutralising capacity of aluminium hydroxide gel	2
13	(unknown sample).	2
14	(unknown sample).	2
15	(unknown sample).	2

Reference(s):

- 1) Handbook for Practical Pharmaceutical Chemistry Adopted by the Department

Objectives (Learning Outcome):

- 1) Develop practical skills in the preparation and purification of common inorganic pharmaceutical compounds.
- 2) Apply pharmacopeial methods for identification, assay, and limit tests of inorganic salts.
- 3) Strengthen understanding of the relationship between chemical composition and pharmaceutical applications.
- 4) Enhance accuracy, precision, and documentation in laboratory practice.

2027 -2026

Department of Clinical Laboratory Sciences

Title of the course: *Pathophysiology*

Level: 3rd Class, 1st Semester

Course number: 313

Code: Phcls26_313-

Credit (hours/week): Theory (3) Laboratory (2) Units: 4

No.	Lecture title	Hours
1.	Introduction.	1
2.	Cell injury and tissue response; Degeneration; Necrosis; Atrophy; Hypertrophy; Metaplasia and Calcification; Inflammation and Repair	6
3.	Disorders of electrolytes and water and acid–base balances: Hyper and Hyponatremia; Hyper and Hypokalemia; Syndrome of inappropriate secretion of ADH; Diabetes insipidus; Metabolic acidosis and alkalosis; Respiratory acidosis and alkalosis	4
4.	Disorders of cardiovascular system: Hyperemia; Congestion and edema; Thrombosis; embolism and infarction; Shock; Coronary heart disease and MI; Rheumatic heart disease; Heart failure; Acute pulmonary edema; Essential hypertension; Secondary hypertension; Malignant hypertension; Hypotension; Aneurysm versus varicose veins	5
5.	Disorders of respiratory system: Pneumonias; Tuberculosis; Respiratory distress syndrome; Bronchial asthma; Emphysema and bronchiectasis; Cystic fibrosis; Pulmonary embolism; Pulmonary hypertension	3
6.	Disorders of the renal system: Nephrotic syndrome; Glomerulonephritis; Diabetic glomerulosclerosis; Hypertensive glomerular disease; Pyelonephritis; Drug related nephropathies; Acute renal failure; Chronic renal failure	4
7.	Disorders of GI and hepatobiliary systems: Peptic ulcer and Zollinger – Ellison syndrome; Irritable bowel syndrome; Crohn's disease; Diarrhea; Celiac disease; Viral hepatitis; Primary biliary cirrhosis; Liver failure; Cholelithiasis	4
8.	Disorders of thyroid function: Hypothyroidism, Hyperthyroidism, Graves's disease, Thyrotoxicosis	2
9.	Disorders of adrenal function: Cushing syndrome. Adrenal cortical insufficiency (primary and secondary). Congenital adrenal hyperplasia. Pheochromocytoma	2
10.	Diabetes mellitus and metabolic syndrome; Dyslipoproteinemia	5
11.	Neoplasia.	4
12.	Metabolic and rheumatic disorders of skeletal system: Osteoporosis; Osteomalacia and rickets; Rheumatoid arthritis; Systemic lupus erythematosus; Ankylosing spondylitis; Gout; Osteoarthritis syndrome.	2
12	Alteration in immune response: Hypersensitivity disorders; Autoimmune disease; Transplantation immunopathology; Immunodeficiency disorders	3

Reference text

Carol Mattson Porth ,Essentials in Pathophysiology,3rdedition,2010.

2027 -2026

Department of Clinical Laboratory Sciences
Title of the course: *Practical Pathophysiology*
Level: 3rd Class, 1st Semester
Course number: 313
Code: Phcls26_313-

No.	Lab. Title	Hours
1.	General introduction and slide preparation	2
2.	Cell injury and degenerations	2
3.	Growth disturbances	2
4.	Inflammation	2
5.	Thrombosis	2
6.	Neoplasia	2
7.	Disorders of respiratory system	2
8.	Disorders of the cardiovascular system	2
9.	Disorders of renal system	2
10.	Liver disorders.	2
11.	Disorders of the gastrointestinal tract	2
12.	Disorders of the central nervous system	2
13.	Disorders of the reproductive system	2
14.	Disorders of skeletomuscular system	2
15.	Disorders of endocrine system	2

Reference text

Laboratory Manual for Practical Pathophysiology adopted by the department.

2027 -2026

Department of Pharmaceutics

Title of the course: *Pharmaceutical Technology*

Level: 3rd Class, 1st Semester

Course number:314

Code: Phind26_314-

Credit (hours/week): Theory (3) Laboratory (2) Units: 4

No.	Lesson Subject	Hours
1-3	Pharmaceutical preformulation (Chapter 23) (Aulton's <i>Pharmaceutics; The Design and Manufacture of Medicines</i> ; 6th edition, 2022) • The concept of preformulation • Solubility • Molecular dissociation • Partitioning • Dissolution rate • Hygroscopicity • Physical form • Powder properties • Compaction properties	9
4-6	Solutions (Chapter 13) (<i>Pharmaceutical Dosage Forms and Drug Delivery Systems</i> by Howard A. Ansel; 11th edition, 2017) • Some Solvents for Liquid Preparations • Preparation of solutions • Mixing oral liquids • Oral solutions and preparations for oral solution • Syrups • Elixirs • Tinctures • Proper administration and use of liquid peroral dosage forms • Topical Solutions and Tinctures • Vaginal and rectal solutions • Topical tinctures • Topical oral (dental) solutions • Miscellaneous solutions • Nonaqueous solutions • Extraction methods for preparing solutions	9
7-9	Suspensions (Chapter 14: <i>Pharmaceutical Dosage Forms and Drug Delivery Systems</i> by Howard A. Ansel; 11th edition, 2017) (Chapter 26: Aulton's <i>Pharmaceutics; The Design and Manufacture of Medicines</i> ; 6th edition, 2022) • Reasons for suspension • Features of desired in a pharmaceutical suspension • Sedimentation rate of the particles of a suspension • Physical features of the dispersed phase • Dispersion medium	9

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	• Rheology of suspensions • Preparation of suspensions • Sustained-release suspensions • Extemporaneous compounding of suspensions • Mixing solids in liquids • Packaging and storage of suspensions • Examples of pharmaceutical suspensions • Dry powders for oral suspension	
10-11	Aerosols and foams (Chapter 14) <i>(Pharmaceutical Dosage Forms and Drug Delivery Systems by Howard A. Ansel; 11th edition, 2017)</i> • Types of aerosols • Advantages of the aerosol dosage form • The aerosol principle • Aerosol systems • Aerosol container and valve assembly • Metered-dose inhalers • Filling operations • Packaging, labeling, and storage • Proper Administration and Use of • Proper administration and use of pharmaceutical aerosols • Examples of aerosols • Topical aerosols • Vaginal and rectal aerosols • Foams: Their types and preparation	6
12-15	Parenterals <i>(Chapter 15: Pharmaceutical Dosage Forms and Drug Delivery Systems by Howard A. Ansel; 11th edition, 2017)</i> <i>(Chapter 38: Aulton's Pharmaceutics; The Design and Manufacture of Medicines; 6th edition, 2022)</i> • Injections • Parenteral routes of administration • Official types of injections • Solvents and vehicles for injections • Colligative properties for injections • Methods of sterilization • Validation/verification of sterility • The industrial preparation of parenteral products • Packaging, labeling, and storage of injections • Available injections (examples) • Small volume parenterals • Large volume parenterals • Special considerations associated with parenteral therapy • Irrigation and dialysis solutions	12
	Total Hours	45

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Reference(s):

- 1) Aulton's Pharmaceuticals; The Design and Manufacture of Medicines; 6th edition, 2022.
- 2) Pharmaceutical Dosage Forms and Drug Delivery Systems by Howard A. Ansel; 11th edition, 2017.

Objectives (Learning Outcome):

- 1) Understand the fundamentals of **pharmaceutical preformulation**, including solubility, partitioning, powder, and compaction properties.
- 2) Learn the **formulation, preparation, and administration** of various **solution dosage forms**, both oral and topical.
- 3) Explore the **principles and techniques** involved in developing **suspensions**, including stability, rheology, and compounding methods.
- 4) Study the formulation and delivery mechanisms of **aerosols and foams**, with focus on metered-dose inhalers and topical/vaginal applications.
- 5) Gain knowledge of **parenteral dosage forms**, including types of injections, sterilization methods, and production standards.
- 6) Develop an understanding of **storage, packaging, and labeling** practices across all listed dosage forms to ensure quality and patient safety.



2027 -2026

Department of Pharmaceutics

Title of the course:

Practical of Pharmaceutical Technology

Level: 3rd Class, 1st Semester

Course number:314

Code: Phind26 314-

No.	Lesson Subject	Hours
1.	Introduction: Laboratory Safety and Good Laboratory Practice (GLP)	2
2.	Calibration curve and saturated solubility determination (UV and HPLC)	4
3.	Oral solutions: preparation methods and quality evaluation	2
4.	Syrups: materials, preparation methods and quality evaluation	4
5.	Elixirs: materials, preparation methods and quality evaluation	4
6.	Tinctures: materials, preparation methods and quality evaluation	2
7.	Aromatic waters: materials, preparation methods and quality evaluation	2
8.	Suspensions: materials, preparation methods and quality evaluation	6
9.	Quality evaluation of parenteral preparations	4
	Total Hours	30

Reference(s):

- 1) Handbook of Extemporaneous Preparation by Mark Jackson and Andrew Lowey; 1st edition; 2010.
- 2) British Pharmacopeia (BP); 2025 edition.
- 3) United States Pharmacopeia- National Formulary (USP-NF); 2025 edition.

2027 -2026

Department of Pharmacognosy

Title of the course: *Pharmacognosy-II*

Level: 3rd Class, 1st Semester

Course number:315

Code: Phcog26_315-

Credit (hours/week): Theory (2) Laboratory (2) Units: 3

No.	Lecture title	Hours
1.	Introduction: General biosynthesis pathways of secondary metabolites	2
2.	Carbohydrates	2
3.	Glycosides: Biosynthesis, physical and chemical properties; cardiac glycosides; saponin glycosides; anthraquinone glycosides; flavonoid glycosides; cyanophore glycosides	5
4.	Glycosides: Isothiocyanate glycosides; aldehyde glycosides; alcoholic glycosides; phenolic glycosides; lactone glycosides; coumarins and chromones	5
5.	Resins and resin combination; tannins	2
6.	Lipids: fixed oils and waxes	3
7.	Volatile oils: Introduction; chemistry of volatile oils; biosynthesis of volatile oils; hydrocarbons as volatile oils; alcohols as volatile oils; aldehydes as volatile oils	4
8.	Ketones as volatile oils; Phenols as volatile oils; Oxides as volatile oils; Ester as volatile oils; Phenolic ethers as volatile oils	3
9.	Non- medicinal toxic plants	2
10.	Vitamins and Amino acids	2

Reference text

Robbers JE, Speedie MK, Tyler VE , Pharmacognosy and Pharmacobiotechnology; 2nd edition,2008.

