Republic of Yemen
Ministry of Higher Education &
Scientific Research
Al-Razi University
Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Program & Courses Specifications of

Bachelor of PHARMACY

2012- 2017

A- Program Specifications

I- Programme Title: Bachelor of Pharmacy

Departments affiliated to college of Medical sciences

- Department of Pharmacy
- Department of Laboratory Medicine
- Department of Applied Medical sciences

II. Program Vision

The vision of Bachelor of pharmacy program is to achieve excellence in innovative pharmacy education, scholarly research, service to society and the profession, and thus improve the healthcare of the rural Appalachian community and is aspired to be the department of choice in Yemen and the region for learners and scholars.

III. Program Mission

The mission of Bachelor of pharmacy program is to provide a comprehensive and progressive education that prepares pharmacists to assume an active role in providing skilled, ethical, and compassionate patient care that improves the health and quality of life of residents in Yemen. The department achieves its mission by maintaining a community of active and creative scholars devoted to the discovery, integration and dissemination of knowledge in the clinical and pharmaceutical sciences.

IV. Program Aims

1. To provide excellent education and professional development of pharmacy students
2. To equip of pharmacy graduate students with fundamental knowledge and skills to enhance career opportunities within the pharmaceutical or biotechnology industries, academic pharmaceutical research, or pharmaceutical regulatory organizations.
3. To develop intellectual and professional skills of use to graduates irrespective of their career choice after graduation.
4. To conduct and promote applied research and problem-oriented basic research as a vital element of pharmaceutical sciences

5. To motivate scholar development in order to maintain high quality teaching and training skills for both undergraduates and postgraduates
6. To encourage extracurricular activities that enhances faculty image and pride.
7. To encourage and support the development of appropriate pharmacist models for various practice setting
8. To foster interdisciplinary aspects between faculty of pharmacy and community development needs

V. Program Learning Outcomes

After completion of this program the graduate will be able to:-

1. PROGRAM INTENDED LEARNING OUTCOMES (PILOS)

A. Knowledge and Understanding

PILOs	Teaching& Learning Methods	Assessment Methods
a1. Explain the structural and functional units as well as the biological processes in human body and the factors influencing human health. يشرح الوحدات البنائية و الوظيفية و العمليات الحيوية في الجسم البشري و العوامل المؤثرة على صحة الإنسان	○ Lecture ○ Lecture-discussion (Tutorial) ○ Feed-back learning ○ Laboratory practice	○ Written exam ○ Attendance ○ Quizzes ○ Assignments ○ Practical activities assessment : ▪ Practical reporting ▪ Practical exam
a2. Describe the physicochemical properties & biological influences of matters (including chemicals, biochemical, drugs, dosage forms, products, poisons, etc.) used or encountered during practicing the pharmacy profession يوضح الخواص الفيزيائية و الكيميائية و التأثير البيولوجي للمواد (بما يشمل المواد الكيميائية و النباتية و الأدوية و المواد الكيميائية الحيوية و الأشكال الدوائية و المنتجات والسموم الخ) و المواد الأخرى ذات العلاقة بالعلوم الطبية و الصيدلانية.		
a3. Explain the scientific principles & concepts applied in various pharmacy practices. يشرح المبادئ و المفاهيم و النظريات العلمية المستخدمة في ممارسه الأعمال الصيدلانية		

a4. Describe the carrier missions, ethical responsibilities of pharmacists to patients and community while practicing various fields of pharmacy profession. يصف المهام الوظيفية للصيدلي و مسئولياته الأخلاقية و المهنية تجاه المرضى و المجتمع في مختلف مجالات مهنة الصيدلة	○ Lecture ○ Lecture-discussion (Tutorial) ○ Feed-back learning ○ Laboratory practice	○ Written exam ○ Attendance ○ Quizzes ○ Assignments ○ Practical activities assessment : ▪ Practical reporting ▪ Practical exam

B. Intellectual Skills

PILOs	Teaching& Learning Methods	Assessment Methods
b1▪ Interpret accurately data of medical prescriptions and results of pharmacy-related experiments & tests. يفسر بدقة بيانات الوصفة الطبية و نتائج التجارب و الاختبارات الصيدلانية	○ Lecture-discussion (Tutorial) ○ Feed-back learning ○ Laboratory practice ○ Field-training ○ Group activities	○Written exam ○Assignments ○Quizzes ○Practical Part assessment : ▪ Practical reporting ▪ Practical exam ○Field-training assessment ▪ Field Reporting ○Graduation activities assessment ▪ Research discussion
b2▪ Analyze efficiently drug information and other information various pharmacy- related information. يحلل بكفاءة المعلومات الدوائية و المعلومات الأخرى ذات العلاقة بمجالات العمل الصيدلاني		
b3▪ Integrate knowledge & skill to effectively perform missions of various pharmacy practices. يدمج المعرفة و المهارات لتنفيذ المهام المختلفة في مجالات العمل الصيدلاني		
b4▪ Evaluate different data and information encountered during practicing of pharmacy in order to make a critical judgment and proper selections. يقيم البيانات و المعلومات المختلفة و يتخذ على ضوء ذلك القرارات المناسبة		

C.Professional and Practical Skills

PILOs	Teaching& Learning Methods	Assessment Methods
c1. Operate and maintain the laboratory and manufacturing equipment and instruments and handle different materials safely and efficiently. يشغل ويحافظ على الأجهزة و المعدات الصيدلانية ويتعامل مع مختلف المواد المعملية بكفاءة و أمان	○ Laboratory practice ○ Group activities ○ Case study & Seminar ○ Graduation research project	○ Practical Part assessment ○ Field-training assessment ○ Assignments ○ Seminar assessment ○ Graduation research project assessment
c2. Execute effectively the practical , industrial and research activities related to profession safely according to standard quality procedures. ينفذ الأنشطة الصيدلانية العملية و البحثية و التصنيعية بكفاءة و أمان تبعا للإجراءات المعيارية للجودة	○ Laboratory practice ○ Group activities ○ Case study & Seminar ○ Graduation research project	○ Practical Part assessment ○ Field-training assessment ○ Assignments ○ Seminar assessment ○ Graduation research project assessment
c3. Perform the missions of marketing , administration and information providing as well as the patient-oriented missions effectively. يؤدي بكفاءة المهام الصيدلانية الإدارية و التسويقية وتقديم المعلومات الدوائية و مهام خدمة المرضى	○ Laboratory practice ○ Group activities ○ Case study & Seminar ○ Graduation research project	○ Practical Part assessment ○ Field-training assessment ○ Assignments ○ Seminar assessment ○ Graduation research project assessment
c4. Efficiently apply language and medical terms and utilize library and electronic technologies to search for information , to present thoughts and report works. يطبق بفعالية قواعد اللغة و المصطلحات الطبية ويستخدم المكتبة و التقنيات الإلكترونية في عرض الأفكار و كتابة التقارير و البحث عن المعلومات		

D. General & Transferable Skills

PILOS	Teaching& Learning Methods	Assessment Methods
d1. Participate effectively in teamwork activities. يشارك بفاعلية في أنشطة الفريق الواحد	○ Laboratory practice ○ Field training ○ Group activities ○ Case studies demonstrations ○ Graduation research project	○ Practical activities assessment ▪ Practical reporting ▪ Practical exam ▪ Lab. accomplishments ○ Field-training assessment ▪ Field attitude ▪ Field Reporting ▪ Field Tasks accomplishment ○ Assignments ○ Graduation Research project assessment ▪ Research attendance &attitude
d2. Demonstrate ethical conduct , discipline life respect and desire to serve community. يظهر الممارسة الأخلاقية و الانضباط و احترام الحياة والرغبة في خدمة المجتمع		
d3. Communicate efficiently with colleagues, supervisors, teachers, patients and members of healthcare team. يتواصل بفعالية مع زملائه و المشرفين عليه و المدرسين و المرضى و أعضاء الفريق الطبي	○ Laboratory practice ○ Field training ○ Group activities ○ Case studies demonstrations ○ Graduation research project	○ Practical activities assessment ▪ Practical reporting ▪ Practical exam ▪ Lab. accomplishments ○ Field-training assessment ▪ Field attitude ▪ Field Reporting ▪ Field Tasks accomplishment ○ Assignments ○ Graduation Research project assessment ▪ Research attendance &attitu
d4. Demonstrate respect to laws , regulations and profession ethics and demonstrate the skills of time management, self-learning and problem solving يظهر مهارات إدارة الوقت و التعلم الذاتي و حل المشكلاتويظهر احتراما للقوانين و الأنظمة و أخلاقيات المهنة		

VI. Program System

A. Programme duration B. The academic year C. The academic Semester	= 5 levels (5 years) (10 semesters) = 2 academic Semesters (32 weeks) = 16 weeks
D. Attendance	Obligatory for at least 75 % of lectures/practice sessions of each course
D. Programme structure :-	
Total number of courses	69
Total number of credit hours per 5 years	175 credit hours
No. of actual hours of training at Real-life fields	288 hours

VII. Study Plan

Level 1 / Semester I				
	First Semester	Credit Hours		
No	Course	Theory	Practical	Total
1.	General Biology	2	1	3
2.	Mathematics	2	-	2
3.	Arabic language	2	-	2
4.	English language I	2	-	2
5.	Introduction of Computer	1	2	3
6.	Islamic culture	2	-	2
7.	General chemistry	2	1	3
Total Credit Hours		13	4	**17**

Level 1 / Semester II				
No	Course	Credit Hours		
		Theory	Practical	Total
1.	English language II	2	-	2
2.	Biostatistics	2	-	2
3.	Biophysics	2	1	3
4.	Psychology	2	-	2
5.	Organic chemistry	2	1	3
6.	Introduction to Pharmacy profession	2	-	2
7.	Physical Pharmacy	2	1	3
Total Credit Hours		14	3	**17**

Level 2 / semester III				
No	Course	Credit Hours		
		Theor	Practical	Total
1.	Pharmaceutics I	2	1	3
2.	Pharmaceutical Organic chemistry I	2	1	3
3.	Anatomy of Human body	2	1	3
4.	Physiology I	2	-	2
5.	Public health	2	-	2
6.	Pharmaceutical analytical chemistry I	2	1	3
7.	Pharmaceutical calculation skills	2	-	2
Total Credit Hours		14	4	**18**

Level 2 / Semester IV				
No	Course	Credit Hours		
		Theory	Practical	Total
1.	Pharmaceutics II	2	1	3
2.	Physiology II	2	-	2
3.	Pharmaceutical analytical chemistry II	2	1	3
4.	Histology	1	1	2
5.	Pharmaceutical Organic chemistry II	2	1	3
6.	Botany	1	1	2
Total Credit Hours		10	5	**15**

Level 3 / Semester V				
No	**Course**	**Credit Hours**		
		Theory	**Practi**	**Total**
1.	Pharmaceutics III	2	1	3
2.	General Pharmacognosy I	2	1	3
3.	Pharmaceutical Organic chemistry III	2	1	3
4.	Biochemistry	2	1	3
5.	Pathology	2	-	2
6.	Pharmaceutical analytical chemistry III	2	1	3
7.	Pharmaceutical Microbiology I	2	1	3
Total Credit Hours		14	6	**20**

Level 3/ Semester VI				
No	**Course**	**Credit Hours**		
		Theory	**Practical**	**Total**
1.	Pharmaceutics IV	2	1	3
2.	Pharmacology I	2	1	3
3.	General Pharmacognosy II	2	1	3
4.	Pharmaceutical Biochemistry	2	1	3
5.	First aid	2	-	2
6.	Pharmaceutical Microbiology II	2	1	3
Total Credit Hours		12	4	**17**

Level 4 / Semester VII				
No	Course	Credit Hours		
		Theory	Practical	Total
1.	Pharmacology II	2	-	2
2.	Phytochemistry I	2	1	3
3.	Toxicology	2	1	3
4.	Medicinal chemistry I	2	1	3
5.	Pathophysiology	2	-	2
6.	Biotechnology	2	-	2
7.	Biopharmaceutics & Pharmacokinetics I	2	-	2
Total Credit Hours		14	3	**17**

Level 4 / Semester VIII				
No	Subject	Credit Hours		
		Theory	Practical	Total
1.	Clinical Chemistry	2	-	2
2.	Biopharmaceutics & pharmacokinetics II	2	-	2
3.	Pharmacology III	2	-	2
4.	Phytochemistry II	2	1	3
5.	Medicinal chemistry II	2	1	3
6.	Parasitology	2	1	3
Total credit hours		12	3	15

Level 5 / Semester IX				
No	**Course**	**Credit Hours**		
		Theory	**Practical**	**Total**
1.	Applied Pharmacognosy I	2	1	3
2.	Clinical pharmacy I	2	-	2
3.	Quality control	2	1	3
4.	Industrial pharmacy I	2	-	2
5.	Pharmacology IV	2	-	2
6.	Research methodology	2	-	2
7.	Hospital pharmacy	2	-	2
8.	Medicinal chemistry III	2	1	3
Total Credit Hours		16	3	19

Level 5 / Semester X				
No	**Course**	**Credit Hours**		
		Theory	**Practical**	**Total**
1.	Marketing	2	-	2
2.	Community pharmacy	2	-	2
3.	Medicinal Chemistry IV	2	1	3
4.	Applied Pharmacognosy II	2	1	3
5.	Clinical pharmacy II	2	-	2
6.	Industrial pharmacy II	2	-	2
7.	Professional Ethics & Regulation	2	-	2
8.	Graduation Research	-	4	4
Total Credit Hours		14	6	20

VIII. Programme Admission Requirements

The degree of Bachelor of Pharmaceutical Science will be recommended for students:-

1. Who have passed the secondary school (scientific department)
2. Who have fulfilled the requirements laid by Ministry of higher education and scientific research.
3. Have fulfilled the requirements laid by Al-Razi College for medical sciences.