2027 -2026

Department of Pharmacognosy

Title of the course: *Practical Pharmacognosy-II*

Level: 3rd Class, 1st Semester

Course number:315

Code: Phcog26_315-

No.	Lab. Title	Hours
1.	Cardio-active glycosides	2
2.	Anthraquinone glycosides	2
3.	Saponin glycosides	2
4.	Tannins	2
5.	Volatile oils	2
6.	Isolation of piperine from black pepper	2
7.	Isolation of belladonna alkaloids and their identification	2
8.	Isolation of caffeine from tea	2
9.	Isolation of <i>Peganum harmala</i> alkaloids	2
10.	Preparation of Khellin	2
11.	Flavonoids of <i>Ruta graveolens</i>	2
12.	Extraction of hesperidin	2
13.	Isolation of pectin	2
14.	Isolation of citric acid from lemon juice	2
15.	Isolation of Podophyllotoxin from <i>Podophyllum emodi</i> ; Isolation of Rotenone from <i>Lonchocarpus</i> Spp	2

Reference text

Special curriculum prepared for this purpose.

2027 -2026

Department of Clinical Laboratory Sciences

Title of the course: *Biochemistry-II*

Level: 3rd Class, 2nd Semester

Course number: 326

Code: Phcls26_326-

Credit (hours/week): Theory (3) Laboratory (2) Units: 4

No.	Lecture title	Hours
1.	Bioenergetic	2
2.	Biologic oxidation	2
3.	The respiratory chain and oxidative phosphorylation.	2
4.	Over view of metabolism	2
5.	Citric acid Cycle	2
6.	Glycolysis	2
7.	Metabolism of glycogen	4
8.	Gluconeogenesis	3
9.	Pentose phosphate pathway and other pathways of hexose metabolism	3
10.	Biosynthesis of fatty acids	3
11.	Oxidation of fatty acids	2
12.	Metabolism of acylglycerol and sphingolipids	2
13.	Lipid transport and storage	2
14.	Cholesterol synthesis, transport, and excretion	2
15.	Biosynthesis of the Nutritionally Nonessential Amino Acids	3
16.	Catabolism of Proteins & of Amino Acid Nitrogen	3
17.	Catabolism of the Carbon Skeletons of Amino Acids	2
18.	Conversion of Amino Acids to Specialized Products	2
19.	Porphyrins & Bile Pigments	2

Reference text

Robert Murray, David Bender, Kathleen M. Botham, Peter J. Kennelly, Victor Rodwell, P. Anthony Weil, Harpers Illustrated Biochemistry, 29th edition, 2012.

2027 -2026

Department of Clinical Laboratory Sciences

Title of the course: *Practical Biochemistry-II*

Level: 3rd Class, 2nd Semester

Course number: 326

Code: Phcls26_326-

No.	Lab. Title	Hours
1.	General urine examination: Physical properties	2
2.	General urine examination: Chemical properties; Protein in urine; Sugar in urine	2
3.	General urine examination: Ketone bodies in urine (Rothera test); Bile salts in urine (Hays test); Bilirubin in urine	2
4.	General urine examination: Evaluation of unknown urine sample	2
5.	Cerebrospinal fluid analysis: Measurement of glucose in CSF	2
6.	Cerebrospinal fluid analysis: Measurement of chloride in CSF	2
7.	Cerebrospinal fluid analysis: Measurement of proteins in CSF	
8.	Serum calcium measurement	2
9.	Blood phosphorus measurement (inorganic phosphate)	2
10.	Serum total proteins (quantitative analysis)	2
11.	Estimation of urea level in the blood	2
12.	Measurement of serum uric acid level	2
13.	Measurement of serum ascorbic acid level	
14.	Gastric juice analysis: Detection of free hydrochloric acid concentration	2
15.	Gastric juice analysis: detection of free acid, total acid content	2

Reference text

Laboratory Manual for Practical Biochemistry adopted by the department.

2027 -2026

Department of Clinical Pharmacy
Title of the course: *Pharmacy Ethics*

Level: 3rd Class, 2nd Semester

Course number: 327

Code: Phclp26_327-

Credit (hours/week): Theory (1) Laboratory (0) Units: 1

No.	Lecture title	Hours
1.	Introduction to Pharmacy Ethics (Theoretical considerations)	2
2.	Code of Ethics for Pharmacists	1
3.	Common Ethical Considerations in Pharmaceutical Care Practice (Beneficence, Autonomy, Honesty, Informed Consent, Confidentiality, Fidelity)	3
4.	Inter-professional Relations	2
5.	Making ethical decisions	1
6.	Ethical issues related to clinical pharmacy research	1
7.	Ethical problems in the pharmacist's clinical practice	1
8.	Preventing misuse of medicines	1
9.	Case studies in pharmacy ethics	3

Reference text

1- Ruth Rodgers, (ed.); fast track: Law and Ethics in Pharmacy Practice. Pharmaceutical Press, 2010.

2-Joy Wingfield and David Badcott . Pharmacy Ethics and Decision Making. Pharmaceutical Press,2007

3-Robert J. Cipolle, Linda M. Strand, Peter C. Morley.Pharmaceutical Care Practice: The clinician's Guide, 2nd Edition.

4- Robert m. Veatch and Amy Haddad. Case Studies in Pharmacy Ethics. second edition. Copyright © 2008 by Oxford University Press, Inc.

2027 -2026

Department of Pharmaceutical Chemistry

Title of the course: *Organic Pharmaceutical Chemistry- I*

Level: 3rd Class, 2nd Semester

Course number: 328

Code: Phpch26_328-

Credit (hours/week): Theory (3) Laboratory (2) Units: 4

No.	Lecture title	Hours
1.	Drug distribution	4
2.	Acid- base properties	3
3.	Statistical prediction of pharmacological activity	3
4.	QSAR models	2
5.	Molecular modeling (Computer aided drug design)	1
6.	Drug receptor interaction: force involved	1
7.	Steric features of drugs	2
8.	Optical isomerism and biological activity	1
9.	Calculated conformation	1
10.	10. Three- dimensional quantitative structure activity relationships and databases	1
11.	Isosterism	1
12.	Drug-receptor interaction and subsequent events	1
13	General pathways of drug metabolism: Sites of drug biotransformation; Role of cytochrome P450 mono-oxygenases in oxidative biotransformation; Oxidative reactions; Reductive reactions; Hydrolytic reactions; Phase II reactions	22
14	Factors affecting drug metabolism	2

Reference text

Wilson and Gisvold Textbook of Organic medicinal and Pharmaceutical chemistry, Delgado JN, Remers WA, (Eds); 12th edition, 2010.

2027 -2026

Department of Pharmaceutical Chemistry

Title of the course:

Practical of Organic Pharmaceutical Chemistry- I

Level: 3rd Class, 2nd Semester

Course number: 328

Code: Phpch26_328-

No.	Lab. Title	Hours
1.	Preparation and standardization of 0.1N KMnO ₄ (known sample)	2
2.	Preparation and standardization of 0.1N KMnO ₄ (quiz and unknown)	2
3.	Assay of hydrogen peroxide solution (known sample)	2
4.	Assay of hydrogen peroxide solution (quiz and unknown sample)	2
5.	Assay of ferrous sulfate (known sample)	2
6.	Assay of ferrous sulfate (unknown sample)	2
7.	Preparation and standardization of 0.1Na ₂ S ₂ O ₄ solution (known sample)	2
8.	Preparation and standardization of 0.1Na ₂ S ₂ O ₄ solution (quiz and unknown sample)	2
9.	Assay of copper sulfate (known sample)	2
10.	Assay of copper sulfate (unknown sample)	2
11.	Assay of Chlorinated Lime (known sample)	2
12.	Assay of Chlorinated Lime (quiz and unknown)	2
13.	Preparation and assay of Lugol's Solution (known sample)	2
14.	Preparation and assay of Lugol's Solution (quiz and unknown)	2
15.	Assay of Alum (unknown sample)	2

Reference text

Laboratory Handbook for Practical Pharmaceutical Chemistry adopted by the department.

2027 -2026

Department of Pharmaceutics

Title of the course: *Pharmaceutical & Cosmetic Preparations*

Level: 3rd Class, 2nd Semester

Course number: 329

Code: Phind26_329-

Credit (hours/week): Theory (3) Laboratory (2) Units: 4

No.	Lesson Subject	Hours
1-3	Emulsions (Chapter 14) (<i>Pharmaceutical Dosage Forms and Drug Delivery Systems</i> by Howard A. Ansel; 11th edition, 2017) • Purpose of emulsion and emulsification • Theories of emulsification • Gibbs free energy in an emulsion • Preparation of emulsions • Emulsifying agents • HLB system • Blending of surfactants • Surface area of globules • Methods of emulsion preparation • Mixing immiscible liquids • Microemulsions • Stability of emulsions • Examples of oral emulsions • Examples of topical emulsions	9
4-6	Ointments, creams and gels (Chapter 10) (<i>Pharmaceutical Dosage Forms and Drug Delivery Systems</i> by Howard A. Ansel; 11th edition, 2017) • Ointments • Ointment bases • Selection of the appropriate base • Compendial requirements for ointments • Preparation of ointments • Creams • Preparation of creams • Gels: preparation, packaging and storage • Miscellaneous semisolid preparations: pastes, plasters, and glycerogelatin • Packaging semisolid preparations • Examples of ointments, creams and gels • Features and uses of dermatologic preparations • Features and uses of ophthalmic ointments and gels • Features and uses of nasal ointments and gels • Features and uses of rectal preparations • Features and uses of vaginal preparations • Drug release from semisolid dosage forms	9
7-9	Suppositories, inserts and sticks (Chapter 12) (<i>Pharmaceutical Dosage Forms and Drug Delivery Systems</i> by Howard A. Ansel; 11th edition, 2017) • Suppositories	9