IX. Assessment of students:

Assessment of the learning objectives will be carried out during as well as at the end of the course, through:

Course assessment

1- For courses involving only theoretical parts

- Assignments and Quizzes 20%
- Mid-term exam 20%
- Final Exam 60%

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Total 100 %

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2- For courses involving both theoretical and practical parts

A. Theoretical part

- Assignments 10%
- Mid-theory term exam 10%
- Final theory Exam 40%

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Total 60 %

B. Practical part

- Laboratory achievements (Experiments, reporting, etc.) 10 %
- Attitude 10%
- Final Practical Exam 20%

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Total 40 %

Graduation Research assessment

Each graduation research will be assessed by a committee of three member as follows

Items	**Weight**
The supervisor	70 %
Internal examiner : a member of the department teaching stuff.	15 %
external examiner : a qualified external examiner (either from other departments of the college or from another university)	15 %
Total	**100**

Assessment of the project by the supervisor	
Items	**Mark**
Attendance	35
Attitude and collaboration	35
Total	**70**

Assessment by the internal/External examiner	
Items	**Mark** [1]
Research methodology	5
Research writing	5
Presentation	2
Discussion	3
Total	**15**

[1]: The whole students team of the projects will be assessed as one unit

X. Grade classification:

Evaluation of successful students will be according to the following standards:

From 90% to 100% from total marks.	Excellent
From 80% to less than 90% from total marks.	Very Good
From 65% to less than 80% from total marks.	Good
From 50% to less than 65% from total marks.	Pass
Less than 50% from total marks.	Fail

XI. Regulations for Progression and Programme Completion

- For the students to be transferred from one academic year to the next, he is required to have successfully passed in all subjects in the final or in the complementary exams in October of the same year.
- However, the student may still be transferred if he has failed in not more than three subjects on of them elective. In such cases, students " carrying" subjects from one year to the next should re-sit for their "failed" subjects in their proper respective semesters.
- Final year students who have failed in October exam also, he has to re-sit for his exams in those subjects in their proper respective semesters thereafter as many times as necessary until he succeeds
  - **First Year/Level/Semester 1:** Automatically moved to second Semester
  - **First Year/Level/Semester 2:** Pass in all subjects or fail in not more than three subjects.
  - **Second Year/Level/Semester 1:** Automatically moved to second semester
  - **Second Year/Level/Semester 2:** Pass in all subjects or fail in not more than three subjects.
  - **Third Year/Level/Semester 1:** Pass in all subjects or fail in not more than three subjects.
  - **Third Year/Level/Semester 2:** Pass in all subjects or fail in not more than three subjects.
  - **Fourth Year/Level/Semester 1:** Automatically moved to second Semester
  - **Fourth Year/Level/Semester 2:** Pass in all subjects or fail in not more than three subjects.
  - **Fifth Year/Level/Semester 1:** Automatically moved to second Semester
  - **Fifth Year/Level/Semester 2:** Pass in all subjects

XII. Learning Media:

Learning aids are powerful communication tools for teaching. These are devices that can be presented in a visual and auditory format. Learning aids can be:

- Computer + Data show (for PowerPoint slides) or overhead projector
- Posters, and pictures
- Whiteboard or blackboard (plus chalk for blackboard or special whiteboard marker pens)

B- Course Syllabus

Republic of Yemen
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Al-Razi University

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Course Title: GENERAL BIOLOGY

level	Semester	Credit hours		
		Theory	Practical	Total
1	1	2	1	3

Theoretical Aspect:

Order	Units/ Topics List	Learning Outcomes	Sub Topics List	No. of Weeks	contact hours
1	**Scope of Biology**	a1, a2, b2	• Definitions and brief history of biology • Living organisms and Non-Living things • Chemical context of life • Common features of Life process . • Biological structures of living organisms: cell, tissue, organ, system. • Energy sources in living organisms	4	8
2	**The cell : the basic unit of life**	a3, a4, , b2	• Structure and components of the cell: cell membranes : types, Functions and properties, cytoplasm, Micro and macro molecules of cell • Function of enzymes &Chemical constituents of the protoplasm • basic process in the cell (respiration, nutrition, etc.) • life cycle of the cell • differences between animal and plant cell.	4	8
MID-TERM EXAM				1	2
3	**animal kingdom**	a1, b1	• classification of living organisms into kingdoms, genera and species. • Animal kingdoms classification : Genera and species; common features, diversity &reproduction. • Examples of common species of general of animal kingdoms and their anatomical features.	3	6
4	**Inheritance**	a6, b3	• Mendel Experiments and the Gene Idea • Molecular basis of inheritance : chromosome, DNA, genes	3	6
FINAL - EXAM				1	2
TOTAL				16	32

Practical Part

No.	Tasks/ Experiments	Number of Weeks
1.	Introduction to biology lab: safety, tools, instruments, scope of experiments and reporting assignments.	1
2.	Structure & components of the cells: using illustrative models	1
3.	Light microscope: sample preparations, operation	2
4.	Differentiation between animal and plant cells.	1
5.	Common species of animal genera: morphological and microscopical features	4
6.	Molecular basis of hereditary using illustrative models.	1
7.	Mendel experimentation of hereditary	1
PRACTICAL EXAM		**1**
Total		**12**

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Course Title: Mathematics

level	Semester	Credit hours		
		Theory	Practical	Total
1	1	2	-	2

Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Graphs and Gradients**	a1, b1, , c1,	• Rectangular Co-ordinates. Curve fitting using first-degree equation in both variables. • Determination of slope and intercept and point of intersection • Equation of first degree in both x and y (circle, ellipse, rectangular hyperbola etc. • Exponential and logarithmic curves, graphical solution of equation, graphical solution of • simultaneous equations • Arithmetic progression, geometric progression, permutation-combination, binomial theorem, exponential theorem • Application of curve fitting method in expressing degradation of drugs	6	12
MID-TERM EXAM				1	2
2	**Calculus**	a1, c1	• Rate process, rules of differentiation, successive and partial differentiation, differentiation of a function, relation between the derivatives of inverse functions • Rules of integration, integration as a summation, area under curve, integration by partial fraction, graphical integration, indefinite and definite integrals.	3	6
3	**Matrices**	a1, c1	• Addition. Subtraction and multiplication of matrices • unit matrix, row transformation, determinants, inverse of matrix and solution of equations by matrix	4	8
Course Review		a1, c1	Review of the course topics by discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				16	32

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Course Title: Arabic Language

level	Semester	Credit hours		
		Theory	Practical	Total
1	1	2	-	2

محتوى المقرر

الرقم	وحدات/ موضوعات المقرر	المواضيع التفصيلية	عدد الأسابيع	الساعات الفعلية	مخرجات تعلم المقرر
1	النحو	– الكلمة و أقسامها – الاسم أقسامه وعلاماته و اعرابه – الفعل أقسامه وعلاماته و اعرابه – الحرف أقسامه وعلاماته و اعرابه – صور ائتلاف الكلام – الاعراب	5	10	a1,a2, b1
2	الصرف	– مقدمة – الميزان الصرفي – المجرد و المزيد	2	2	a1,a2, b1
	اختبار نصف الفصل		1	2	a1,a2, b1
2	المعجم	–مقدمة في تعريف أهم معاجم اللغة العربية – دراسة معجم الصحاح – دراسة معجم العين	2	4	a1,a2, b1
3	النصوص	– دراسة أجزاء من خطبة الرسول (صلى الله عليه وسلم) في حجة الوداع – دراسة قصيدة كعب بن زهير (بانت سعاد) – نقد النص الأدبي – التعبير	5	10	a1,a2, b1
	اختبار نهاية الفصل		1	2	
	إجمالي الأسابيع والساعات		**16**	**32**	

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Course Title: English Language 1

level	Semester	Credit hours		
		Theory	Practical	Total
1	1	2	-	2

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	contact hours
1	**Basic English**	b1, c1, d1	• English letters : A to Z, capitals, small letters • Classification of words ○ Nouns ○ Articles ○ Pronouns ○ Quantity ○ Adjective ○ Adverbs ○ Prepositions • verbs : Be, have, do , Modal auxiliaries and related verbs	4	16
2	**The sentence**	b1, c1, d1	• Simple, compound, complex • Passive and causative • Questions, answers, negatives • Conditional sentences • Direct and indirect speech • The infinitive and the "ing" form	3	12
			MID-SEMESTER EXAM	1/2	2
3	**Tenses**	b1, c1, d1	• Past simple	1/2	2
			• Past perfect • Past continuous (progressive) • Present simple • Present perfect • Present continuous(progressive) • Future simple • Future perfect • Future continuous (progressive)	7	28
			Total	15	60
Number of Weeks /and Units Per Semester				**15**	**3**

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Course Title: Introduction of computer

level	Semester	Credit hours		
		Theory	Practical	Total
1	1	1	2	3

Course Content:

Theoretical and practical parts

1 hour theoretical followed by 2 hour practical ;Teaching is performed in the computer Lab.

Order	Units/Topics List	Sub Topics List	No. of Weeks	Contact hours	Learning Outcomes
1	Introduction	▪ Concepts of Computers ▪ Hardware and software; trends and technology	2	4	a1, b1
2	Introduction to disk-operating system	▪ DOS ▪ Windows (all version) ▪ Introduction to MS-Word ▪ MS-Excel with pictorial presentation ▪ MS-Access ▪ MS-Power point	6	12	a1, b1
3	Midterm exam		1	2	a1, b1
4	Multimedia	▪ Types & uses ▪ Computer aided teaching & testing.	2	4	a1, b1
5	Internet and e-mail	▪ Internet ▪ e-mail	2	4	a1, b1
7	Final exam		1	2	a1, b1
Number of Weeks /and Units Per Semester			**15**	**30**	

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Course Title: Islamic culture

level	Semester	Credit hours		
		Theory	Practical	Total
1	1	2	-	2

محتوى المقرر					
الرقم	**وحدات/ موضوعات المقرر**	**المواضيع التفصيلية**	**عدد الأسابيع**	**الساعات الفعلية**	**مخرجات تعلم المقرر**
1	الإسلام عقيدة و منهج حياه	– تعريفات و مفاهيم – أسس العقيدة الاسلامية – الاسلام منهج حياة	3	6	a1,a2, b1
2	الثقافة الإسلامية	– تعريفات و مفاهيم – الأهمية – أهم المصادر – مقارنة بالثقافات الأخرى	3	6	a1,a2, b1
	اختبار نصف الفصل		1	2	a1,a2, b1
2	الثقافة الإسلامية	–وعي المسلم و دوره للدفاع عن الاسلام	3	6	a1,a2, b1
3	قضايا معاصرة	رأي الاسلام في عدد من القضايا و المسائل الانسانية و العلمية و الثقافية	5	10	a1,a2, b1
	اختبار نهاية الفصل		1	2	
	إجمالي الأسابيع والساعات		**16**	**32**	

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Course Title: General Chemistry

level	Semester	Credit hours		
		Theory	Practical	Total
1	1	2	1	3

Course Content:

Theoretical Aspect:

Order	Units/ Topics List	Aligned Course Learning Outcomes	Sub Topics List	No. of Weeks	contact hours
1	**Introduction**	a1, b4	• chemistry (definition, brief history) • disciplines of chemistry : general, organic, inorganic, analytical, medicinal, physical, etc.) • importance and alications of chemistry in modern sciences.	1	2
2	**Chemical structures**	a2, b1, b2, b3, b6	• atoms , atomic structure • electronic configuration • molecules and molecular formula, • elements, periodic table of elements, • compounds (types) • chemical bonds (ionic, covalent, etc)	3	6
3	**Chemical properties**	a2, b2	• electronegativity, dipole moments, polar and non-polar molecules • acidity, basicity. (pH), ionization constant , pKa • buffer systems	2	4
MID-TERM EXAM				1	2
4	**Quantum in chemistry**	b2	• atomic weight, molecular weight, equivalent weight, milliequivalent, moles • molarity, molality, normality	2	4
5	**Chemical reactions and equilibrium**	a3, b7, c2	• chemical reactivity, inertness, energy change and heat of reaction • chemical equations balance • reactions catalysts • acid-base reactions, Redox reactions, addition reaction, elimination reactions, substitution reactions, decomposition reactions etc.	3	6
6	**Inorganic chemistry**	b4, c2	○ Comparison between inorganic and organic compounds. ○ Identification and reactions of common	3	6

			inorganic compounds • Cationic radicals • Anionic radicals		
Course Review and discussion session				1	2
FINAL - EXAM				1	2
TOTAL				16	32

Course Title: General Chemistry

Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Course Learning Outcomes
1.	Introduction to chemistry lab: safety, instruments, scope of experiments and reporting assignments. Chemical structures (atoms, molecules, bonds) using models	**1**	**2**	c1, c2 a2
2.	pH- meter principle and standard operation procedure: determination of pH of water, weak acids / bases determination of pH of strong acids/bases, salts	**1**	**2**	c1, c2, , d3, , d1, d2
3.	Preparation of buffers phosphate , citrate , acetate	**1**	**2**	c1, c2, , d3, , d1, d2
4.	Oxidation reactions using potassium permanganate & Decomposition reaction of sodium bicarbonate in water.	**1**	**2**	c1, c2, , d3, , d1, d2
5.	Acid/base reaction s e.g : HCl and NaOH	**1**	**2**	c1, c2, d3, , d1, d2
6.	Scheme Identification of cationic inorganic radicals	**3**	**6**	c1, c2, d3, , d1, d2
7.	Scheme Identification of anionic inorganic radicals	**3**	**6**	c1, c2, , d3, , d1, d2
PRACTICAL EXAM		**1**	**2**	a2, c1, c2,
Total		**12**	**24 equivalent to 12 credit hours**	

Republic of Yemen
Ministry of Higher Education &
Scientific Research
Al-Razi University
Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title: English language II

level	Semester	Credit hours		
		Theory	Practical	Total
1	2	2	-	2

Course Content:

Order	Units/Topics List	Sub Topics List	No. of Weeks	Contact hours	Learning Outcomes
1	Introduction	▪ Origin of medical terms ▪ Parts of a medical term: prefix, suffix, root ▪	1	2	a1, b1, c1, d1
2	Prefixes	▪ Prefixes related adjectives e.g. numeric (e.g.mono) , size" large and small" (e.g. micro, macro) , dimension "short (e.g. brachy) , speed" slow, fast (e.g. brady, tachy), location (intra, exter, per, ante, post) increased and decreased (e.g. hypo, hyper , mal, olig, a, an), different (e.g. dis, pseud, meta,) , colors (e.g. leuco, erytho) ▪	3	6	a1, b1, c1, d1
3	Suffixes	▪ Suffixes related to science (e.g. -logy, -logist), tests (-scope, -scopy, ----- ▪ -graph, -graphy, , measurement (e.g. -meter), case (-ia, -iasis, -osis,), diseases (e.g.- pathy, -oma, -neoplsm), operations(e.g. –ectomy)	3	6	a1, b1, c1, d1

	Midterm exam		1	2	a1, b1, c1, d1
4	Roots of terms	▪ Roots related to body : ○ cells (e.g. cyte, cyto) tissues(hist) , organs (vaso, card) ○ systems and organs ○ pjysio, patho,	5	a1, b1, c1, d4	a1, b1, c1, d1
		▪ chemical names (glyc, hydr, chlor, proteo), sciences Multi-roots terms e.g. hyperglycemia	1		a1, b1, c1, d1
5	No suffix or prefix terms	▪ Terms without suffix e.g. erythrocytes ▪ Terms without prefix e.g. cardiology	1		a1, b1, c1, d1
6	Final exam		1	3	a1, b1, c1, d1
Number of Weeks /and Units Per Semester			**16**	**32**	

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title: Biostatistics

level	Semester	Credit hours		
		Theory	Practical	Total
1	2	2	-	2

Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction**	a1, b1, c1	definition and significant of statistics, types of data: data, parametric data, nominal data , categorization of data, presentation of data	1	2
2	**Descriptive statistics**	a1, b1, c1	Mean, mode, median, standard deviation, variance, standard error, coefficient of variation.	4	8
3	**Distribution of data**	a1, b1, c1	Types: normal, abnormal; interpretation, solving problems	1	2
4	**Sampling**	a1, b1, c1	definition of population, samples, methods of sampling, with solving problems	1	2
MID-TERM EXAM				1	2
5	**95 % confidence Interval**	a1, b1, c1	Definition, significance, applications, solving problems	1	2
6	**Correlation statistics**	a1, b1, c1	• Types of correlation • Linear regression • Pearson correlation • Spearman rank correlation • Other methods • solving problems	1	2
7	**Comparative statistics: testing of variations**	a1, b1, c1	• Hypothesis • F-test : P-value , significance of differences in variances between two sets of data, , with solving problems	4	8

			• Student-t test : P-value, significance of differences in means between two sets of data , one-sided test, two-sided test, assuming equal variance, assuming unequal variance, with solving problems • ANOVA : P-value, significance of differences in variances between more than two sets of data , single-factor test, two-factors with replication test, two-factors without replication test • Chi-square test : compare the differences in categorized data. • solving problems		
7	**Introduction to Computer programs in statistics**	a1, b1, c1	• SPSS • Microsoft excel • others	1	4
Course Review		a1, b2, b3, b4, c1,c2	Review of the course topics by discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	3 Units

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title: Biophysics

level	Semester	Credit hours		
		Theory	Practical	Total
1	2	2	1	3

Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction to physics**	a1, b1	• Definition, brief history; relation & applications of physics to modern sciences especially medical sciences	1	2
2	**Kinematics and Newtonian`s laws**	a1, b1, b2	• definition, parameters, Newtonian`s law of motion, factors affecting including force, gravity, mass, etc. • Applications in medical/pharmaceutical sciences. • Exercise Problems	2	4
3	**Work and Energy**	a1, b1, b2	• Definitions • differences between energy, work and Power& Laws governing • Forms and sources of energy (electric, optical, chemical, thermal, etc.) • Applications in medical/pharmaceutical sciences.	3	8
MID-TERM EXAM				1	2
4	**Pressure**	a1, b1, b2	• Definitions, types • Applications in medical/pharmaceutical sciences. • Exercise Problems	1	
5	**Electricity**	a1, b1, b2	• definition, brief history • electromagnetic field electrical resistance, potential and current • generation techniques • Applications in medical/pharmaceutical	3	6

			sciences. • Exercise Problems		
6	**Optical physics**	a1, b1, b2	• photons, light waves, wave length, wave number, frequency. • Light spectrum (visible, UV, IR, ..,etc.), light absorbance, light refraction, light scattering • Applications in medical/pharmaceutical sciences. • Exercise Problems	2	4
7	**Sonic (sound) physics**	a1, b1, b2	• Sonic waves • ultrasonic waves • Echo • Applications in medical/pharmaceutical sciences. • Exercise Problems	1	2
Course Review		a1, b1, b2	Review of the course topics by discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	7 Units

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
1.	**Introduction to Physics lab: safety, tools, instruments, scope of experiments and reporting assignments.**	**1**	**2**	c1, c2, d1, d2, d3
2.	**Determination of gravity acceleration**	**1**	**2**	c1, c2, d1, d2, d3
3.	**Determination of different forms of Forces**	**2**	**2**	c1, c2, d1, d2, d3
4.	**Determination of Energy**	**2**	**2**	c1, c2, d1, d2, d3
5.	**Determination of Pressure**	**1**	**2**	c1, c2, d1, d2, d3
6.	**measuring of electric current and voltage with different electricity sources.**	**2**	**2**	c1, c2, d1, d2, d3
7.	**Light spectrum (Prism)**	**1**	**2**	c1, c2, d1, d2, d3
8.	**Review**	**1**	**2**	c1, c2, d1, d2, d3
PRACTICAL EXAM		**1**	**2**	c1, c2, d1, d2
Total		**12**	**24 equivalent to 12 credit hours**	
Number of Weeks			**12**	

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title: Psychology

level	Semester	Credit hours		
		Theory	Practical	Total
1	2	2	-	2

Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction to psychology**	a1	• Definition, historical progress • Purposes of psychology • schools of psychology.	2	2
2	**Human needs and drives**	a3	• Basic human needs and biological or primary drives, Secondary social and psychological drives.	2	2
3	**Psychology concepts**	a2	• Mental ability , Motor skills, motives • Sensation , Conceit , emotion	2	2
MID-TERM EXAM				1	1
4	**Personality**	a4,, b2, b3, b4, d2	• Definition and dimensional types • Growth and environment factors • Relationship between achievement of development stages goals and basic structure of personality. • Types of personalities • Methods of assessment • Dealing and communication with various types of personalities • Differences between psychopathic and normal persons.	4	4
5	**Medical psychology**	b1, d2	• Fear, anxiety and depression associated with Illness. • Emotional needs of ill persons • Psychological health and behavioral Medicine. • Psychiatry	3	3
Course Review		a1, a2, a3, a4,, b2, b3, b4, d2	Review of the course topics by discussion session.	1	1
FINAL - EXAM				1	2
TOTAL				16	19

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title: Organic Chemistry

level	Semester	Credit hours		
		Theory	Practical	Total
1	2	2	1	3

Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	Aligned Course Learning Outcomes	Sub Topics List	No. of Weeks	contact hours
1	**Introduction to organic chemistry**	a1, a2	• definition, brief history • significance of organic chemistry in modern sciences • Carbon chemistry: carbon atomic structure, chemical bonds, atomic Orbitals and electron configuration; sp^3, sp^2, sphybridization • Physical state • stereochemistryof organic compounds • isomerism • Resonance • dipole moment • structural theory • Models of Structural formula (all-stick formula, dot formula, dash formula, condensed formula, bond-line formula	4	16
2	**Functional groups & Classification of organic compounds**	a1, a2, b1, b2, b3, b4	• Definition and types of functional groups • classification into categories based on functional groups. • Role of functional group in physical & chemical properties of organic compounds. • Cod1on names Origin • IUPAC Nomenclature priority (which functional group is more important ?) • Differences between aliphatic & aromatic organic compounds	4	8
3	**Hydrocarbons**	a1, a2, b1, b2, b3, b4	**(1) Aliphatic (Alkanes, Alkenes, Alkynes, cycloalkanes, cycloalkenes)**: definitions, general formula, nomenclature, influence	3	6

			of functional group on physical and chemical properties, radical groups nomenclature, synthesis and reactions (including mechanisms of reactions). **(2) Aromatic hydrocarbon** (definitions, types, general formula, structural models, nomenclature, influence of functional group on physical and chemical properties, radical groups nomenclature, , synthesis and reactions (including mechanisms of reactions).		
4	**Haloalkanes**	a1, a2, b1, b2, b3, b4	• **Aliphatic and aromatic Alkyl halides (Haloalkanes)** and organometallic compounds: (definitions, types, general formula, nomenclature, influence of functional group on physical and chemical properties, radical groups nomenclature, physical properties, synthesis and reactions (including mechanisms of reactions).	3	6
Course Review and discussion session				1	2
FINAL - EXAM				1	2
TOTAL				16	32

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Course Learning Outcomes
1.	Physical properties & Chemical identification of compounds belonging to the following aliphatic and aromatic organic groups:			
2.	**Aliphatic alkanes**	**2**	**4**	b1, b4, c1, c2, d1, d2, d3
3.	**Aromatic alkanes**	**2**	**4**	b1, b4, c1, c2, d1, d2, d3
4.	**Aliphatic Alkenes**	**2**	**4**	b1, b4, c1, c2, d1, d2, d3
5.	**Aromatic alkenes**	**2**	**4**	b1, b4, c1, c2, d1, d2, d3
6.	**Aliphatic akenes**	**2**	**4**	b1, b4, c1, c2, d1, d2, d3
7.	**alkynes**	**2**	**4**	b1, b4, c1, c2, d1, d2, d3
PRACTICAL EXAM		**1**	**2**	b1, b4, c1, c2, d1, d2, d3
Total		**13**	**28 equivalent to 14 credit hours**	

Republic of Yemen
Ministry of Higher Education & Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title: Introduction to Pharmacy profession

level	Semester	Credit hours		
		Theory	Practical	Total
1	2	2	-	2

IV. Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Pharmacy and pharmacists**	a1, a2, d2	• definitions (pharmacy, pharmacist, drugs, medications, drug products) • pharmacy motto • Pharmacy profession missions • foundations of pharmacy (world , Asian, Arabic and Yemeni) • Relation of pharmacists with other health care professionals.	2	4
2	**Current pharmacy practices**	a4, a2	• Pharmacy career opportunities (academic, industrial, researcher , developer, hospital, clinical and community pharmacists)	2	4
3	**Education of pharmacy**	a2	• basic pharmacy sciences • academic Baccalaureate programs, higher programs.	1	2
4	**Pharmacists as drug experts**	b1, a1	• drugs benefits • drugs risks • Role of pharmacists as drug experts • sources of information (primary, secondary, tertiary).	1	2
MID-TERM EXAM				1	2
5	**History of pharmacy**	a1	History of pharmacy in : ○ in Sumerian, ○ Egyptian ○ Chinese, Indian, ○ Roman, Greek ○ Arabic and Islamic ○ Western civilization	5	10
6	**Future aspects of pharmacy**	a2, a3	• factors influencing future of pharmacy • current development of pharmacy profession • newer pharmacy disciplines e.g. Complementary and alternative therapy, gene therapy and radiopharmacy	2	4

Course Review	a1, a2, a3, a4, b1, c1, d1, d2	Review of the course topics by discussion session	1	2
FINAL - EXAM			1	2
TOTAL			16	32
Number of Weeks /and Units Per Semester			16	6 units

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Introduction to Pharmacy profession

level	Semester	Credit hours		
		Theory	Practical	Total
1	2	2	-	2

Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Pharmacy and pharmacists**	a1, a2, d2	• definitions (pharmacy, pharmacist, drugs, medications, drug products) • pharmacy motto • Pharmacy profession missions • foundations of pharmacy (world , Asian, Arabic and Yemeni) • Relation of pharmacists with other health care professionals.	2	4
2	**Current pharmacy practices**	a4, a2	• Pharmacy career opportunities (academic, industrial, researcher , developer, hospital, clinical and community pharmacists)	2	4
3	**Education of pharmacy**	a2	• basic pharmacy sciences • academic Baccalaureate programs, higher programs.	1	2
4	**Pharmacists as drug experts**	b1, a1	• drugs benefits • drugs risks • Role of pharmacists as drug experts • sources of information (primary, secondary, tertiary).	1	2
MID-TERM EXAM				1	2
5	**History of pharmacy**	a1	History of pharmacy in : ○ in Sumerian, ○ Egyptian ○ Chinese, Indian, ○ Roman, Greek ○ Arabic and Islamic ○ Western civilization	5	10