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	• Uses and applications • Some factors of drug absorption from rectal suppositories • Suppository bases • Formulation variables • Preparation of suppositories (dose replacement calculations) • Manufacturing suppositories • Quality control • Packaging and storage • Stability • Rectal suppositories (with examples) • Urethral suppositories (with examples) • Vaginal inserts • Vaginal inserts (tablets) • Medication sticks • Special types of suppositories • Clinical considerations	
10	Pharmaceutical Incompatibilities (chapter 21) <i>(Pharmaceutical Dosage Forms and Drug Delivery Systems by Howard A. Ansel; 11th edition, 2017)</i> Physical incompatibilities, chemical incompatibilities, correction of incompatibilities	2
10-15	Cosmetic Formulations <i>(Cosmetic Formulation of Skin Care Products; by Zoe Diana Draelos and Lauren A. Thaman; Taylor and Francis Group; 2006)</i> • Introduction • Cosmetic formulation of skin care products (Chapter 1) • Toners and astringents (Chapter 5) • Antiperspirants (Chapter 8) • Sunscreens (Chapter 9) • Anti-aging skin care formulations (Chapter 11) • Topical exfoliation—clinical effects and formulating considerations (Chapter 15) Herbs in cosmeceuticals (Chapter 19)	16
Total Hours		45

Reference(s):

- 1) Pharmaceutical Dosage Forms and Drug Delivery Systems by Howard A. Ansel; 11th edition, 2017.
- 2) Cosmetic Formulation of Skin Care Products; by Zoe Diana Draelos and Lauren A. Thaman; Taylor and Francis Group; 2006

Objectives (Learning Outcome):

- 1) Understand the principles, preparation, and stability of pharmaceutical emulsions, including surfactant systems and microemulsions.
- 2) Study the formulation, compounding, and use of semisolid dosage forms such as ointments, creams, gels, and dermatologic preparations.
- 3) Explore the design and clinical applications of suppositories, vaginal inserts, and medication sticks, including manufacturing and quality control.
- 4) Learn the physicochemical and therapeutic considerations for selecting appropriate bases and packaging for topical and rectal formulations.
- 5) Examine the formulation strategies and clinical uses of cosmetic products, including sunscreens, exfoliants, and anti-aging preparations.
- 6) Apply knowledge of formulation science to ensure safety, effectiveness, and patient acceptability of pharmaceutical and cosmetic products.

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Department of Pharmaceutics

Title of the course:

Practical of Pharmaceutical & Cosmetic Preparations

Level: 3rd Class, 2nd Semester

Course number: 329

Code: Phind26 329-

No.	Lesson Subject	Hours
1.	Emulsions: materials, preparation methods and quality evaluation	4
2.	Ointments: materials, preparation methods and quality evaluation	4
3.	Ophthalmic ointments: materials, preparation methods and quality evaluation	2
4.	Creams: materials, preparation methods and quality evaluation	2
5.	Gels: materials, preparation methods and quality evaluation	2
6.	Suppositories: materials, preparation methods and quality evaluation	4
7.	Hair care formulations: materials, preparation methods and quality evaluation	4
8.	Skin care formulations: materials, preparation methods and quality evaluation	4
9.	Detection and characterization of pharmaceutical incompatibilities (chemical and physical incompatibilities)	4
	Total Hours	30

Reference(s):

- 1) Handbook of Extemporaneous Preparation by Mark Jackson and Andrew Lowey; 1st edition; 2010.
- 2) British Pharmacopeia (BP); 2025 edition.
- 3) United States Pharmacopeia- National Formulary (USP-NF); 2025 edition.
- 4) FDA Cosmetic Regulations

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Department of Pharmacognosy

Title of the course: *Pharmacognosy–III*

Level: 3rd Class, 2nd Semester

Course number:3210

Code: Phcog26_3210-

Credit (hours/week): Theory (2) Laboratory (2) Units: 3

No.	Lecture title	Hours
1.	Alkaloids: Introduction; Physical and chemical properties; pyridine, piperidine alkaloids; tropane alkaloids	5
2.	Alkaloids: Quinoline tropan alkaloids; iso-quinoline alkaloids; imidazole alkaloids; indole alkaloids	5
3.	Alkaloids: Steroidal alkaloids; lupinane alkaloids; alkaloidal amines; purine alkaloids	4
4.	Antibiotics: Natural sources; biosynthetic pathways, isolation and purification	6
5.	Tissue culture of medicinal plant: Introduction and history; laboratory of the plant tissue culture; aseptic techniques	4
6.	phytotherapy :Introduction , principles,medicinal plants in selected health care systems.Important natural products & phytomecines used in pharmacy & medicine.	6

Reference text

Robbers JE, Speedie MK, Tyler VE , Pharmacognosy and Pharmacobiotechnology, 2ndedition,2008.

2027 -2026

Department of Pharmacognosy

Title of the course: *Practical Pharmacognosy-III*

Level: 3rd Class, 2nd Semester

Course number:3210

Code: Phcog26_3210-

No.	Lab. title	Hours
1.	Isolation of <i>Peganum harmala</i> alkaloids	4
2.	Preparation of Khellin	4
3.	Flavonoids of <i>Ruta graveolens</i>	4
4.	Extraction of hesperidin	4
5.	Isolation of pectin	2
6.	Isolation of citric acid from lemon juice	4
7.	Isolation of Podophyllotoxin from <i>Podophyllum emodi</i> ; Isolation of Rotenone from <i>Lonchocarpus</i> Spp	4
8.	Isolation of <i>Peganum harmala</i> alkaloids	4

Reference text

Lab. Manual for Practical Pharmacognosy Adopted by the Department.

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Department of Pharmacology and Toxicology

Title of the course: *Pharmacology -I*

Level: 3rd Class, 2nd Semester

Course number:3211

Code: Phpht26_3212-

Credit (hours/week): Theory (3) Laboratory (0) Units: 3

No.	Lecture title	Hours
1.	General introduction to Pharmacology	2
2.	Pharmacokinetics	4
3.	Drug Receptor interaction and Pharmacodynamics	4
4.	The autonomic nervous system (ANS)	2
5.	Cholinergic system	6
6.	Adrenergic system	6
7.	Principal of antimicrobial therapy	2
8.	β - lactam and other cell wall synthesis inhibitor antibiotics	4
9.	Protein synthesis inhibitors	4
10.	Quinolones, Folate antagonists, and urinary tract antiseptics	3
11.	Antimycobacterium drugs	2
12.	Antifungal drugs	2
13.	Antiprotozoal drugs	1
14.	Anthelmintic drugs	2
15.	Antiviral drugs	1

Reference text

Howland RD, Mycek MJ. Lipincotts Illustrated Reviews Pharmacology, 6th edition, 2013, Lippincott William and Wilkins, Philadelphia.

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Department of Pharmaceutics

Title of the course: *Biopharmaceutics*

Level: 4th Class, 1st Semester

Course number:411

Code: Phind26_411-

Credit (hours/week): Theory (2) Laboratory (2) Units: 3

No.	Lecture title	Hours
1.	Introduction to biopharmaceutics	2
2.	Biopharmaceutic aspects of products; drug absorption; mechanisms of absorption; physicochemical factors; dissolution rate; effects of excipients; type of dosage forms	6
3.	One compartment open model	2
4.	Multicompartment models	2
5.	Pharmacokinetics of drug absorption	2
6.	Bioavailability and bioequivalence	2
7.	Clearance of drugs from the biological systems	2
8.	Hepatic elimination of drugs	2
9.	Protein binding of drugs	2
10.	Intravenous infusion	2
11.	Multiple dosage regimens	2
12.	Non-linear pharmacokinetics	2
13.	Dosage adjustment in renal diseases	2

Reference text

Shargel L, Yu AB, (Eds.), Applied Biopharmaceutics and Pharmacokinetics; 6th edition,2012.

2027 -2026

Department of Pharmaceutics

Title of the course: *Practical of Biopharmaceutics*

Level: 4th Class, 1st Semester

Course number:411

Code: Phind26_411-

No.	Lab. title	Hours
1.	Preparation of calibration curve of salicylic acid	2
2.	<i>In vitro</i> evaluation of bulk laxative	2
3.	<i>In vitro</i> evaluation of antacids	2
4.	Dissolution of tablets	4
5.	Review and tutorial	2
6.	Determination of pharmacokinetic parameters from CP-time by residual method	4
7.	Determination of pharmacokinetic parameters from CP-time by trapezoidal method	4
8.	Determination of pharmacokinetic parameters from urine excretion samples	4
9.	Hydrolysis of aspirin in buffer pH 6.8	4
10.	Review and tutorial	2

Reference text: Lab Manual for Practical Biopharmaceutics Adopted by the Department.

2027 -2026

Department of Clinical pharmacy

Title of the course: *Clinical pharmacy - I*

Level: 4th Class, 1st Semester

Course number:412

Code: Phelp26_412-

Credit (hours/week): Theory (2) Laboratory (2) Units: 3

No.	Lecture title	Hours
1.	Introduction to community pharmacy	1
2.	Respiratory problems: Cough, Common cold, allergic rhinitis, Otitis media, Laryngitis and Pharyngitis	3
3.	G.I.T problems: Diarrhea, Constipation, Heart burn and indigestion, IBS and Hemorrhoids	4
4.	Pediatric care practice : Oral thrush, pinworms and head lice	2
5.	Skin conditions: Acne, Scabies, Psoriasis, Hair loss, Fungal infection, Eczema and Dermatitis, Dandruff, Cold sore, Corns and Callus	5
6.	Women's' health care: Cystitis and vaginal thrush, primary dysmenorrhea and Premenstrual syndrome	2
7.	CNS related problems: Headache, Insomnia, Motion sickness, Nausea and vomiting	3
8.	- Eye problems	1
9.	ENT problems	1
10.	Oral hygiene, mouth ulcer	1
11.	Obesity and body weight control	1
12.	- Pain and musculoskeletal disorders	1
13	Nicotine replacement therapy (NRT)	1
14	Dietary supplements	1
15.	An update in reclassification of OTC drugs (simvastatin, Tamusotisin & azithromycin)	2
16.	Medication adherence and errors	1

Reference text

1-Paul Rutter; Community Pharmacy; Symptoms, Diagnosis and Treatment, 3rd edition, 2013.

2- Roger Walker, Clive Edwards (Eds), Clinical Pharmacy and Therapeutics, Churchill Livingstone, London, 5th edition, 2011.