6	**Future aspects of pharmacy**	a2, a3	• factors influencing future of pharmacy • current development of pharmacy profession • newer pharmacy disciplines e.g. Complementary and alternative therapy, gene therapy and radiopharmacy	2	4
Course Review			Review of the course topics by discussion session	1	2
FINAL - EXAM				1	2
TOTAL				16	32

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Physical pharmacy

level	Semester	Credit hours		
		Theory	Practical	Total
1	2	2	1	3

Course Content:

A – Theoretical Aspect:

(Definition, types, principle, mathematical expression, measurement (Analysis), factors affecting and pharmaceutical applications of physical properties/phenomena)

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction to physical pharmacy**	a1,	• **Scope and purposes** of physical pharmacy • **State of matters :** factors affecting (intermolecular forces, vapor pressure, atmospheric pressure, thermal energy) • **Circle of inter-conversion** of a matter from a state of state ; name of processes, internal and external factors	1	2
2	**Physical properties of solid state**	a1, b1	• **Melting point** • **Micrometrics** ○ Particle size, particle shape ○ Arrangement of particles: Crystals, amorphous, polymorphism, solvate (hydrates) ○ Crystallization : principles and applications ○ Tapped and bulk density and porosity ○ Flowability : Carr`s index& angle of repose • **Surface Energy &wettability.**	3	6
3	**liquid states physical properties**	a1, b1	• **Thermodynamic liquids:**Evaporation, boiling, vaporization and volatilization • **Vapour pressure** • **Viscosity** • **Surface phenomena:**Surface tension, interfacial tension	3	6
MID-TERM EXAM				1	2

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	AlignedCourse Intended Learning Outcomes PILOs
1.	**Melting point determination by capillary method**	**1**	**2**	**c1, c2, d1, d2**
2.	**Particle size analysis (sieve and sedimentation method)**	**1**	**2**	**c1, c2, d1, d2**
3.	**Crystallization : preparation of salicylic acid crystals**	**1**	**2**	**c1, c2, d1, d2**
4.	**Tapped and bulk density porosity and Carr`s index of flowability description ..**	**1**	**2**	**c1, c2, d1, d2, d3**
5.	**Viscosity determination (Ostwald tube)**	**1**	**2**	**c1, c2, d1, d2, d3**
6.	**Surface tension determination (Capillary or Drop weight method)**	**1**	**2**	**c1, c2, d1, d2, d3**
7.	**Critical micelles concentration (CMC)determination**	**1**	**2**	**c1, c2, d1, d2, d3**
8.	**Partition coefficient determination (salicylic acid between water & ether)**	**1**	**2**	**c1, c2, d1, d2, d3**
9.	**Review**	**1**	**2**	**c1, c2, d1, d2, d3**
PRACTICAL EXAM		**1**	**2**	**c1, c2, d1, d2**
Total		**10**	**20**	

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : pharmaceutics I

level	Semester	Credit hours		
		Theory	Practical	Total
2	3	2	1	3

Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction To pharmaceutics**	a1, a2, a4, b1, b2	Definitions and brief history of pharmaceutics, pharmacopeia, Definition of dosage form, the components, the need to dosage forms, classification of dosage forms	1	2
2	**Pharmaceutical excipients**	a1, a2, a4	Roles, types with examples • **Essential:** solvents, vehicles, emulsifying agents, binders, etc. • **Organoleptic** excipients: colorants, sweeteners, flavors • **Stabilizers:** buffers, preservatives, antioxidants, anti-cake, etc. • **Bioavailability enhancers** • **Excipients for other purposes**	1	2
3	**Design of dosage form: Preformulation, Formulation and development**	a1, a2, a3, a4, b3	• **Preformulation stage:**physicochemical properties and analytical data required. Scheme of preformulation, Compatibility testing. • **Formulation:** general rules, sources of raw materials, economic impact • **Development**stage	2	4
4	**Old pharmaceutical dosage forms**	a1, a2, a3, a4, b3	Definition; disadvantages of Galenicals, lozenges, cachets, pills, etc.	1	2
5	**Introduction to Non-sterile Pharmaceutical solutions**	a1, a2, a3, a4, , a6, b1, b2, b3	Definition of solutions, types, advantages, disadvantages, general method of preparation, enhancement of dissolution, excipients, types of waters	1	2

6	**Aqueous Pharmaceutical solutions (1)**		Definition, General characters, advantages, disadvantages, method of preparation, formulations and excipients with examples of **Topical** : (aqueous Tinctures, Douches/washes, Enema, mouthwashes/gargle, nasal solutions, oticaqueous solutions)	1	2
Mid-term exam				1	2
6	**Aqueous Pharmaceutical solutions (2)**	a1, a2, a3, a4, , a6, b1, b2, b3	Definition, General characters, advantages, disadvantages, method of preparation, formulations and excipients with examples of **Oral :** Syrups, linctuses,Elixirs, other oral solutions.	2	4
7	**Non-Aqueous Pharmaceutical solutions**	a1, a2, a3, a4, , a6, b1, b2, b3	Definition, General characters, advantages, disadvantages, method of preparation, formulations and excipients with examples of **Topical :**Alcoholic Tinctures, Collodions, liniments, Glycerites **Oral:** oleovitamins	1	2
8	**Non-sterile liquid Dispersion systems (1): Suspensions**	a1, a2, a3, a4, , a6, b1, b2, b3	• **Introduction** Definition, types: coarse dispersion, fine dispersion; compare disperse system and true solution ; compare colloids, suspensions, emulsions; general advantages and problems of disperse systems • **Coarse dispersions** ➢ **Suspensions** ○ Definition, types, advantages , disadvantages, ideal properties ○ Formulation: (flocculated, deflocculated) , excipients (suspending agents, flocculating agents; others) ○ Steps of preparation ○ Instability Problems : sedimentation; cake formation; evaluation and approaches to reduce ○ Packaging	2	4

8	**Non-sterile liquid Dispersion systems (2): Emulsions**		➢ **Emulsions** ○ Definition, types, advantages, disadvantages ○ Formulation: excipients (Emulsifying agents; types and selection; HLB) ○ Methods of preparation: wet method, dry ○ method, bottle method ○ Self-emulsified emulsions ○ Instability problems: coalescence, braking, creaming, phase inversion; causes and how to reduce • **Fine dispersions** Definition, types, advantages, disadvantages, principles and method of preparations ➢ **Colloidal suspensions** • **Microemulsions and nanoemulsion:**	2	4
Course Review		a3, a4, , b1, b2, b3,	Review of the course topics by discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				16	32

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
Aqueous solutions				
1.	**Iodine tincture**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
2.	**Vaginal douches (sodium borate solution)**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
3.	**simple syrup(BP; USP)**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
4.	**Peppermint aromatic water**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
5.	**Oral rehydration solution**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
6.	**Preparation of elixir (paracetamol elixir)**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
Non-aqueous solutions				
7.	**Flexible collodions**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
8.	**camphor liniment**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
9.	**Boric acid glycerite**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
Liquid disperse systems				
10.	**calamine lotion (suspension)**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
11.	**emulsions (castor oil emulsion)**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
PRACTICAL EXAM		**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
Total		**11**	**22 equivalent to 12 credit hours**	

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Pharmaceutical Organic chemistry I

level	Semester	Credit hours		
		Theory	Practical	Total
2	3	2	1	3

Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	Aligned Course Learning Outcomes	Sub Topics List	No. of Weeks	contact hours
1	**Aliphatic and aromatic Alcohols , ethers and thioethers**	a1, a2, b1, b2, b3, b4	• (definitions, types, general formula, nomenclature, influence of functional group on physical and chemical properties, radical groups nomenclature, synthesisreactions (including mechanisms of reactions).	3	6
2	**Aliphatic and aromatic Amines**	a1, a2, b1, b2, b3, b4	• (definitions, types, general formula, nomenclature, influence of functional group on physical and chemical properties, radical groups nomenclature, synthesis and reactions)	2	4
3	**Aliphatic and aromatic Nitro compounds**	a1, a2, b1, b2, b3, b4	• **:** (definitions, types, general formula, nomenclature, influence of functional group on physical and chemical properties, radical groups nomenclature, physical properties, synthesis and reactions (including mechanisms of reactions).	3	6
4	**Aliphatic and aromatic aldehydes and ketones**	a1, a2, b1, b2, b3, b4	• **:** (definitions, types, general formula, nomenclature, influence of functional group on physical and chemical properties, radical groups nomenclature, physical properties, synthesis and reactions)	2	4
5	**Aliphatic and aromatic carboxylic acids**	a1, a2, b1, b2, b3, b4	• **:** (definitions, types, general formula, nomenclature, influence of functional group on physical and chemical properties, radical groups nomenclature, physical properties, synthesis and reactions (including	2	4

			mechanisms of reactions).		
6	**Aliphatic and aromatic derivatives of carboxylic acids**	a1, a2, b1, b2, b3, b4	**Esters, amides, acyl halides, acid anhydrides:** • **:** (definitions, types, general formula, nomenclature, influence of functional group on physical and chemical properties, radical groups nomenclature, physical properties, synthesis and reactions (including mechanisms of reactions).	2	4
Course Review and discussion session				1	2
FINAL - EXAM				1	2
TOTAL				16	32

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Course Learning Outcomes
1.	**Physical properties & Chemical identification of compounds belonging to the following aliphatic and aromatic organic groups:**			
2.	**Alcohols**	**2**	**4**	b1, b4, c1, c2, d1, d2, d3
3.	**Ethers**	**1**	**2**	b1, b4, c1, c2, d1, d2, d3
4.	**amines**	**1**	**2**	b1, b4, c1, c2, d1, d2, d3
5.	**Aldehydes**	**1**	**2**	b1, b4, c1, c2, d1, d2, d3
6.	**Ketones**	**1**	**2**	b1, b4, c1, c2, d1, d2, d3
7.	**Carboxylic acids**	**2**	**4**	b1, b4, c1, c2, d1, d2, d3
8.	**Esters**	**1**	**2**	b1, b4, c1, c2, d1, d2, d3
9.	**Scheme of identification of organic compounds**	**2**	**2**	b1, b4, c1, c2, d1, d2, d3
PRACTICAL EXAM		**1**	**2**	b1, b4, c1, c2, d1, d2, d3
Total		**12**	**24 equivalent to 12 credit hours**	
Number of Weeks			**12**	

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Anatomy of Human body

level	Semester	Credit hours		
		Theory	Practical	Total
2	3	2	1	3

IV. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Sub Topics List	No. of Weeks	Contact hours	Learning Outcomes
1	The Skeletal System	▪ Bones- types, structure, Axial & Appendicular Skeleton, ▪ Bone formation and growth ▪ Description of bones ▪ Joints - classification and structure	2	4	a1, a2, b1, b3
2	The Muscular System	▪ Types and structure of muscles ▪ Muscle groups Alterations in disease Applications and implications in nursing	1	2	a1, a2, b1, b3
3	Midterm exam		1	2	
4	The Nervous System	▪ Structure of neurologia& neurons ▪ Somatic Nervous system - Structure of brain, spinal cord, cranial nerves, spinal nerves, peripheral nerves ▪ Autonomic Nervous System - sympathetic, parasympathetic - Structure, location	2	4	a1, a2, b1, b3

5	Circulatory and lymphatic system	▪ The Circulatory System - Blood-Microscopic: structure - Structure of Heart - Structure of blood vessels-Arterial & Venous System, - Circulation: systemic, pulmonary, coronary ▪ Lymphatic system: - Lymphatic vessels and lymph - Lymphatic tissues - Thymus gland - Lymph nodes o Lymphatic nodules	2	4	a1, a2, b1, b3
6	The Respiratory System	▪ Structure of the organs of respiration ▪ Muscles of respiration: Intercostal and Diaphragm	2	4	a1, a2, b1, b3
7	The Digestive System	▪ Structure of Alimentary tract and accessory organs of digestion	1	2	a1, a2, b1, b3
8	The Excretory System (Urinary)	▪ Structure of organs of urinary ▪ System: Kidney, ureters, urinary bladder, urethra, structure of skin	1	2	a1, a2, b1, b3
9	The Endocrine System	▪ Structure of Pituitary, Pancreas, thyroid, Parathyroid, thymus and adrenal glands	2	4	a1, a2, b1, b3
10	The Reproductive system including breast	▪ Structure of female reproductive organs ▪ Structure of male reproductive organs. ▪ Structure of breast	1	2	a1, a2, b1, b3

11	Final exam	1	2	a1, a2, b1, b3
Number of Weeks /and Units Per Semester		**16**	**32**	

B - Practical Aspect:				
Order	**Tasks/ Experiments**	**Number of Weeks**	**contact hours**	**Learning Outcomes**
1	Introduction	1	2	b2, c1, c2, d1, d2, d3
2	Skeletal system	2	4	b2, c1, c2, d1, d2, d3
3	Muscles	2	4	b2, c1, c2, d1, d2, d3
4	Nervous system	1	2	b2, c1, c2, d1, d2, d3
5	Circulatory system	2	4	b2, c1, c2, d1, d2, d3
6	Respiratory system	2	4	b2, c1, c2, d1, d2, d3
7	Digestive system	1	2	b2, c1, c2, d1, d2, d3
8	Final practical exam	1	2	b2, c1, c2, d1, d2, d3
Number of Weeks /and Units Per Semester		**12**	**24**	