2027 -2026

Department of Clinical pharmacy

Title of the course: *Practical of Clinical pharmacy - I*

Level: 4th Class, 1st Semester

Course number:412

Code: Phclp26_412-

No.	Practice Title	Hours
1	Communication with patients.	2
2	Respiratory system in practice (part I): Cough.	2
3	Respiratory system in practice (part II): Common cold.	2
4	G.I.T system in practice (part I): Constipation.	2
5	G.I.T system in practice (part II): Diarrhea and IBS.	2
6	GIT system in practice (part III): GERD& indigestion.	2
7	Skin conditions in practice (part I): Hair loss; cold sore and athlete's foot.	2
8	Skin conditions in practice (part II): Dandruff, Eczema and mouth ulcer.	2
9	Skin conditions in practice (part III): warts and scabies.	2
10	Pediatrics in practice: Oral thrush; colic; pinworm and napkin rash.	2
11	Minor eye disorders in practice.	2
12	CNS system: Insomnia, motion sickness, obesity and nicotine replacement therapy (NRT).	2
13	Drug Information sources for pharmacist.	2
14	An update in reclassification of OTC drugs.	2
15	Collective practice.	2

Reference text

Symptoms in Pharmacy: A guide to the management of common illness; Blenkinsopp A, Paxton P, (Eds); 6th edition,2008.

2027 -2026

Department of Pharmaceutical Chemistry

Title of the course: **Organic Pharmaceutical Chemistry - II**

Level: 4th Class, 1st Semester

Course number:413

Code: Phpch26_413-

Credit (hours/week): Theory (3) Laboratory (2) Units: 4

No.	Lesson Subject		Hours
1	Cholinergic agents	Cholinergic agents ,cholinergic receptors and their subtype	2
		Cholinergic agonists; stereochemistry and SAR; products; cholinesterase inhibitors	5
		Cholinergic blocking agents; SAR; solanaceous alkaloid and analogues; synthetic cholinergic blocking agents and products; ganglionic blocking agents) neuromuscular blocking agents.(	5
2	Adrenergic agents	Adrenergic agents (adrenergic neurotransmitters), adrenergic receptor; drugs affecting adrenergic neurotransmission; sympathomimetic agents, adrenergic receptor antagonists	9
3	CNS drugs	CNS depressant; benzodiazepines and related compounds; barbiturate; CNS depressant with skeletal muscle relaxant properties; antipsychotics; anticonvulsants	5
		CNS stimulants	2
4	Drugs affecting cardiovascular system	Drugs affecting the Renin Angiotensin pathway and calcium blockers, vasodilators.	5
5	Histamine and anti-histaminic agents	Structure–activity relationships at H ₁ receptors ;first-generation antihistamine classes ;second-generation antihistamines; recent antihistamine developments: the “dual-acting” antihistamines; histamine H ₂ antagonists: structural derivation of the “H ₂ antagonists”	7
6	NSAIDs	Cyclooxygenases; Therapeutic Classifications; SAR.	5
Total Hours			45

Reference:

1. Foye's Principles of Medicinal Chemistry Roche PhD (Author), S. William PhD Zito 7 th Edition PhD by Victoria PhD F., College of Pharmacy, Houston Uni, Texas, USA.
2. Wilson and Gisvolds textbook of organic medicinal and pharmaceutical chemistry, John M. B.; John H.B. (twelfth edition).
3. An Introduction to Medicinal Chemistry 7th Edition by Graham L. Patrick, University of the West of Scotland, UK

Objectives (Learning Outcome):

1. This course offers an in-depth exploration of the pharmaceutical chemistry and pharmacology of major drug classes that target key physiological systems. The curriculum focuses on the relationship between chemical structure and biological activity (SAR), the mechanism of action at specific receptors, and the therapeutic applications of these agents in treating various diseases.

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Department of Pharmaceutical Chemistry

Title of the course:

Practical of Organic Pharmaceutical Chemistry - II

Level: 4th Class, 1st Semester

Course number:413

Code: Phpch26 413-

No.	Lesson Subject	Hours
1	Preparation of salicylic acid.	2
2	Re-crystallization of salicylic acid.	2
3	Synthesis of aspirin.	2
4	Re-crystallization of aspirin.	2
5	Assay of aspirin (known sample).	2
6	Assay of aspirin (unknown sample).	2
7	Preparation of nitrobenzene.	2
8	Preparation of aniline.	2
9	Preparation of acetanilide.	2
10	Re-crystallization of acetanilide.	2
11	Chlorosulfonation of acetanilide.	2
12	Amination of <i>p</i> -chlorobenzene sulfonyl chloride.	2
13	Hydrolysis of <i>p</i> -chlorobenzene sulfonyl chloride to sulfanilamide.	2
14	Synthesis of paracetamol.	2

Reference(s):

- 1) Lab Handbook for Practical Organic Pharmaceutical Chemistry Adopted by the Department

Objectives (Learning Outcome):

- 1) **Perform synthesis of simple pharmaceutical compounds** (e.g., aspirin, acetanilide, paracetamol, nitrobenzene, aniline) using standard organic chemistry procedures.
- 2) **Apply purification techniques** such as recrystallization to isolate and purify synthesized products.
- 3) **Conduct assays of pharmaceutical compounds** (e.g., aspirin) and evaluate the quality, yield, and purity of products.
- 4) **Understand chemical transformations** such as nitration, reduction, sulfonation, amination, and hydrolysis in the context of drug synthesis.
- 5) **Strengthen documentation and reporting skills** by maintaining accurate lab records, calculating yields, and presenting results systematically.

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Department of Pharmacology and Toxicology

Title of the course: *Pharmacology- II*

Level: 4th Class, 1st Semester

Course number:414

Code: Phpht26_414-

Credit (hours/week): Theory (3) Laboratory (2) Units: 4

No.	Lecture title	Hours
1.	Introduction to CNS pharmacology	2
2.	CNS stimulants	2
3.	Anxiolytic and Hypnotic drugs	3
4.	General and Local Anesthetics	3
5.	Antidepressant drugs	3
6.	Antipsychotic (neuroleptic) drugs	2
7.	Opioid analgesics and antagonists	3
8.	Treatment of neurodegenerative diseases	3
9.	Antiepileptic Drugs	2
10.	Diuretics	2
11.	The treatment of heart failure (HF)	2
12.	Antiarrhythmic drugs	2
13.	Antianginal Drugs	2
14.	Antihypertensive drugs	3
15.	Drugs affecting the blood	3
16.	Antihyperlipidemic drugs	2
17.	Gastrointestinal and antiemetic drugs	3
18.	Drugs acting on the respiratory system	3

Reference text

Howland RD, Mycek MJ. Lipincotts Illustrated Reviews Pharmacology, 6th edition, 2013, Lippincott William and Wilkins, Philadelphia.

2027 -2026

Department of Pharmacology and Toxicology

Title of the course: *Practical Pharmacology- II*

Level: 4th Class, 1st Semester

Course number:414

Code: Phpht26 414-

No.	Lab. title	Hours
1.	Routs of drug administration	4
2.	Onset and duration of drugs (Barbiturates)	2
3.	Absorption and excretion of drugs	2
4.	Effect of parasympathomimetics on gland secretions	2
5.	Drugs and human eye.	4
6.	The effects of drugs on IOP rabbits	2
7.	Evaluation of opioid analgesics	2
8.	Evaluation of NSAIDs	4
9.	Evaluation of anti-parkinsonian drugs	2
10.	Evaluation of anti- convulsant drugs	2
11.	The effects of drugs and their antagonists on isolated rats ileum	2
12.	The effects of drugs and their antagonists on isolated rabbits ileum	2

Reference text

Laboratory Manual for Practical Pharmacology adopted by the department

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Department of Clinical Laboratory Sciences

Title of the course: *Public Health*

Level: 4th Class, 1st Semester

Course number:415

Code: Phcls26_415-

Credit (hours/week): Theory (2) Laboratory (0) Units: 2

No.	Lecture title	Hours
1.	Concepts and principles of public health and preventive medicine	1
2.	General items & ICD10	2
3.	Communicable diseases: Infections through the gastro-intestinal tract	2
4.	Infections through skin and mucous membranes	2
5.	Infections through the respiratory tract	1
6.	Arthropod-borne infections	2
7.	Non-communicable disease: Health in transition	2
8.	Nutritional disorders	1
9.	Family health, Family planning include maternal infections, vaccination	1
10.	Sexually transmitted diseases	1
11.	Introduction: a historic background of pharmacy practice	1
12.	Pharmacy practice and the health care system	3
13.	Health promotion in community pharmacy	1
14.	Introduction to pharmaceutical care	1
15.	Pharmaceutical care planning	2
16.	Community pharmacy management	1
17.	Hospital pharmacy service	1
18.	Biosafety in pharmacy practice	2
19.	Formulary management and regulatory affairs	2
20.	Rational use of drugs	2

Reference text

1-Lucas AO, Gilles HM, (Eds), Short Textbook of Public Health Medicine for the Tropic, 3rd edition, 2003.

2-Lilian M Azzopardi, Lecture Notes in Pharmacy Practice, 1st edition, 2010.

2027 -2026

Department of Clinical Pharmacy

Title of the course: *Communication Skills*

Level: 4th Class, 2nd Semester

Course number:426

Code: Phelp26_426-

Credit (hours/week): Theory (2) Laboratory (0) Units: 2

No.	Lecture title	Hours
1.	Patient-Centered Communication in Pharmacy Practice	2
2.	Principles and Elements of Interpersonal Communication	2
3.	Nonverbal type of communication	2
4.	Barriers to communication	2
5.	Listening and empathic responding during communication	2
6.	Assertiveness	2
7.	Interviewing and assessment	2
8.	Helping patients to manage therapeutic regimens	2
9.	Patient counseling; counseling check list; point-by-point discussion; counseling scenario	2
10.	Medication safety and communication skills	2
11.	Strategies to meet specific needs	2
12.	Communicating with children and elderly about medications	2
13.	Communication skills and inter-professional collaboration	2
14.	Electronic communication in healthcare	2
15.	Ethical behavior when communicating with patients	2

Reference text

1-Robert S. B., Carole L. K., William N. T.,Communication Skills in Pharmacy Practice, 5th edition,2007,Lippincott Williams & Wilkins.

2-Bruce A. B., Communication Skills for Pharmacists; American Pharmacists Association; 2nd edition, 2005.