Republic of Yemen
Ministry of Higher Education &
Scientific Research
Al-Razi University
Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Physiology I

level	Semester	Credit hours		
		Theory	Practical	Total
2	3	2	-	2

Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction**	a1, a2, a3, a4, b1, b2	physiology definition, the concept of homeostasis. Negative feedback.	1	2
2	**The Cell and body fluids physiology**	a1, a2, a3, a4, b1, b2	• structure, functions, membrane transport mechanisms: (passive diffusion , mediated transport, osmosis) • membrane potential(resting, action) • Cell repair : mechanisms. • Composition and regulations of Body fluids, electrolytes and acid-base balance	2	4
3	**The Nervous system**	a1, a2, a3, a4, b1, b2	• Classification of nervous system • classes of neurons • Synaptic transmission (chemical synapsis, summation, interconnection between neurons, factors affecting the transmission)	1	2
4	**Central nervous system (CNS) Part (1)**	a1, a2, a3, a4, b1, b2	• Components of CNS • level of CNS functions • functions of brain composition (cerebrum, cerebral cortex, etc.), • blood brain barrier • spinal cord (function, composition, spinal reflex, cerebrospinal fluid)	2	4
MID-TERM EXAM				1	2
4	**Central nervous system (CNS)**	a1, a2, a3, a4, b1, b2	• Sensation: nociception, hyperalgesia, pain pathway, neurotransmitters of pain, types of	2	

	Central nervous system (CNS)		pain (cutaneous, visceral, deep, , referred , phantom) , endogenous analgesic system • Regulating areas in brain (function, neurotransmitters) :nociceptionarea, psychic area, heat regulating center, area controlling muscles relaxation and contraction vasomotor center, Chemoreceptor trigger zone and other areas involved in diseases.		4
5	**Autonomic nervous system**	a1, a2, a3, a4, b1, b2	• definition and composition & regulation • sympathetic system (functions, neurotransmitters, receptors), adrenal medulla , • parasympathetic system (functions, neurotransmitters, receptors)	2	4
6	**Endocrine system**	a1, a2, a3, a4, b1, b2	• hormones (biochemical classification, transport, mechanism of actions) • functions and regulation of • hormones of (pituitary gland, thyroid gland, parathyroid gland, pancreas, sex organs)	2	4
7	**Muscles**	a1, a2, a3, a4, b1, b2	• types , functions • factors affecting contraction and relaxation	1	2
Course Review		a3, a4, , , ,d1, d2	Review of the course topics by discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	7 Units

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Public Health

level	Semester	Credit hours		
		Theory	Practical	Total
2	3	2	-	2

Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction**	a1, a2, a3, b1	• Definitions : health , public health • Concept of health ,public health • Factors affecting personal and public health : (personal hygiene, hereditary ,environment ,life style ,socioeconomic condition)	3	6
2	**Primary health care**	a1, a2, a3, b1	• Objectives • Methods • programs	2	4
3	**Introduction to epidemiology**	a1, a2, a3, b1	• definition of Epidemiology, Epidemic diseases • Objectives of epidemiology studies and preventive programs • role of pharmacist in assisting health care team in preventive programs ○	1	2
Mid-term exam				1	2
4	**Epidemic diseases in Yemen (1)**		Study of epidemology and public preventive programs of • Malaria • TB • Dengu fever • Rabies • Leprosy • Hepatitis • AIDS and other sexual transmitted disease	8	16

Course Review	a1, a2, a3, b1	Review of the course topics by discussion session.	1	2
FINAL - EXAM			1	2
TOTAL			16	32

Republic of Yemen
Ministry of Higher Education & Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Pharmaceutical analytical chemistry I

level	Semester	Credit hours		
		Theory	Practical	Total
2	3	2	1	3

Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction to analytical chemistry& analytical techniques**	a1,a2, a3, b1, b2, b3, b4	• Definitions, brief history, scope of applications • Quantitative and qualitative analysis (purposes , types) • Validation of analysis ○ Source of errors ○ Sampling procedures. ○ calibration of analytical equipment ○ preparation of standard solutions and calibration curve ○ Analyzing of results : average, SD, coefficient of variation (CV%), accuracy , precision ○ Significant numbers, rejection of doubtful values • Manual versus instrumental analytical techniques: types, advantages , disadvantages.	2	4
2	**Titrimetric analysis (1-Aqueous Acid Base Titration)**	a1,a2, a3, b1, b2, b3, b4	• Types & comparison of titrimetric analysis Definitions • Distribution of acid-base species with pH of the medium. • Acid-Base titrimetry for determination of weakly acidic and basic drugs. • Indicators (theories) and their selection • **applications and solve problems**	2	4
	Titrimetric analysis (2-Non-Aqueous	a1,a2, a3, b1, b2, b3, b4	• Theoretical considerations and principles.	2	

	Acid Base titration)		• Bronsted Lowery of acids and bases. • Non-aqueous solvents. • Titration of weak acids and weak bases. • **Applications and solve problems**		4
2	**Titrimetric analysis (3- Oxidation Reduction Titration)**	a1,a2, a3, b1, b2, b3, b4	• Principles and concepts, determination involving oxidizing agents • iodimetric and iodometric determination, miscellaneous oxidation and reduction titrations. Indicators • applications. • chromometric determination, miscellaneous oxidation • Applications and **solve problems**	1	2
	Titrimetric analysis (4- Complexometric Titration)	a1,a2, a3, b1, b2, b3, b4	• Principle, Complexes and chelates, stability of complex ions. • Types of Complexometric titrations. Technique employed in complexometric titration, End point detection • Applications and **solve problems**	2	4
MID-TERM EXAM				1	2
3	**Electrochemical analysis**	a1,a2, a3, b1, b2, b3, b4	• **Electrogravimetric analysis:** Theory of electroanalysis, polarizatuon, decomposition, potential and over voltage electrolytic determination at constant current and with controlled potential at the cathode. • **Conductometry**: experimental details of conductometric titration and applications. • **Potentiometry**: Principles, methods and application. • **Amperometry:** theory and technique of amperometric titration with dropping mercury electrode, high frequency titration, its applications.	4	8

			• **Polarographic analysis**: Introduction, principles, diffusion current and half wave potential, quantitative techniques. • **Applications and solve problems**		
Course Review		a1,a2, a3, b1, b2, b3, b4	Review	1	3
FINAL – EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	4 Units

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
1.	**introduction to the Lab.: safety requirements, list of experiments, How to report, source of errors, etc.**	**1**	**2**	c1, c2, d1, d2, d3
2.	**aqueous titration of weak acids e.g. acetic acid**	**1**	**2**	b1, b2, b3, b4, c1, c2, d1, d2, d3
3.	**aqueous titration of weak bases e.g. ammonium chloride**	**1**	**2**	b1, b2, b3, b4, c1, c2, d1, d2, d3
4.	**non-aqueous titration of weak acids e.g. salicylic acid**	**1**	**2**	b1, b2, b3, b4, c1, c2, d1, d2, d3
5.	**Oxidation/reduction titration (iodometry) ; titration of H_2O_2 using iodine**	**1**	**2**	b1, b2, b3, b4, c1, c2, d1, d2, d3
6.	**Complexiметric titration of calcium salt**	**1**	**2**	b1, b2, b3, b4, c1, c2, d1, d2, d3
7.	**Potentiometric titration of drugs : diclofenac sodium**	**2**	**2**	b1, b2, b3, b4, c1, c2, d1, d2, d3
8.	**Review**	**1**	**2**	b1, b2, b3, b4, c1, c2, d1, d2, d3
PRACTICAL EXAM		**1**	**2**	b1, b2, b3, b4, c1, c2, d1, d2, d3
Total		**10**	**20 equivalent to 10 credit hours**	
Number of Weeks			**12**	

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Pharmaceutical calculation skills

level	Semester	Credit hours		
		Theory	Practical	Total
2	3	2	-	2

Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction**	a1	basic mathematical processing, calculators , source of errors, Roman and Arabic Numerals	1	2
2	**Pharmaceutical measurement systems of weights**	a1, b2,c1	: • Apothecary and avoird. systems • metric system. • Equivalent weight and milliequivalent weight	2	4
3	**Pharmaceutical measurement systems of volumes**	a1, b2, c1	• Apothecary • Metric system • house-hold systems	2	4
4	**Expressions of concentrations**	a1, b2,c1	percentage, ratio, quantity/quantity, PPM, PPB, molarity	1	2
5	**Dilution &Allegation**	a1, b2,c1	• Dilution of conc. Solutions • dilution of potent solids	1	2
MID-TERM EXAM				1	2
6	**Isotonicity**	a1, b2,c1	• definition & significance • determination	1	2
7	**Buffer capacity**	a1, b2,c1	• definition & significance • determination	1	2
8	**Medical prescriptions**	a1,b1, b2,c1	• ideal prescription, • components of the	2	

			prescriptions • common symbols and abbreviations		4
9	**Enlarging and reducing prescription formulas**	a1,b1, b2,c1	• definition • determination	1	2
10	**Pediatric Dose**	a1,b1, b2,c1	• definitions of doses • Expression of doses • Rules for calculation the child`s dose based on age, weight and body surface area	2	4
Course Review		a1, , , , c1	Review of the course topics by discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	10 Units

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Pharmaceutics II

level	Semester	Credit hours		
		Theory	Practical	Total
2	4	2	1	3

Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Pharmaceutical aerosols**	a1, a2, a3, a4, , a6, b1, b2, b3	Definition , advantages, disadvantages, types of aerosols, anatomical features of the bronchi, Pressurized packages (Type of propellants , Containers , Formulation aspects, Air-blast nebulizers), methods of preparation (pressurized filling, cold filling), quality control evaluation	3	6
2	**Semisolid dosage forms (1) Introduction**	a1, a2, a3, a4, , a6, b1, b2, b3	• **introduction:** definitions , advantages, disadvantages, types, anatomical features and targets of the skin, • Classification of semisolid preparation	1	2
	Semisolid dosage forms :(2)Ointments and pastes	a1, a2, a3, a4, , a6, b1, b2, b3	• **ointments** (definitions, advantages, advantages, disadvantages, classification based on type of ointment base, formulation considerations, method of preparation**)** • **Pastes:** (definitions, advantages, advantages, disadvantages, classification based on type of ointment base,	4	8
Mid-term exam				1	2
3	**Semisolid dosage forms (3) Creams and gels**	a1, a2, a3, a4, , a6, b1, b2, b3	• **Creams** (definitions, advantages, advantages, disadvantages, classification, formulation considerations, method of preparation	3	6

			• **Gels** (definitions, advantages, classification, formulation **,** considerations, method of preparation		
3	**Suppositories**	a1, a2, a3, a4, , a6, b1, b2, b3	definitions, advantages, advantages, disadvantages, classification (rectal, vaginal) formulation, types of suppository bases, method of preparation	3	6
Course Review		a1, a2, a3, a4, , a6, b1, b2, b3	Review of the course topics :discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	3 Units

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
1.	**Pharmaceutical aerosols: construction and use**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
2.	**Preparation of salicylic acid 2 % ointment in simple ointment base**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
3.	**Preparation of hydrophilic ointment USP**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
4.	**Preparation of Polyethylene glycol ointment base.**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
5.	**Preparation of o/ w creams: vanishing cream base**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
6.	**Preparation of w/o creams: cold cream base**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
7.	**Preparation of hydrophilic gel base : Carbomer or Carboxymethyl cellulose gel**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
8.	**Preparation of Aspirin in cocoa butter base suppositories.**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
9.	**Preparation of Glycerin suppositories.**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
10.	**Preparation of Dusting powders**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
11.	**Preparation of Effervescent base granules**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
PRACTICAL EXAM		**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
Total		**11**	**22**	

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Physiology II

level	Semester	Credit hours		
		Theory	Practical	Total
2	4	2	-	2

Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**The Blood**	a1, a2, a3, a4, b1, b2	• Blood composition, functions and regulation of plasma, RBCs, WBCs and platelets. • Circulation: regulations and factors affecting venous return and blood flow.	2	4
2	**Cardiovascular system**	a1, a2, a3, a4, b1, b2	• the heart: functions and regulation of the heart work, physiologic parameters of the heart work: heart rate, cardiac output, heat rhythmicity, conductivity, contraction • Blood vessels: functions and regulation of the blood vessels (veins, arteries, capillaries), physiologic parameters of the blood vessels : blood pressure, peripheral vascular resistance.	3	6
3	**Respiratory system**	a1, a2, b1, b2, b3, b4, b5, d2	• blood-gas interface, airways, the pleura, mechanism of breathing, Ventilation, Diffusion , Partial pressures of oxygen and carbon dioxide, Ventilation–perfusion matching, Gas transport in blood , Regulation of ventilation, Ventilator response to exercise.	2	4
				1	2
4	**Alimentary system**	a1, a2, a3, a4, b1, b2	• functions and regulations of the mouth, pharynx and the gastrointestinal tract (esophagus, stomach, small and large intestine • the digestive system associated – organs: the liver, gall bladder., spleen and pancreases	3	6

5	**Renal system**	a1, a2, a3, a4, b1, b2	• basic unit of the kidney • renal blood flow, glomerular filtration, active excretion tubular reabsorption, • regulation of plasma volume and plasma osmolality	2	4
6	**immune system**	a1, a2, a3, a4, b1, b2	• Definition , functions • Passive immunity and involved mechanisms and cells: naturally acquired, artificially acquired, transfer of activated T-cells • Active immunity and involved cells and mechanism naturally acquired, artificially acquired,	3	6
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	6 Units

Republic of Yemen
Ministry of Higher Education &
Scientific Research
Al-Razi University
Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Pharmaceutical analytical chemistry II

level	Semester	Credit hours		
		Theory	Practical	Total
2	4	2	1	3

V. Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Optical analysis**	a1,a2, a3, b1, b2, b3, b4	• **Flow cyometry:** Principle, apparatus, procedures, applications • **Polarimetery: Determination of optical and specific optical rotation:** Principle, purpose, apparatus, procedures**,** • **Determination of refractive index:** Principle, purpose, apparatus, procedures	3	6
2	**Thermal analysis**	a1,a2, a3, b1, b2, b3, b4	• **Thermogravimetry:** principle, instrumentation, temperature, verification, verification of electrobalance, procedures. • **Differential scanning calorimetry (DSC):** principles, instrumentation, calibration of equipments, procedures, phase change, applications, determination of purity • **Melting point testing :**Principle, instrumentation, procedures, applications • **Thermomicroscopy:** principle, apparatus, applications • **Freezing point tester:**Principle, purpose, apparatus • **Determination of Distillation Range :** Principle, purpose, apparatus, procedures, applications. • **Determination of boiling point** Principle, purpose, apparatus,	4	8

			procedures, applications.		
Mid-term exam				1	2
3	**Introduction to spectrophotometry**	a1,a2, a3, b1, b2, b3, b4	• Electromagnetic radiation, units, electromagnetic • Light spectra • Principle: Absorption and emission of radiation • Lambert's and Beer's Laws • Deviation from Lambert-Beer's law • Instrumentation • Colorometry, Chromophores and Auxochromes shifts	2	4
4	**Visible and UV Spectrophotometry**	a1,a2, a3, b1, b2, b3, b4	• Applications of Ultraviolet and Visible in quantitative analysis of drugs; data validation : calibration curve linearity, regression equation • Applications of Ultraviolet and Visible in qualitative analysis: Wavelength of maximal absorbance with illustrates examples • Factors Affecting Spectral Response • Data validation: specificity, robustness	3	6

5	**Fluorescence spectrophotometry (Fluorimetry)**	a1,a2, a3, b1, b2, b3, b4	• Principle, emission and Intensity: governing law • Instrumentation • Applications of quantitative analysis of drugs • Data validation: specificity, robustness	1	2
Course Review		a1, a2 , a3, b1, b2, b3, b4, b5, b6, d2	Review of the course topics by discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	5 Units

B - Practical Aspect

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
1.	**Polarimetric analysis of specific rotation of D- and L- compounds e.g. glucose**	**1**	**2**	b1, b2, b3, b4, c1, c2, d1, d2, d3
2.	**Determination of melting point by (capillary-thermometer-parrafin oil) method for : benzoic acid**	**1**	**2**	b1, b2, b3, b4, c1, c2, d1, d2, d3
3.	**Determination of boiling point of toluene by (capillary- thermometer-parrafin oil)**	**1**	**2**	b1, b2, b3, b4, c1, c2, d1, d2, d3
4.	**Uv-visible spectrophometric operation and handling**	**1**	**2**	b1, b2, b3, b4, c1, c2, d1, d2, d3
5.	**Uv-visible spectrophometric analysis of potassium permanganate aqueous solution (prepare standard solution, determine UV spectrum and 300-700 nm . Wavelength max.)**	**1**	**2**	b1, b2, b3, b4, c1, c2, d1, d2, d3
6.	**Uv-visible spectrophometric analysis of potassium permanganate aqueous solution at wavelength max. (calibration curve and concentration of sample with unknown concentration)**	**1**	**2**	b1, b2, b3, b4, c1, c2, d1, d2, d3
7.	**Uv-visible spectrophometric analysis of aspirin in methanol solution (UV spectrum 200-400 nm, wavelength max.)**	**1**	**2**	b1, b2, b3, b4, c1, c2, d1, d2, d3
8.	**Uv-visible spectrophometric analysis of aspirin in methanol at wavelength max (calibration curve and concentration of sample with unknown concentration)**	**1**	**2**	b1, b2, b3, b4, c1, c2, d1, d2, d3
9.	**Review**	**1**	**2**	b1, b2, b3, b4, c1, c2, d1, d2, d3
PRACTICAL EXAM		**10**	**20**	b1, b2, b3, b4, c1, c2, d1, d2, d3
Total		**10**	**20 equivalent to 10 credit hours**	

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Histology

level	Semester	Credit hours		
		Theory	Practical	Total
2	4	2	-	2

Course Contents:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours	Learning Outcomes (PILOs)
1	**Introduction to histology**	– Definitions – Brief history – Significance and applications – Cell structures and types – Basic of cytogenetic	1	2	a1, a2, a3, a4
2	**Preparation of Human tissue specimens**	– Histological tools and techniques – Specimen sources: excision, incision, punch, shave, curetting's, core – Specimens types : whole-mount, squash, smear, section – Specimen preservation, transport and storage – Specimen reception fixation, grossing, processing, embedding, sectioning, staining	2	3	a1, a3, a4
3	**Epithelial tissues**	– Classification, cell types, structure, location , development and functions	2	3	a1, a3, a4, b2
4	**Connective tissues**	– Classification, cell types, structure, location , development and functions	2	3	a1, a3, a4, b2
		Mid-Term Theoretical Exam	1	2	a1, a2, a3, a4, b2
5	**Muscle tissues**	Classification, cell types, structure, location , development and functions	2	3	a1, a3, a4, b2

6	**Nervous tissues**	– Classification, cell types, structure, location , development and functions	2	3	a1, a3, a4, b2
7	**Embryology**	– Definition and application of embryology – Stages of Human Embryonic development o Germinal stage o Gastrulation stage o Neurulation stage o Development of organs and systems o Development of physical features	3	4.5	a1, a2, b2
		Final Theoretical Exam	1	2	a1, a2, a3, a4, b2
Number of Weeks /and Units Per Semester			**16**	**25**	

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Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Pharmaceutical Organic chemistry II

level	Semester	Credit hours		
		Theory	Practical	Total
2	4	2	1	3

IV. Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Monocyclic Alicyclic compounds**	a1, b1, b2, b3, b4	Classification, physicochemical properties, preparation, reactions, examples of drugs and their medical uses.	4	8
2	**Benzyl and Benzhydryl derivatives**	a1, b1, b2, b3, b4	Classification, physicochemical properties, preparation, reactions, examples of drugs and their medical uses.	4	8
3	**Phenethyl and Phenylpropylamines**	a1, b1, b2, b3, b4	Classification, physicochemical properties, preparation, reactions, examples of drugs and their medical uses.	4	8
4	**Arylacetic and Arylpropionic Acids**	a1, b1, b2, b3, b4	Classification, physicochemical properties, preparation, reactions, examples of drugs and their medical uses.	3	6
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	8 Units

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
Experiments of drugs belonging to the Chemical group (identification , synthesis chemical reactions)				
1.	Monocyclic Alicyclic compounds	**3**	**6**	b1, b4, c1, c2, d1, d2, d3
2.	Benzyl and Benzhydryl derivatives	**2**	**4**	b1, b4, c1, c2, d1, d2, d3
3.	Phenethyl and Phenylpropylamines	**2**	**4**	b1, b4, c1, c2, d1, d2, d3
4.	Phenethyl and Phenylpropylamines	**2**	**4**	b1, b4, c1, c2, d1, d2, d3
5.	Arylacetic and Arylpropionic Acids	**2**	**4**	b1, b4, c1, c2, d1, d2, d3
PRACTICAL EXAM		**1**	**2**	b1, b4, c1, c2, d1, d2, d3
Total		**12**	**24 equivalent to 12 credit hours**	
Number of Weeks			**12**	

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Botany

level	Semester	Credit hours		
		Theory	Practical	Total
2	4	2	1	3

VI. Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction to botany**	a1, a3, a4,b1, b2,b3,	• Definition and Brief history of botany • Basis of plant structures: plant cell and plant cellular contents , types of plant tissues and plant organs • Differences between plant kingdom and animal kingdom • Nutrition, metabolism and growth of plant • Plant taxonomy : basis of classification of plant kingdom intoorders, families,, suborders, genera, species.	2	4
2	**Plant Order (1) THALLOPHYTES (Thallophyta)**	a1, a3, a4,b1, b2,	• General characters • **Algae**e.g. Pleurococcus, Spirogyra, Vaucheria, Diatoms.), economic use of algae • **Fungi :** differences from algae, types phycomycetes (oomycetes e.g. saprolegnia), (zygomycetes e.g. black mold) eumycetes (ascomycetes e.g. yeasts: Ergot fungi) (Basidiomycetes edible mushroom, amanita) economic use of fungi • **lichens** types and examples • **Bacteria** (only brief study on general characters and differences from fungi, algae and lichens. • **Viruses** : general characters, examples	2	4
3	**Plant order (2) ARCHEGONIATES (Archegoniatae)**	a1, a3, a4,b1, b2,	• General characters • Bryophytes e.g. Hepaticae, mosses • Pteridophytes e.g. Ferns, club mosses	2	4

4	**Plant order (3) SPERMOPHYTES (seeding plants)**	a1, a3, a4,b1, b2,	• Gymnosperms , characters, differences, examples of plants • Angiosperms: characters, differences, economically and medically valuable families.	1	2
MID-TERM EXAM				1	2
5	**Plant parts in Angiosperms**	a1, a2, a3, a4, b1,b2,	(morphology, anatomy and physiology) of : • The roots • The stems • The bark • The leaf • The flower • The fruit • The seed	3	6
6	**classification of angiosperms yielding vegetable drugs**.	a1, a3, a4,b1, b2,	• **Monocotyledons :** general characters, classification, examples of plants and their yielding drugs • **Dicotyledons : (**Archichlamydeae or Choripetalae, Metachlamydeas or Sympetalas): general characters, classification, examples of plants and their yielding drugs	3	9
Course Review		a1, a2, a3, a4, b1,b2,	Review of the course topics by discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	6 Units

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
1.	**introduction to pharmaceutical organic chemistry Lab.: safety requirements, list of experiments, How to report, etc.**	**1**	**2**	**a1, a2, c1, c2, , d3, d1, d2,**
2.	**Algea: microscopical slides**	**1**	**2**	**a1, a2, c1, c2,, d3, d1, d2,**
3.	**Fungi: microscopical and morphological features of different fungi species**	**2**	**4**	**a1, a2, c1, c2, d3, d1, d2,**
4.	**Plant leaves: morphology and microscopy**	**2**	**4**	**a1, a2, c1, c2, d3, d1, d2,**
5.	**Plant barks: morphology and microscopy**	**1**	**2**	**a1, a2, c1, c2, d3, d1, d2,**
6.	**Plant roots and rhizomes: morphology and microscopy**	**1**	**2**	**a1, a2, c1, c2,, d3, d1, d2,**
7.	**Plant flowers: morphology and microscopy**	**1**	**2**	**a1, a2, c1, c2,, d3, d1, d2,**
8.	**Plant fruits: morphology and microscopy**	**1**	**2**	**a1, a2, c1, c2 , d3, d1, d2,**
9.	**Differentiation between** Monocotyledons Dicotyledons : **morphology and microscopy**	**1**	**2**	**a1, a2, c1, c2,, d3, d1, d2,**
PRACTICAL EXAM		**1**	**2**	**a1, a2, b2, c1, c2, d1, d2,**
Total		**12**	**24 equivalent to 12 credit hours**	
Number of Weeks			**12**	

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Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Pharmaceutics III

level	Semester	Credit hours		
		Theory	Practical	Total
3	5	2	1	3

Course Content:

A – Theoretical Aspect:

No.	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Solid dosage forms: (1) : Introduction & Powders**	a1, a2, a3, a4, , a6, b1, b2, b3	**Introduction** □ classifications of dosage forms □ Advantages and disadvantages □ Formulation consideration **Powders** □ Definitions, advantages, disadvantages □ classification (coarse, fine, microfine, etc; divided, bulk; compounded; medicated, cosmetic) □ Formulation considerations □Bulk powder, divided powder and Dusting powder:: formulation, examples □ Powders packaging □ Quality control evaluation	2	4
2	**Solid dosage forms: (2) Granules**	a1, a2, a3, a4, , a6, b1, b2, b3	□ Definition, advantages, disadvantages □ Method of preparation □ Formulation considerations **Effervescent granules** o Definition, composition o Method of preparation: dry (fusion) method, wet method o Determination of the required quantity of effervescent base in the formulation	1	2
3	**Solid dosage forms: (3) Tablets**	a1, a2, a3, a4, , a6, b1, b2, b3	□ Advantages and disadvantages. □ Types and Ideal properties of tablets □ Tablet excipients □ Tableting methods Steps, advantages and disadvantages (Direct compression, Dry granulation, Wet granulation) □ Tablet press machines □ Problems encountered during tablet formulation.	5	