2027 -2026

Department of Clinical Pharmacy

Title of the course: *Clinical Pharmacy - II*

Level: 4th Class, 2nd Semester

Course number:427

Code: Phelp26_427-

Credit (hours/week): Theory (2) Laboratory (2) Units: 3

No.	Lecture title	Hours
1.	Introduction to the concept of clinical pharmacy- its activities and professional responsibilities.(including current state of clinical pharmacy in Iraq)	1
2.	An overview of pharmaceutical care practice (the patient care process)	1
3.	Hematologic disorders: Anemia and sickle cell disease	2
4.	Hypertension	2
5.	Ischemic heart diseases	2
6.	Heart failure	2
7.	Peripheral vascular diseases	1
8.	- Asthma	2
9.	Chronic obstructive pulmonary disease (COPD)	1
10.	Diabetes mellitus & Diabetic ketoacidosis (DKA)	2
11.	Peptic ulcer disease	2
12.	Tuberculosis	1
13.	Infective meningitis	1
14.	Respiratory tract infections	2
15.	GIT infections	1
16.	Gout and hyperuricemia	1
17.	Rheumatoid arthritis (RA) and osteoarthritis (OA)	2
18.	Osteoporosis and other metabolic bone disease	1
19.	Infectious Endocarditis	1
20.	Surgical antibiotic prophylaxis	1
21.	Urinary tract infection (UTI)	1

Reference text

1- Roger Walker, Clive Edwards (eds), *Clinical Pharmacy and Therapeutics*, Churchill Livingstone, London, Latest edition.

2- Mary Anne koda-kimble (ed.), *Applied Therapeutics: The clinical use of drugs*, Walter Klumer, Latest edition.

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Department of Clinical Pharmacy

Title of the course: *Practical of Clinical Pharmacy - II*

Level: 4th Class, 2nd Semester

Course number:427

Code: Phclp26_427-

No.	Practice Title	Hours
1	Communication with physician and patient counseling	2
2	Drugs for anemia and related disorders	2
3	Cardiovascular drugs in practice part I: diuretics, β -blockers, ACE-inhibitors and Ag II receptor blockers	2
4	Cardiovascular drugs in practice part II: nitrates, Ca^{2+} -channel blockers, α -blockers, and anti-hyperlipidemic drugs	2
5	Drugs for asthma and COPD in practice	2
6	Antimicrobial drugs in practice part I: β -lactam antibiotics, tetracyclines and aminoglycosides	2
7	Antimicrobial drugs in practice part II: macrolides, sulphonamides, quinolones, and other miscellaneous antibiotics	2
8	Antimicrobial drugs in practice part III: antivirals and antifungals	2
9	Drugs for endocrine system part I (Diabetes Mellitus)	2
10	Drugs for endocrine system part II: thyroid disorders, corticosteroids, and hormones used in gynecological disorders	2
11	Drugs acting on CNS (antimigraine drugs, analgesics and antiemetics) and musculoskeletal disorders (NSAIDs and bisphosphonates)	2
12	Drugs for GI disorders: peptic ulcer disease and inflammatory bowel disorders	2
13	Drugs for ENT and skin disorders	2
14	Contraception	2
15	Collective practice	2

Reference text

Current edition of the British National Formulary (BNF)

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Department of Pharmacology and Toxicology

Title of the course: *General Toxicology*

Level: 4th Class, 2nd Semester

Course number:428

Code: Phpht26_428-

Credit (hours/week): Theory (2) Laboratory (2) Units: 3

No.	Lecture title	Hours
1.	Introduction: general consideration; host factor, environmental factors of toxic effects	3
2.	Carcinogenesis	2
3.	Target organs and systemic toxicology; Respiratory system, Liver, Kidney, Nervous system, cardiovascular system, Blood	12
4.	Toxic substances: Food additive and contaminants, Pesticides, Metals, Solvents	10
5.	Environmental toxicology: Air pollution, water and soil pollutants, Gases (Tear gas, Pepper spray), CO, Cyanide (H ₂ S).	2
6.	Mutagenesis.	1

Reference text

Klassen C.Casarett and Doulls, Toxicology, The Basic Science of Poisons, 8th edition 2013, McGraw-Hill.

2027 -2026

Department of Pharmacology and Toxicology
Title of the course: *Practical of General Toxicology*
Level: 4th Class, 2nd Semester
Course number:428
Code: Phpht26_428-

No.	Lab. Title	Hours
1.	General introduction to practical toxicology	2
2.	Acute toxicity study, determination of LD50	4
3.	Drug toxicity on liver	4
4.	Nicotine toxicity	4
5.	Pesticide toxicity	4
6.	Metal toxicity	4
7.	Blood toxicity	4
8.	Drug-induced toxicity	4

Reference text

Laboratory Manual for Practical General Toxicology adopted by the department.

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Department of Pharmaceutics

Title of the course: *Industrial Pharmacy –I*

Level: 4th Class, 2nd Semester

Course number:429

Code: Phind26_429-

Credit (hours/week): Theory (3) Laboratory (2) Units: 4

No.	Lecture title	Hours
1.	Principles of pharmaceutical processing; mixing; fluid mixing; flow characteristics; mechanisms of mixing; mixing equipments; batch and continuous mixing; mixer selection; solid mixing theory and particulate solid variables; forces and mechanisms	7
2.	Milling; pharmaceutical application; size measurement methods; theory and energy of comminution; types of mills; factors influencing milling; selection of mill techniques; specialized drying methods	7
3.	Drying: definition; purpose; humidity measurement; theory of drying; drying of solids, and classification of dryer; specialized drying methods	7
4.	Clarification and filtration: Theory; filter media; filter aids; selection of drying method; non-sterile and sterile operations; integrity testing; equipments and systems (commercial and laboratory)	7
5.	Sterilization; validation of methods; microbial death kinetics; methods of sterilization (thermal and non-thermal); mechanisms; evaluation	7
6.	Pharmaceutical dosage form design; pre-formulation; preliminary evaluation; bulk characterization; solubility and stability analysis	3
7.	Pharmaceutical dosage forms; sterile products; development; formulation; production; processing; quality control	7

Reference text

Leon Lachman et al.,The Theory and Practice of Industrial Pharmacy, 4th edition,2013 .

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Department of Pharmaceutics

Title of the course: *Practical of Industrial Pharmacy –I*

Level: 4th Class, 2nd Semester

Course number:429

Code: Phind26_429-

No.	Lab. title	Hours
1.	Introduction in industrial pharmacy and pre-formulation	2
2.	Effervescent granules: Preparation and characterization	4
3.	Flow properties and rheology of granules	4
4.	Tablet dosage form: Preparation and characterization	4
5.	Evaluation of tablets	4
6.	Preparation of children aspirin by wet granulation method	4
7.	Sustained release dosage forms: Preparation and characterization	4
8.	Coating techniques of tablets	4

Reference text

Laboratory Manual for Practical Pharmacology adopted by the department.

2027 -2026

Department of Pharmaceutical Chemistry

Title of the course: **Organic Pharmaceutical Chemistry- III**

Level: 4th Class, 2nd Semester

Course number:4210

Code: Phpch26_4210-

Credit (hours/week): Theory (3) Laboratory (2) Units: 4

No.	Lesson Subject		Hours
1	Anticancer agents	Antineoplastic agents :alkylating agents; antimetabolites; antibiotics; plants products ; miscellaneous compounds	15
		Hormones and related compounds; Future anti-neoplastic agents; Monoclonal antibodies; Gene therapy of cancer.	5
2	Antibacterials	β - lactam antibiotics(penicillins); β - lactamase inhibitors; cephalosporins and monobactams	9
		Aminoglycosides and chloramphenicol; tetracyclines; macrolides; Lincomycins and polypeptides	6
		Sulfonamide:chemistry, nomenclature, mechanism of action, resistance, toxicity, side effect, metabolism protein binding, distribution and SAR) products, sulfones	3
3	Antivirals	Agents Inhibiting Virus Attachment, Penetration, and Early; Agents Interfering with Viral Nucleic Acid Replication; HIV Protease Inhibitors; HIV Reverse Transcriptase Inhibitors; HIV Integrase Inhibitors; Investigational Antiviral Agents	5
4	Antifungals	Biochemical targets for antifungal chemotherapy; Polyene Membrane Disruptors; Ergosterol Biosynthesis Inhibitors; Inhibitors of Cell Wall Biosynthesis—Echinocandins; miscellaneous drugs.	2
	Total Hours		45

Reference(s):

1. Foye's Principles of Medicinal Chemistry Roche PhD (Author), S. William PhD Zito 7 th Edition PhD by Victoria PhD F. , College of Pharmacy, Houston Uni, Texas, USA.
2. Wilson and Gisvolds textbook of organic medicinal and pharmaceutical chemistry, John M. B.; John H.B. (twelfth edition).
3. An Introduction to Medicinal Chemistry 7th Edition by Graham L. Patrick, University of the West of Scotland, UK

Objectives (Learning Outcome):

- 1) This course covers the medicinal chemistry and pharmacology of chemotherapeutic drugs. It details the mechanisms of anticancer agents, from traditional antineoplastics to modern biotherapeutics.
- 2) The curriculum also provides an in-depth analysis of major antibacterial classes (including β -lactams and sulfonamides) and concludes with an overview of antiviral and antifungal agents.

2027 -2026

Department of Pharmaceutical Chemistry

Title of the course:

Practical of Organic Pharmaceutical Chemistry- III

Level: 4th Class, 2nd Semester

Course number:4210

Code: Phpch26 4210-

No.	Lesson Subject
1	Hydrolytic Degradation of Ceftriaxone and Detection of β -Lactam Ring Cleavage
2	Demonstration of Acidic Instability of Benzylpenicillin (PenicillinG)
3	Comparative Stability Study of Azithromycin and Erythromycin
4	Comparing the acid stability of Azithromycin and Erythromycin
5	Comparative In Vitro Evaluation of Oral Absorption Potential of Tetracycline Class Antibiotics
6	Demonstration of the Amphoteric Nature of Tetracyclines
7	Simulation of Tetracycline Inactivation by Calcium from Milk and Antacids
8	Effect of pH on the Solubility of Ciprofloxacin and its Clinical Relevance to Crystalluria
9	Demonstration of Metal Ion Chelation by Quinolones (e.g., Ciprofloxacin)

Reference(s):

- 1) Handbook for Practical Pharmaceutical Chemistry Adopted by the Department

Objectives (Learning Outcome):

- 1) To demonstrate the **chemical stability and degradation pathways** of key antibiotics (β -lactams, macrolides, tetracyclines, quinolones).
- 2) To link laboratory findings with **clinical relevance**, e.g., gastric instability of penicillins, reduced absorption due to food/metal interactions, risk of crystalluria with fluoroquinolones.
- 3) To illustrate how **physicochemical properties (pH, solubility, amphoteric nature, chelation)** influence drug absorption, bioavailability, and therapeutic efficacy.

For more details, please scan the QR code below:



2027 -2026

Department of Pharmacology and Toxicology

Title of the course: *Pharmacology- III*

Level: 4th Class, 2nd Semester

Course number:4211

Code: Phpht26_4211-

Credit (hours/week): Theory (2) Laboratory (0) Units: 2

No.	Lecture title	Hours
1.	Hormones of the pituitary and thyroid glands	3
2.	Insulin and oral hypoglycemic drugs	4
3.	Adreno-corticosteroids	3
4.	The gonadal hormones and inhibitors	3
5.	Autacoids and autacoid antagonists	3
6.	Non-steroidal anti-inflammatory drugs (NSAIDs) and other anti-inflammatory agents	3
7.	Drugs used in erectile dysfunction	2
8.	Drugs used in osteoporosis	2
9.	Drugs used in the management of obesity	2
10.	Cancer Chemotherapy: Anticancer drugs and immunosuppressants.	5

Reference text

Howland RD, Mycek MJ. Lippincotts Illustrated Reviews Pharmacology, 6th edition, 2013, Lippincott William and Wilkins, Philadelphia.

2027 -2026



Fifth Year

2027 -2026

Department of Clinical Pharmacy

Title of the course: *Applied Therapeutics - I*

Level: 5th Class, 1st Semester

Course number:511

Code: Phelp26_511-

Credit (hours/week): Theory (3) Laboratory (0) Units: 3

No.	Lecture title	Hours
1.	Interpretation of Lab. data.	2
2.	Acute coronary syndrome.	2
3.	Arrhythmias	2
4.	Thrombosis	2
5.	Dyslipidemia	1
6.	Stroke	1
7.	Shock	2
8.	Liver cirrhosis	2
9.	Viral hepatitis	1
10.	Inflammatory bowel diseases	2
11.	Acute renal failure (ARF)	1
12.	Chronic renal failure (CRF)	2
13.	Hemodialysis and peritoneal dialysis	1
14.	Systemic lupus erythematosus (SLE)	1
15.	Benign prostatic hyperplasia (BPH)	1
16.	Acid – base disorders	2
17.	Disorders of fluid and electrolytes	2
18.	Urinary incontinence and pediatric enuresis	1
19.	Epilepsy and status epilepticus	2
20.	Fungal infections	1
21.	Parkinson's disease	2
22.	Pain management	1
23.	Headache disorders	1
24.	Tobacco use and dependence	1
25.	Parasitic infections	1
26.	Viral diseases	1
27.	Parenteral nutrition	1
28.	Enteral nutrition	1
29.	Evidence-based pharmacy practice and medicine.	1
30.	Drug distribution systems	2
31.	Pharmacovigilance	2

Reference text:

1- Roger Walker, Clive Edwards (eds), Clinical Pharmacy and Therapeutics, Churchill Livingstone, London, 5th edition, 2011.

2- Barbara G. Wells & Joseph T. Diriro. Pharmacotherapy hand book, 8th edition, 2011.

2027 -2026

Department of Clinical Laboratory Sciences

Title of the course: *Clinical Chemistry*

Level: 5th Class, 1st Semester

Course number:512

Code: Phcls26_512-

Credit (hours/week): Theory (3) Laboratory (2) Units: 4

No.	Lesson Subject	Hours
1	Disorders of Carbohydrates metabolism, Hyperglycemia & Diabetes mellitus, Hypoglycemia	4
2	Disorders of lipid metabolism	3
3	Liver Function Tests	3
4	Kidney Function Tests	3
5	Diagnostic enzymology	3
6	Hypothalamus & pituitary endocrinology, adrenal gland	6
7	Reproductive system, disorders of gonadal function in males & females	6
8	Thyroid function tests	3
9	Drug interaction with laboratory Tests	3
10	Disorders of calcium metabolism	3
11	Tumor markers	2
12	Inborn errors of metabolism	6
	Total Hours	45

Reference(s):

- 1) Crook, Clinical Chemistry & Metabolic Medicine, 8th edition
- 2) Tietz Clinical chemistry & Molecular Diagnostics 6th edition; 2018
- 3) Kaplan, Clinical Chemistry, 5th edition

Objectives (Learning Outcome):

- 1) Understanding of human body chemistry in both healthy and diseased states, enabling to diagnose, monitor, and manage disease through laboratory data analysis.
- 2) Interpreting the results of biochemistry analyses that augment the clinical examination to achieve definite diagnosis of the disease.
- 3) Evaluating data accuracy, and applying this knowledge to therapeutic decision-making and patient care.

2027 -2026

Department of Clinical Laboratory Sciences
Title of the course: *Practical of Clinical Chemistry*
Level: 5th Class, 1st Semester
Course number:512
Code: Phcls26_512-

No.	Lesson Subject	Hours
1	Preparation of patient, Blood withdrawal ,Handling of sample	2
2	Blood Glucose measuring	2
3	Glucose Tolerance Test	2
4	Determination of Urea level	2
5	Creatinine Estimation	2
6	Lipid profile :TG	2
7	Total cholesterol	2
8	HDL-Cholesterol	2
9	AST estimation	2
10	ALT Estimation	2
11	ALP Estimation	2
12	ACP Estimation	2
13	Bilirubin estimation	2
14	Total protein	2
15	Plasma albumin	2
	Total Hours	30

Reference(s):

- 1) Tietz Clinical chemistry& Molecular Diagnostics 6th edition; 2018
- 2) Manual of clinical chemistry

Objectives (Learning Outcome):

- 1) Interpreting the results of biochemistry analyses that augment the clinical examination to achieve definite diagnosis of the disease.
- 2) Learning Technical skills in clinical laboratories :Collection & Handling of different specimens .

2027 -2026

Department of Clinical Pharmacy
Title of the course: *Hospital Training*

Level: 5th Class, 2nd Semester

Course number: 513

Code: Phelp26_513-

Credit (hours/week): Theory (0) Laboratory (4) Units:2

No.	Practice title	Hours
1.	Clinical Pharmacy Practice in Internal Medicine: Clinical observation of cases; evaluation of the case sheets; case presentation; discussion and evaluation	20
2.	Clinical Pharmacy Practice in Surgery wards: Clinical observation of cases; evaluation of the case sheets; case presentation; discussion and evaluation	10
3.	Clinical Pharmacy Practice in Gynecology and Obstetrics Ward: Clinical observation of cases; evaluation of the case sheets; case presentation; discussion and evaluation	10
4.	Clinical Pharmacy Practice in Pediatric Ward: Neurology , Cardiology , GIT , Birth defects , Sepsis , Meningitis	20

Reference text:

Manuals for Clinical Training adopted by the department.

2027 -2026

Department of Pharmacology and Toxicology

Title of the course: *Clinical Toxicology*

Level: 5th Class, 1st Semester

Course number:514

Code: Phpht26_514-

Credit (hours/week): Theory (2) Laboratory (2) Units: 3

No.	Lecture title	Hours
1.	Initial Evaluation and Management of the Poisoned Patient. Including pediatric poisoning and special consideration in the geriatric patient	3
2.	Drug Toxicity: Over the counter drugs; caffeine; theophylline; antihistamine and decongestant; non-steroidal anti-inflammatory drugs; vitamins	3
3.	Toxicity of Prescription Medications: Cardiovascular drugs; beta blockers; ACE inhibitors; Digoxin; Calcium channel blocker; Antiarrhythmic agents; hypoglycemic drugs; Opioids; CNS depressants; tricyclic antidepressants; anti-cholinergic phenothiazines; CNS stimulant	13
4.	Drug of Abuse: Opioids; Cocaine; phencyclidine; marijuana; Lysergic acid	4
5.	Chemical and Environmental Toxins: Hydrocarbones; Household toxins; Antiseptic; Disinfectants; Camphor; moth repellents	3
6.	Botanicals and plants-derived toxins: Herbal preparation; Toxic plants; Poisonous mushrooms	4

Reference text

1-Gossel TA, Bricker TD, (Eds.); Principles of Clinical Toxicology; 3rd edition,1994.

2-Viccellio P, (Ed.); Handbook of Medicinal Toxicology; 1st edition,1993.

2027 -2026

Department of Pharmacology and Toxicology
Title of the course: *Practical of Clinical Toxicology*
Level: 5th Class, 1st Semester
Course number:514
Code: Phpht26_514-

No.	Lab. Title	Hours
1.	Laboratory Principles or Toxicological Screening	2
2.	Over the counter drugs: Case on Acetaminophen poisoning; Salicylates; evaluation of urine salicylates	4
3.	Urine analysis of toxins and chemicals	4
4.	Cardiac glycosides toxicity: Digitalis	2
5.	Cases on toxicity with foods and dietary supplements	4
6	Identification of some common poisons in biological samples: Arsenic; cyanide; strychnine; Salicylates; Phenothiazine derivatives; barbiturates	6
6.	Evaluation of cases of toxicity with anti-Parkinsonian drugs	4
7.	Evaluation of drug toxicity on human	4

Reference text

- 1-Gossel TA, Bricker TD, (Eds.); Principles of Clinical Toxicology; 3rd edition,1994.
2-Viccellio P, (Ed.); Handbook of Medicinal Toxicology; 1st edition,1993.

2027 -2026

Department of Pharmaceutics

Title of the course: *Industrial Pharmacy -II*

Level: 5th Class, 1st Semester

Course number:515

Code: Phind26_515-

Credit (hours/week): Theory (3) Laboratory (2) Units: 4

No.	Lecture title	Hours
1.	Pharmaceutical dosage forms: Tablets; role in therapy; advantages and disadvantages; formulation; properties; evaluation; machines used in tableting; quality control; problems; granulation, and methods of production; excipients, and types of tablets	10
2.	Tablet coating; principles; properties; equipments; processing; types of coating (sugar and film); quality control, and problems	4
3.	Capsules: Hard gelatin capsules; materials; production; filling equipments; formulation; special techniques	3
4.	Soft gelatin capsules: Manufacturing methods; nature of capsule shell and content; processing and control; stability	2
5.	Micro-encapsulation; core and coating materials; stability; equipments and methodology	2
6.	Modified (sustained release) dosage forms; theory and concepts; evaluation and testing; formulation	3
7.	Liquids: Formulation; stability and equipments	3
8.	Suspensions: Theory; formulation and evaluation	3
9.	Emulsions: Theory and application; types; formulation; equipments and quality control	3
10.	Semisolids: Percutaneous absorption; formulation; types of bases (vehicles) preservation; processing and evaluation	3
11.	Suppositories: Rectal absorption; uses of suppositories; types of bases; manufacturing processes; problems and evaluation	3
12.	Pharmaceutical aerosols: Propellants; containers; formulation; types and selection of components; stability; manufacturing; quality control and testing	6

Reference text

Leon Lachman et al.,The Theory and Practice of Industrial Pharmacy, 4th edition,2013 .