			□ Tablet coating Sugar coating , Film coating, Enteric coating, extended release coating : advantages, disadvantages, coating materials, process of coatings □ Quality evaluation		10
Mid-term exam				1	2
4	**Solid dosage forms: (4) Capsules**	a1, a2, a3, a4, , a6, b1, b2, b3	**(i) Hard gelatin capsules** • Advantages and disadvantages • Composition of capsule shell • types of capsule fill • Selection of capsule size. • Excipients used in hard gelatin capsule formulation. • Capsule filling process. • Storage of hard gelatin capsules. **(ii) Soft gelatin capsules** • Advantage and disadvantages. • Capsule shell composition. • types of capsule fill • Shapes and sizes. • Soft gelatin capsule formulation. • capsule filling process • specific properties:O2 impermeability, water content	3	6
5	**Sterile pharmaceutical dosage forms** (Introduction)	a1, a2, a3, a4, , a6, b1, b2, b3	**Differences between sterile & non-sterile dosage forms :** • Definition : sterility, sterilization, preservation, pyrogenicity, pyrogen-free • Review of sterilization methods and preservation of dosage forms • Aseptic techniques • Sources of contamination and methods of prevention • Design of aseptic area , Laminar flow benches services and maintenance) • Isotonicity of sterile preparations and methods of adjustment	1	2
6	**Sterile pharmaceutical dosage forms**	a1, a2, a3, a4, , a6, b1, b2, b3	• Preformulation factors ○ Route of administration of injection ○ Water for injection	2	

	(Parenteral preparations)		○ Non-aqueous vehicles • Formulation consideration ○ Formulation of Infusion fluids • Prefilling , filling and package (small and large sacle) ○ Quality evaluation		4
7	**Sterile pharmaceutical dosage forms** (Ophthalmic preparations)	a1, a2, a3, a4, , a6, b1, b2, b3	• Anatomical features of the eye • Types of ophthalmic preparations • Formulation considerations • Sterilization and preservation. • Package • Quality evaluation	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	7 Units

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
1.	**Preparation of tablets using wet granulation method : paracetamol tablets**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
2.	**Preparation of tablets using wet granulation method : mefenamic acid tablets**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
3.	**Preparation of tablets using direct compression method : aspirin tablets**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
4.	**film-coating of tablets mefenamic acid**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
5.	**Preparation of hard gelatin capsules (Manual): aspirin**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
6.	**Preparation of hard gelatin capsules (Manual): paracetamol**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
7.	**Preparation of I.V. admixtures : DNS + vitamin C + vitamin B complex**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
8.	**Preparation of parenteral solutions from parenteral powders : reconstitution of cefuroxime sodium vial**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
9.	**Preparation of Glycerin suppositories.**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
10.	**Preparation of sterile NaCl eye wash.**	**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
PRACTICAL EXAM		**1**	**2**	**b3, c1,c2, c3, d1, d2, d3**
Total		**11**	**22**	

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : General Pharmacognosy I

level	Semester	Credit hours		
		Theory	Practical	Total
3	5	2	1	3

Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction**	a1, a2, a3, a4, , b1, b3	Definition, importance, and function, brief history Crude, official and unofficial drugs. Nomenclature of crude drugs (botanical, geographical and commercial sources of drugs) Classification of crude drugs (alphabetical ,taxonomical, morphological, pharmacological and chemical) Cultivation (Disadvantages of collecting wild plants and advantages of cultivation, factors affecting cultivation). Collection (Time of the year, time of the day, stage of the development of the plant and general rules of collection). Post-collection processing of crude drugs: Drying(Natural methods, artificial methods, changes occurring after drying), Preservation and protection of crude drugs(deterioration during storage, physicochemical factors, biological factors, methods to destroy and control of insects) Adulteration(sophistication, substitution, admixture and deterioration, determination of adulteration.)	6	12

MID-TERM EXAM				1	2
3	**Medicinal leaves**	a1, a2, a3, a4, , b1, b3	Study of botanical origin, microscopical features, cultivation, adulteration detection, active constituents and medical uses of the following medicinal leaves: Digitalis, Senna, Stramonium, Belladonna, Hyoscymus, Bucho, Boldo , Coca, Jaborandi, Henna.	3	6
4	**Medicinal barks**	a1, a2, a3, a4, , b1, b3	Study of botanical origin, microscopical features, cultivation, adulteration detection, active constituents and medical uses of the followingmedicinal barks:Cinchona, Cinnamon, Frangula, Quillaia, Pomegranate, Hamamelis and Galls.	2	4
5	**Medicinal roots and rhizomes**	a1, a2, a3, a4, , b1, b3	Study of botanical origin, microscopical features, cultivation, adulteration detection, active constituents and medical uses of the following medicinal roots and rhizomes :Liquorice,Ipecacuanha,Rauwolfia,Senega,Ginger,Colchicum,Squill,Ginseng,Rhubarb,Curcuma,Podophylum,Aconite,Veratrum,Sasaparilla,Kava-kava	2	4
Course Review		a1, a2, a3, a4, , b1, b3	Review of the course topics by discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	5 Units

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
1.	preparation of hard parts of plant(e.g. roots, seeds), for investigation : drying, grinding, treating with reagents , etc	1	2	b1, b2, b4, c1, c2, c3, d1, d2, d3
2.	preparation of soft parts of plant(e.g. leaves, flowers), for investigation : drying, grinding, treating with reagents , etc	1	2	b1, b2, b4, c1, c2, c3, d1, d2, d3
3.	microscopical Detection of types of calcium oxalate in plant	1	2	b1, b2, b4, c1, c2, c3, d1, d2, d3
4.	microscopical Detection of types of starch in plant	1	2	b1, b2, b4, c1, c2, c3, d1, d2, d3
5.	morphology and microscopical determination of medicinal leaves : senna leaves	1	2	b1, b2, b4, c1, c2, c3, d1, d2, d3
6.	morphology and microscopical determination of medicinal leaves : Henna leaves	1	2	b1, b2, b4, c1, c2, c3, d1, d2, d3
7.	morphology and microscopical determination of medicinal barks : cinnamon bark	1	2	b1, b2, b4, c1, c2, c3, d1, d2, d3
8.	morphology and microscopical determination of medicinal barks : pomegranate bark	1	2	b1, b2, b4, c1, c2, c3, d1, d2, d3
9.	morphology and microscopical determination of medicinal roots & rhizomes: Ginger	1	2	b1, b2, b4, c1, c2, c3, d1, d2, d3
10.	morphology and microscopical determination of medicinal roots & rhizomes: liquorice	1	2	b1, b2, b4, c1, c2, c3, d1, d2, d3

11.	**Review**	**1**	**2**	**b1, b2, b4, c1, c2, c3, d1, d2, d3**
PRACTICAL EXAM		**1**	**2**	**b1, b2, b4, c1, c2, c3, d1, d2, d3**
Total		**12**	**24 equivalent to 12 credit hours**	
Number of Weeks			**12**	

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Pharmaceutical Organic chemistry III

level	Semester	Credit hours		
		Theory	Practical	Total
3	5	2	1	3

IV. Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Arylethylenes compounds**	a1, b1, b2, b3, b4	Classification, physicochemical properties, preparation, reactions, examples of drugs and their medical uses.	3	6
2	**Polycyclic Aromatic compounds**	a1, b1, b2, b3, b4	Classification, physicochemical properties, preparation, reactions, examples of drugs and their medical uses.	3	6
3	**Steroids**	a1, b1, b2, b3, b4	Classification, physicochemical properties, preparation, reactions, examples of drugs and their medical uses.	4	8
4	**Heterocyclic compounds: 5, 6, 7 – membered fused to one ring and two rings**	a1, b1, b2, b3, b4	Classification, physicochemical properties, preparation, reactions, examples of drugs and their medical uses.	5	10
Course Review		a1, b1, b2, b3, b4	Review of the course topics by discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	8 Units

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
General physicochemical properties of the chemical group. experiments of Chemical identification and synthesis of one-two drugs belonging to the following groups				
1.	Arylethylene compounds	**2**	**4**	b1, b4, c1, c2, d1, d2, d3
2.	Polycyclic Aromatic compounds	**3**	**6**	b1, b4, c1, c2, d1, d2, d3
3.	Steroids	**2**	**4**	b1, b4, c1, c2, d1, d2, d3
4.	Heterocyclic compounds 5-membered	**1**	**2**	b1, b4, c1, c2, d1, d2, d3
5.	Heterocyclic compounds 6-membered	**1**	**2**	b1, b4, c1, c2, d1, d2, d3
6.	Heterocyclic compounds 7-membered	**2**	**4**	b1, b4, c1, c2, d1, d2, d3
PRACTICAL EXAM		**1**	**2**	b1, b4, c1, c2, d1, d2, d3
Total		**12**	**24 equivalent to 12 credit hours**	
Number of Weeks			**12**	

Republic of Yemen
Ministry of Higher Education &
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Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Biochemistry

level	Semester	Credit hours		
		Theory	Practical	Total
3	5	2	1	3

Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction**	a1, a2, a3	• Definition and significance • General roles of biochemistry • Properties and classification of biochemicals	1	2
2	**Carbohydrates**	a1, a2, a3, b1, b2, b3, b4,b5	• Classifications and physiological roles • Glycolysis • Citric acid cycle • Glycogenesis and glycogenolysis • Hexose monophosphate shunt • Uronic acid pathway • Blood sugar and its regulation. • Pathological conditions related carbohydrates.	4	8
3	**Lipids (1)**	a1, a2, a3, b1, b2, b3, b4,b5	• Classifications and physiological roles • Biosynthesis of fats • Oxidation of fatty acids • Ketogenesis and ketosis • Metabolism of cholesterol • Essential fatty acid and eicosanodis phospholipids. • Sphingolipids. • Bile salts • Pathological conditions related to lipids.	2	4
MID-TERM EXAM				1	2

3	**Lipids (2)**	a1, a2, a3, b1, b2, b3, b4,b5	• Classifications and physiological roles • Biosynthesis of fats • Oxidation of fatty acids • Ketogenesis and ketosis • Metabolism of cholesterol • Essential fatty acid and eicosanodis phospholipids. • Sphingolipids. • Bile salts • Pathological conditions related to lipids.	2	4
4	**Proteins**	a1, a2, a3, b1, b2, b3, b4,b5	• Classification of aminoacides • General biochemical reaction of amino acids like • Transamination • Deamination • Decarboxylation • Peptides and polypeptides • Biosynthesis of proteins : role of DNA • Classifications and physiological roles of proteins • Metabolism of proteins • Urea cycle • Nitrogen balance • Pathological conditions related to proteins.	5	10 4
Course Review		a1, a2, a3, b1, b2, b3, b4,b5	Review of the course topics by discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	4 Units

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
1.	introduction to biochemistry chemistry Lab.: safety requirements, list of experiments, How to report, etc.	**1**	**2**	b4, b5, c1, c2, c3, d1, d2, d3
2.	**carbohydrates**monosaccharaides : physicochemical properties and in vitro identification & differentiation.	**2**	**4**	b4, b5, c1, c2, c3, d1, d2, d3
3.	**carbohydrates**disaccharides physicochemical properties and in vitro identification & differentiation.	**1**	**2**	b4, b5, c1, c2, c3, d1, d2, d3
4.	**carbohydrates**polysaccharides physicochemical properties and in vitro identification & differentiation.	**2**	**4**	b4, b5, c1, c2, c3, d1, d2, d3
5.	**Sampling and preserving of human samples : blood, urine**	**1**	**2**	b4, b5, c1, c2, c3, d1, d2, d3
6.	**Bioassay of blood glucose**	**1**	**2**	b4, b5, c1, c2, c3, d1, d2, d3
7.	**Lipids** physicochemical properties and in vitro identification of cholesterol.	**1**	**2**	b4, b5, c1, c2, c3, d1, d2, d3
8.	**Assay of cholesterol in human blood.**	**1**	**2**	b4, b5, c1, c2, c3, d1, d2, d3
9.	**Proteins:** physicochemical properties and in vitro identification of certain types of proteins	**1**	**2**	b4, b5, c1, c2, c3, d1, d2, d3
PRACTICAL EXAM		**1**	**2**	b4, b5, c1, c2, c3, d1, d2, d3
Total		**12**	**24 equivalent to 12 credit hours**	
Number of Weeks			**12**	

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Pathology

level	Semester	Credit hours		
		Theory	Practical	Total
3	5	2	-	2

Course Content:

Order	Units/Topics List	Sub Topics List	No. of Weeks	Contact hours	Course Learning Outcomes
1	**Introduction**	▪ Importance of the study of pathology ▪ Definition of terms ▪ Methods and techniques ▪ Cellular and Tissue changes : cell resposne to injury: injury repair, failure of repair, cell death; apoptosis	2	4	a1, a2, b1
	Inflammation and tissure repair	▪ Definition ▪ Acute inflammation ▪ Chronic inflamation ▪ Hemodynamic disorders ▪ Thermodynamic disorders ▪ Histopathologic changes	3	6	a1, a2, b1
2	**Alteration in body fluids , electrolytes and acid-base**	Types, mechanisms, prognosis, diseaes	2	4	a1, a2, b1
	Mid-term exam		1	2	
3	**Immunopathology**	Pathogenesis and types of • Immunodeficiencies • immune-complex diseases • autoimmne diseases, • allergy/parasite immunity • T cells mediated-immunity diseases • Immunohematology • Immunogenetics, Tumor immunlogy	4	8	a1, a2, b1
4	**Genetic pathology**	• Diseases caused by single – gene defects • -Disorders with multifactor polygenic inheritance • Cytogenetic disorders • Down s syndrome • sex chromosome disorders • kline felters syndrome XYY	2	4	a1, a2, b1