2027 -2026

Department of Pharmaceutics

Title of the course:

Practical of Industrial Pharmacy -II

Level: 5th Class, 1st Semester

Course number:515

Code: Phind26_515-

No.	Lab. title	Hours
1.	Direct compression method for preparation of tablets	6
2.	Wet granulation method for preparation of tablets	6
3.	Dry granulation method for preparation of tablets	6
4.	Evaluation of tablets	4
5.	Capsules dosage form: Preparation and evaluation	4
6.	Parenteral dosage forms	4

Reference text

Laboratory Manual for Practical Pharmacology adopted by the department.

2027 -2026

Department of Pharmaceutical Chemistry

Title of the course: *Organic Pharmaceutical Chemistry-IV*

Level: 5th Class, 1st Semester

Course number:516

Code: Phpch26_516-

Credit (hours/week): Theory (2) Laboratory (0) Units: 2

No.	Lecture title	Hours
1.	Basic concept of prodrugs; Covalent bonds (cleavable); Prodrugs of functional groups; Types of prodrugs	6
2.	Chemical delivery systems; Polymeric prodrugs; Types and structure of polymers; Cross-linking reagents	6
3.	Drug targeting	4
4.	Project	4
5.	Combinatorial chemistry; Peptides and other linear structures; Drug like molecules; Support and linker; Solution-phase combinatorial chemistry	5
6.	Detection, purification and analgesics; Encoding combinatorial libraries; High-throughput screening; Virtual screening; Chemical diversity and library design	5

Reference text

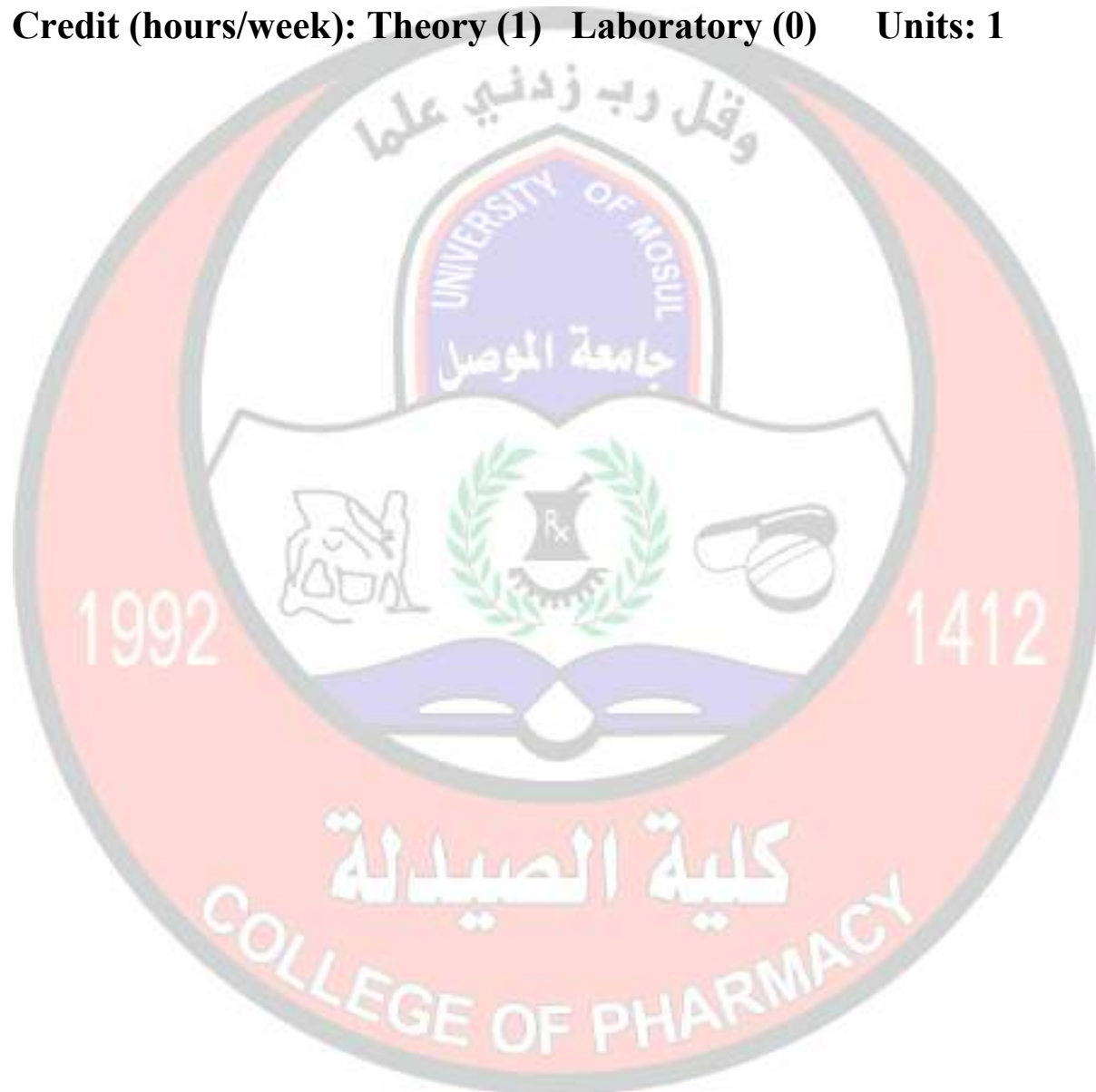
Wilson and Gisvold Textbook of Organic Medicinal and Pharmaceutical Chemistry;
Delgado JN, Remers WA, (Eds.); 12th edition,2010.

2027 -2026

Graduation Project

Level: 5th Class
Course number:517

Credit (hours/week): Theory (1) Laboratory (0) Units: 1



2027 -2026

Department of Pharmaceutical Chemistry

Title of the course: *Advanced Pharmaceutical Analyses*

Level: 5th Class, 2nd Semester

Course number:528

Code: Phpch26_528-

Credit (hours/week): Theory (3) Laboratory (2) Units: 4

No.	Lecture title	Hours
1.	UV / visible spectroscopy; Sample handling and instrumentation; Characteristic absorption of organic compounds; Rules for calculation of lambda max and application; Application of UV/visible; spectroscopy; Problems and solutions	6
2.	Infra Red spectroscopy (theory and H-bonding effect; Sampling techniques and interpretation of spectra; Characteristic group frequencies of organic compounds; Application of IR spectroscopy; Problems and solutions	14
3.	H ¹ –Nucleomagnetic Resonance (NMR) and C ¹³ -NMR spectroscopy; Introduction, the nature of NMR absorption, chemical shifts and factors affecting them, information obtained from NMR spectra, more complex spin-spin splitting patterns, application of H ¹ -NMR spectroscopy; C ¹³ -NMR spectroscopy: introduction and characteristics, DEPT C ¹³ -NMR spectroscopy	12
4.	Mass spectroscopy: Introduction and interpreting Mass spectra; interpreting Mass spectra fragmentation patterns, Mass behavior of some common functional groups.	11
4.	Elemental microanalysis CHNSO	2

Reference text

1. Silverstein, Basslerand Morrill,Spectrometric Identification of Organic Compound,8thedition,2014.
2. Dyer JR ,Applications of absorption spectroscopy of organic compounds,19thedition,1965.
3. McMurry; Thomason learning CA, USA; Organic Chemistry,8th edition,2011.

2027 -2026

Department of Pharmaceutical Chemistry

Title of the course:

Practical of Advanced Pharmaceutical Analyses

Level: 5th Class, 2nd Semester

Course number:528

Code: Phpch26_528-

No.	Lab. Title	Hours
1.	Introduction & demonstration to visible spectrophotometry	2
2.	Absorption spectra of known colored solution	2
3.	Absorption spectra of unknown colored solution	2
4.	Beer's law plot of known solution	2
5.	Beer's law plot of unknown solution	2
6.	Colorimetric assay of tetracycline (FeCl ₃), known sample	2
7.	Colorimetric assay of tetracycline (FeCl ₃), unknown sample	2
8.	Colorimetric assay of tetracycline (acid), known sample	2
9.	Colorimetric assay of tetracycline (acid), unknown sample	2
10.	Colorimetric assay of streptomycin (maltol, known sample)	2
11.	Colorimetric assay of streptomycin (maltol, unknown sample)	2
12.	Colorimetric assay of streptomycin (oxidized, known sample)	2
13.	Colorimetric assay of streptomycin (oxidized, unknown sample)	2
14.	Colorimetric assay of tetracycline (basic, known sample)	2
15.	Colorimetric assay of tetracycline (basic unknown sample)	2

Reference text

Lab. Handbook for Advanced Pharmaceutical Analyses adopted by the department.

2027 -2026

Department of Clinical Pharmacy

Title of the course: *Applied Therapeutics - II*

Level: 5th Class, 2nd Semester

Course number: 529

Code: Phclp26_529-

Credit (hours/week): Theory (2) Laboratory (0) Units:2

No.	Lecture title	Hours
1	Thyroid and parathyroid disorders	2
2	Contraception	1
3	Endometriosis	1
4	Menstruation related disorders	1
5	Hormonal replacement therapy (HRT)	1
6	Cancer treatment and chemotherapy	2
7	Leukemias	2
8	Lymphomas and Multiple myeloma	2
9	Breast and prostate cancers	2
10	Adverse effects of chemotherapy	1
11	Human immunodeficiency viruse	1
12	Adrenal gland disorders	1
13	Pituitary gland disorders	1
14	Alzheimer's disease	1
15	Schizophrenia	2
16	Depressive disorders	2
17	Anxiety disorders	1
18	Sleep disorders	1
19	Bipolar disorders	1
20	Gluacoma	1
21	HSCT(Hematop. Stem- cell- Transplantation).	1
22	Multiple seclerosis	1
23	Adverse drug reactions	1

Reference text

1-Roger Walker, Clive Edwards (eds), Clinical Pharmacy and Therapeutics, Churchill Livingstone, London,1st edition,2012.

2-Barbara G.Wells & Joseph T. Diriro, Pharmacotherapy hand book
8thedition,2011.

2027 -2026

Department of Pharmaceutics

Title of the course: *Drug Delivery Systems Design (Dosage Form Design)*

Level: 5th Class, 2nd Semester

Course number:5210

Code: Phind26_5210-

Credit (hours/week): Theory (2) Laboratory (0) Units: 2

No.	Lesson Subject	Hours
1-3	New Drug Development and Approval Process Introduction, Drug discovery and drug design, Biologic characterization, Early formulation studies, The investigational new drug application, The new drug application, supplemental, abbreviated, and other applications, international conference on Harmonization of technical Requirements for registration of pharmaceuticals for Human use. Chapter 2 (Pharmaceutical Dosage Forms and Drug Delivery Systems by Howard A. Ansel; 11th edition, 2017)	6
4-7	Pharmaceutical Nanotechnology and Nanomedicines Introduction, Applications of pharmaceutical nanotechnology, Polymer-drug conjugates, Dendrimers, Micelle systems, Solid nanoparticles, Liposomes, bilayer vesicles and lipid nanoparticles, Microcapsules and microspheres, Ongoing developments. Chapter 46 (Aulton's Pharmaceutics; The Design and Manufacture of Medicines; 6th edition, 2022)	7
7-9	Nasal Drug Delivery Introduction, Anatomy and physiology, Drug delivery, Nasal delivery systems Chapter 40 (Aulton's Pharmaceutics; The Design and Manufacture of Medicines; 6th edition, 2022)	4
9-11	Ocular Drug Delivery Introduction, Anatomy and physiology of the eye, Some common ocular conditions and pharmacological interventions, Topical ophthalmic preparations, Formulating ophthalmic preparations, Topical, liquid ophthalmic preparations, Barriers to topical ocular drug absorption, Increasing drug solubility and absorption in topical ophthalmic preparations, Sterility of ophthalmic preparations, Ocular drug pharmacokinetics. Targeting the posterior segment of the eye. Problems with traditional and new ocular drug delivery systems, Patient adherence and instillation of eye drops. Chapter 41(Aulton's Pharmaceutics; The Design and Manufacture of Medicines; 6th edition, 2022)	5
12-13	Transdermals and Transdermal Drug Delivery Systems	4

2027 -2026

	Introduction, Factors affecting percutaneous absorption, Percutaneous absorption enhancers, Percutaneous absorption models, Design features of transdermal drug delivery systems, Advantages and disadvantages of TDDSs, Examples of transdermal drug delivery systems, General clinical considerations in the use of transdermals and TDDSs, Patches (not systems), Tapes, Examples of transdermal preparations. Chapter 11 (Pharmaceutical Dosage Forms and Drug Delivery Systems by Howard A. Ansel; 11th edition, 2017)	
14-15	Pulmonary Drug Delivery Inhaled drug delivery, Formulating and delivering therapeutic inhalation aerosols, Methods of aerosol size analysis. Chapter 39 (Aulton's Pharmaceuticals; The Design and Manufacture of Medicines; 6th edition, 2022)	4
	Total Hours	30

Reference(s):

- 1) Aulton's Pharmaceuticals; The Design and Manufacture of Medicines; 6th edition, 2022.
- 2) Pharmaceutical Dosage forms and Drug Delivery Systems by Howard A. Ansel; 11th edition, 2017.

Objectives (Learning Outcome):

By the end of this course, students will be able to:

- 1) Explain the process of new drug development, including drug discovery, preclinical evaluation, early formulation studies, and regulatory submission of INDs, NDAs, and ICH guidelines.
- 2) Explore the principles and applications of pharmaceutical nanotechnology, including the design and use of liposomes, dendrimers, micelles, solid nanoparticles, and lipid-based delivery systems in modern therapeutics.
- 3) Describe the anatomical and physiological considerations for non-oral routes of drug delivery, including nasal, ocular, transdermal, and pulmonary routes.
- 4) Analyze formulation challenges and strategies for improving drug solubility, permeability, bioavailability, and patient adherence across various advanced delivery systems.
- 5) Evaluate the design, function, and clinical considerations of innovative delivery platforms such as patches, inhalers, eye drops, and nanoparticle-based systems.

2027 -2026

Department of Clinical Laboratory Sciences
Title of the course: *Clinical Laboratory Training*

Level: 5th Class, 1st Semester

Course number:5211

Code: Phcls26_5211-

Credit (hours/week): Theory (0) Laboratory (4) Units: 2

No.	Lecture title	Hours
1.	Diagnostic test basics, collecting & transporting specimens, venipuncture, urine specimen, stool specimen	4
2.	Biochemical tests: Fasting blood glucose, Post-prandial glucose, Oral glucose tolerance test	4
3.	Blood urea, Blood creatinine, Creatinine clearance, Uric acid	4
4.	Cholesterol, Lipoproteins, triglycerides	4
5.	Blood proteins, Bilirubin	4
6.	Calcium, Inorganic phosphate, Serum chloride	4
7.	Alkaline phosphatase, Acid phosphatase, Alanine aminotransferase, Aspartate aminotransferase, Lactate dehydrogenase, Creatine phosphokinase	4
8.	Serological tests: VDRL, ASO- Titer, Hepatitis tests	4
9.	C-reactive protein test, Rheumatic factor test, Rosebengal test, Typhoid fever test(Widal test), Pregnancy Test	4
10.	General urine examination, urine specimen collection	4
11.	Hematological tests: RBC count, Hb, PCV, RBC indices, WBC count, Platelets count	4
12.	Blood typing, Coombs test, Bleeding time, ESR	4
13.	Microbiological tests: culture and sensitivity tests, Staining methods	4
14.	Culture media, Enriched culture media for general use	4
15.	Tests for identification of bacteria, Disk diffusion tests of sensitivity to antibiotics, Choice of drugs for disk test, bacterial disease and their laboratory diagnosis	4

Reference text

Manual for Laboratory Training adopted by the department.

2027 -2026

Department of Clinical Pharmacy

Title of the course: *Pharmacoeconomic*

Level: 5th Class, 2nd Semester

Course number: 5212

Code: Phclp26_5212-

Credit (hours/week): Theory (2) Laboratory (0) Units:2

No.	Lecture title	Hours
1	Course overview & basic principle of pharmacoeconomics	2
2	Cost determination	6
3	Cost effectiveness analyses (CEA)	2
4	1st mid-term examination	2
5	Cost utility analyses (CUA)	2
6	Cost-benefit analysis (CBA)	2
7	Critical assessment of economic evaluation	4
8	2nd mid-term examination	2
9	Drug-focused versus disease-focused frame work for conducting pharmacoeconomic analyses	2
10	Introduction to epidemiology	2
11	Project presentation	2
12	Project presentation	2

References

1-Main Reference Text: Drummond MF, O'Brien B, Stoddart GL, Torrance GW. Methods for the economic evaluation of health care programmes. 3rd ed. Oxford: Oxford University Press, 2005.

2-Supplementary Reference text: Bootman JL, Townsend RJ, McGhan WF, (Eds.), Principles of Pharmacoeconomics, 2nd ed., Harvey Whitney Books Company, Cincinnati, Oh,1996.

2027 -2026

Department of Clinical Pharmacy

Title of the course: *Therapeutic Drug Monitoring (TDM)*

Level: 5th Class, 2nd Semester

Course number: 5213

Code: Phclp26_5213-

Credit (hours/week): Theory (2) Laboratory (2) Units:3

No.	Lecture title	Hours
1.	Review of basic pharmacokinetic (PK) and pharmacodynamic (PD)	2
2.	Clinical PK equations and calculations	3
3.	Clinical PK in special population and cases	3
4.	Clinical PK/PD for Aminoglycosides	2
5.	Clinical PK/PD for Vancomycin	2
6.	Clinical PK/PD for Digoxin	2
7.	Clinical PK/PD for Phenytoin	3
8.	Clinical PK/PD for other Anticonvulsants (e.g., Carbamazepine, Valproic Acid, Phenobarbitone/Primidone, Ethosuxsimide	3
9.	Clinical PK/PD for Theophylline	2
10.	Clinical PK/PD for Immunosuppressants (e.g., Cyclosporine, Tacrolimus	2
11.	Clinical PK/PD for other Cardiovascular agents (e.g., Lidocaine, Procainamide/N-Acetyl Procainamide	2
12.	Clinical PK/PD of other drugs (e.g., Lithium), Anticancer agents, and Anticoagulants	4

Reference text

1-Bauer LA (Ed.), Applied Clinical Pharmacokinetics. McGraw Hill, New York, 2008

2-Malcolm Rowland and Thomas Tozer, Clinical Pharmacokinetics Concepts and applications, 3rd edition, 1995.

2027 -2026

Department of Clinical Pharmacy

Title of the course:

Practical of Therapeutic Drug Monitoring (TDM)

Level: 5th Class, 2nd Semester

Course number: 5213

Code: Phclp26_5213-

No.	Lab. title	Hours
1	TDM practice in hospitals (overview of the process of requesting serum level monitoring, TDM request form, TDM lab facilities and instrument, TDM team and their own responsibilities	2
2	Problems in basic Pharmacokinetics (PK) and pharmacodynamic (PD)	2
3	Clinical PK equations and calculations	2
4	Clinical PK in special population and cases	2
5	Problems in Clinical PK for Aminoglycosides	2
6	Problems in Clinical PK for Vancomycin	2
7	Problems in Clinical PK for Digoxin	2
8	Problems in Clinical PK for Phenytoin	2
9	Problems in Clinical PK/PD for other Anticonvulsants (e.g., Carbamazepine, Valproic Acid, Phenobarbitone/Primidone, Ethosuxsimide)	4
10	Problems in Clinical PK for Theophylline	2
11	Problems in Clinical PK/PD for Immunosuppressants (e.g., Cyclosporine, Tacrolimus)	2
12	Problems in Clinical PK/PD for Cardiovascular agents (e.g., Lidocaine, Procainamide/N-Acetyl Procainamide)	2
13	Clinical PK/PD of other drugs (e.g., Lithium), Anticancer agents, and Anticoagulants	4

Reference text

1-Larry A. Bauer, Applied Clinical Pharmacokinetics, 2nd edition, 2008.

2- Malcolm Rowland and Thomas Tozer, Clinical Pharmacokinetics Concepts and

applications, 3rd edition, 1995 by;

3-Laboratory Manual for Practical Pharmacology adopted by the department.

2027 -2026

Department of Pharmaceutics

Title of the course: *Pharmaceutical Biotechnology*

Level: 5th Class, 2nd Semester

Course number:5214

Code: Phind26_5214-

Credit (hours/week): Theory (1) Laboratory (0) Units: 1

No.	Lecture title	Hours
1	Biotechnology - introduction	1
2	Formulation of biotechnology product (biopharmaceutical consideration) Microbial consideration- sterility-pyrogen viral decontamination Excipients of parenteral products - solubility enhancer- anti adsorption agents buffer components-preservatives – osmotic agents.	4
3	Route of administration Parenteral route Oral route Alternative routes (nasal-pulmonary-rectal-buccal transdermal) .	5
4	Pharmacokinetic of peptides and proteins , Elimination of proteins (proteolysis-excretion-metabolism)	5

Reference

Pharmaceutical biotechnology J.A. Crommelin, Robert D. Snyder