5	**Tumor pathology**	etiology, carcinogenic agents, cellular ad histological changes, types of cancers	2	4	a1, a2, b1
Course Review			1	2	a1, a2, b1
Final exam			1		a1, a2, b1
Number of Weeks /and Units Per Semester			**16**	**32**	**7 units**

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Pharmaceutical analytical chemistry III

level	Semester	Credit hours		
		Theory	Practical	Total
3	5	2	1	3

Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Advanced spectroscopic techniques**	a1,a2, a3, b1, b2, b3, b4	**Theoretical principle and components , components interactions , types, instrumentation, factors affecting, output data, applications in quantitative/qualitative analysis, , data interpretation :** ○Atomic absorption spectrophotometer ○Atomic emission spectrophotommeter ○Infrared spectroscopy ○Mass spectroscopy (MS)	4	8
	mid-term exam			1	2
2	**Advanced chromatographic techniques**	a1,a2, a3, b1, b2, b3, b4	**Theoretical principle and components , components interactions , types, instrumentation, factors affecting, output data, applications in quantitative/qualitative analysis, data interpretation :** • High performance liquid chromatography (HPLC) • Ultra High performance liquid chromatography (UHPLC) • gas liquid chromatography	7	14

	NMR	a1,a2, a3, b1, b2, b3, b4	**Theoretical principle and components , components interactions , types, instrumentation, factors affecting, output data, applications in quantitative/qualitative analysis, , data interpretation of** Nuclear magnetic resonance technique .	3	6
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	4 Units

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Course Intended Learning Outcomes PILOs
1.	**Simulation and Determination of drugs in different dosage forms using HPLC :** • Amikacin injections • Amlodipine tablets • Cephradine capsules • Paracetamol + caffeine tablets • Pseudoephedrine + cetrizine capsules • Drotaverine + codeine tablets • Miconazole + hydrocortisone oral gel	7	14	b1, b2, b3, b4, c1, c2, d1, d2, d3
2.	**Simulation and data interpretation of Infrared spectroscopy analysis of** • Carbamezapine • Bisoprolol • Amoxicillin • Unknown drug	3	6	b1, b2, b3, b4, c1, c2, d1, d2, d3
PRACTICAL EXAM		1	2	b1, b2, b3, b4, c1, c2, d1, d2, d3
Total		11	22	

Republic of Yemen
Ministry of Higher Education &
Scientific Research
Al-Razi University
Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Pharmaceutical Microbiology I

level	Semester	Credit hours		
		Theory	Practical	Total
3	5	2	1	3

VII. Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction to Microbiology**	a1, a2, a3, a4	• Definition, brief history, role in medical sciences • Classification of microorganisms: based on motility • Classification of microorganisms: based on cell structures: Prokaryotes and Eukaryotes • Beneficial and pathogenic microorganisms : Role of microorganisms in life	2	4
2	**Medical bacteriology Medical**	a1, a2, a3, a4, b3, b4	• Nomenclature , biological process : (growth, reproduction , nutrition, metabolism) • Classification • General measures to Control of bacterial infections. • Classification. • Study of characteristics , name of infectious disease, life-cycle, and infection mode, culturing , identification and list of appropriate drugs to treat **G+ve bacteria**	3	6
			Study of characteristics , name of infectious disease, life-cycle, and infection mode, culturing , identification and list of appropriate	2	4

			drugs to treat **G-ve pathogenic bacteria**		
Mid-term exam				1	2
2	**Medical bacterilogy**		Study of the microscopical features , Study of characteristics , name of infectious disease, life-cycle, and infection mode, culturing , identification and list of appropriate drugs to treat **acid-fast bacteria**	1	2
3	**Medical mycology (Fugi)**	a1, a2, a3, a4, b3, b4	• General Classification. • Study of characteristics , name of infectious disease, clinical features of disease, life-cycle, and infection mode, culturing , identification and list of appropriate drugs (Antifungals) • General measures to Control of fungi infections.	2	4
4	**Medical virology**		• General Classification. • Study of characteristics , name of infectious disease, clinical features of disease, life-cycle, and infection mode, culturing , identification and list of appropriate drugs (antivirals) • General measures to Control of viral infections.	3	6
5	**Other pathogenic microoganisms**		**Rickettsia** • Study of characteristics , name of infectious disease, clinical features of disease, life-cycle, and infection mode, culturing , identification and list of appropriate drugs • General measures to Control of infections.	1	2
FINAL - EXAM				1	2
TOTAL				16	32

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
1.	**introduction to the Lab.: safety requirements, list of experiments, How to report, source of errors, etc.**	**1**	**2**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
2.	**Preparation of culture media: e.g. Muller Hinton agar and others**	**1**	**2**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
3.	**Sampling and inoculum**	**1**	**2**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
4.	**Microscopical characteristics and differentiation of G+ve bacteria: streptococci, staphylococci**	**2**	**6**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
5.	**Microscopical characteristics and differentiation of G-ve bacteria: E.coli, Klebsilla, pseudomonas, others**	**4**	**8**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
6.	**Microscopical differentiation of M. TB.**	**1**	**2**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
7.	**Microscopical characteristics and differentiation of Fungi Candida albicans.**	**1**	**2**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
PRACTICAL EXAM		**1**	**2**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
Total		**12**	**24**	
Number of Weeks			**12**	

Republic of Yemen
Ministry of Higher Education & Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Pharmaceutics IV

level	Semester	Credit hours		
		Theory	Practical	Total
3	6	2	1	3

VIII. Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**introduction to Novel drug delivery systems**	a1, a3, a4, , b1	• The need for Novel and novel drug delivery systems ○ Factors related to patients convenience ○ New diseases : new challenges ○ Diseases resistant to classical systems ○ Other factors ○ Comparison between Novel and classical delivery systems	1	2
2	**Extended release systems**	a1, a3, a4, , b1	• Definition and purposes • Concepts of extended-release, sustained-release • Advantages and limitations, • Biological features affecting extended-delivery system. • Technology of Microencapsulation • multiple units coating (pellets) • floating tablets • bilayer and multiple layer-tablets	3	6
3	**Transdermal delivery systems**	a1, a3, a4, , b1	• Biological features affecting transdemal delivery system. • Principle, components, formulation, advantages, disadvantages types and applications of : ○ Patches ○ Phonophoresis ○ Inotophoresis ○ Electroporation	3	6

			○ Needle array and needleless injection systems ○ Percutaneous enhancers		
	mid-term exam			1	2
4	**Novel parenteral systems**	a1, a3, a4, , b1	Principle, components, formulation, advantages, disadvantages types and applications of : : ○ Implants ○ Ocuserts	1	2
5	**Novel inhalation delivery systems**	a1, a3, a4, , b1	• Biological features affecting inhalation delivery system. • Principle, components, formulation, advantages, disadvantages types and applications of : ○ Dry solid inhaler systems	1	2
6	**Novel intravaginal delivery systems**	a1, a3, a4, , b1	• Biological features affecting newer intravaginal delivery system. • Principle, components, formulation, advantages, disadvantages and types of intravaginal systems	1	2
7	**Targeted delivery systems**	a1, a2, a3, a4, , b1	• Definition • Purposes • Biological features affecting targeted delivery system. • Principle, components, formulation, advantages, disadvantages types and applications of : ❖ cellular Types of targeted delivery systems ○ T-lymphocytes ○ Lysosome ❖ Particle Types of targeted delivery systems ○ Liposomes ○ Monoclonal antibodies ○ Plasma proteins ○ Polymeric micelles	3	6

			❖ Prodrug Types of targeted delivery systems ○ Conjugation with peptides ○ Gene (or antibodies)-directed enzyme system ○ Drug-linkage-ligand system		
Course Review		a1, a2, a3, a4, , b1	Review of the course topics by discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	7 Units

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
1.	Pellets	1	2	b3, c1,c2, c3, d1, d2, d3
2.	Microencapsulation 1	1	2	b3, c1,c2, c3, d1, d2, d3
3.	Microencapsulation 2	1	2	b3, c1,c2, c3, d1, d2, d3
4.	Floating tablets	1	2	b3, c1,c2, c3, d1, d2, d3
5.	Multiple layer tablets	2	4	b3, c1,c2, c3, d1, d2, d3
6.	Transdermal patches	1	2	b3, c1,c2, c3, d1, d2, d3
7.	Mucoadhered vaginal tablets	1	2	b3, c1,c2, c3, d1, d2, d3
8.	Liposomes	2	2	b3, c1,c2, c3, d1, d2, d3
PRACTICAL EXAM		1	2	b3, c1,c2, c3, d1, d2, d3
Total		11	22	

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Pharmacology I

level	Semester	Credit hours		
		Theory	Practical	Total
3	6	2	1	3

IV. Course Content:

A-Theoretical part

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**General pharmacology**	a1, a2, a3, b1	Introduction Pharmacology Definitions, Sources of drugs, Drug nomenclature, Routes of administration	1	2
			Pharmacokinetics Absorption, Distribution	1	2
			Pharmacokinetics Metabolism, Excretion	1	2
			Pharmacodynamics Mechanisms of drug actions, Drug/response curves, Types of drugs (agonists, antagonists)	1	2
			Pharmacodynamics , Adverse drug effects, drug-drug interactions	1	2
2	**Drugs acting on the autonomic nervous system**		Introduction to ANS Divisions of ANS, functions, neurotransmitters, receptors	1	2
			Parasympathomimetics Direct-acting drugs, indirect-acting drugs, toxicity with organo-phosphorous compounds pesticides and war gases	1	2
			Mid-term exam	1	2
			Parasympatholytics	1	2
			Sympathomimetics Direct acting drugs (selective, non-selective) , indirect acting drugs, dualist drugs	1	2
			Sympatholytics Alpha-blockers, beta-blockers , Adrenergic neuron depressants	1	2

3	**Autocoids pharmacology:**	a1, a2, a3, b1	Autocoids, Anti-histamines, serotonine agonists and antagonists, others	1	2
4	**Respiratory pharmacology**		Drugs for cough Anti-tussives, mucolytics, expectorants	1	2
			Drugs for bronchial asthma Bronchodialators, mast cell stabilizers, …etc	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	4 Units

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
1.	**Introduction to pharmacology Lab.: safety requirements, list of experiments, handling animals, how to report, etc.**	1	2	c1, d1, d2, d3
2.	**Testing of drug effects on rabbit eyes: miotics, mydriatics, normal saline**	2	4	c1, d1, d2, d3
3.	**Testing of skin irritation of dermatological products on on animals: (ciprofloxacin cream), tetracycline ointments, ketoprofen gel**	2	4	c1, d1, d2, d3
4.	**Testing of eye irritancy of solutions : eye washes**	1	2	c1, d1, d2, d3
5.	**testing of LD_{50} of drugs : warfarin, digoxin**	2	4	c1, d1, d2, d3
6.	**Pyrogen testing of parenteral injections: vitamin B complex ampoules, sterile water for injection**	2	4	c1, d1, d2, d3
7.	**Review**	1	2	c1, d1, d2, d3
PRACTICAL EXAM		1	2	
Total		12	24	

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : General Pharmacognosy II

level	Semester	Credit hours		
		Theory	Practical	Total
3	6	2	1	3

IX. Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Medicinal flowers**	a1, a2, a3, a4, , b1, b3	Study of botanical origin, microscopical features, cultivation, adulteration detection, active constituents and medical uses of the following medicinal flowers : Clove, Chammoile, Pyrethrum, Tilia, Santonica, Lavender and Saffron..	3	6
2	**Medicinal seeds**	a1, a2, a3, a4, , b1, b3	Study of botanical origin, microscopical features, active constituents and medical uses of the following medicinal bark seeds:Cardamom, Colchicine , nux vomica, Linseed, Nutmeg, Black and White Mustard, Fenugreek, Clabar and Nigella.	3	6
Mid-term exam				1	2
3	**Medicinal fruits**	a1, a2, a3, a4, , b1, b3	Study of botanical origin, microscopical features, active constituents and medical uses of the following medicinal fruits Ammi vinaga, Anise, Fennel, Caraway, Capsicum, star Anise, Coriander, Vanilla	3	6
4	**Medicinal herbs**	a1, a2, a3, a4, , b1, b3	Study of botanical origin, microscopical features, active constituents and medical uses of the following medicinal herbs : Ergot, Indian hemp, Chatharanthus, Lobelia, Peppermint, Thyme,Passiflora and Ephedra	2	4
5	**Unrecognized plant drugs**	a1, a2, a3, a4, , b1, b3	• Definition , classification, chemical and physical properties • Study of medicinal resin and resin	2	

			combinations: Colophony, Myrrh, Tolu peru, Tolu Balsam, Oliabanum and Benzoin • Medicinal gums , juices and extracts		4
Course Review		a1, a2, a3, a4, , b1, b3	Review of the course topics by discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	5 Units

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Course Intended Learning Outcomes PILOs
1.	morphology and microscopical investigation of medicinal flowers : clove	1	2	b1, b2, b4, c1, c2, c3, d1, d2, d3
2.	morphology and microscopical investigation of medicinal flowers : Saffron	1	2	b1, b2, b4, c1, c2, c3, d1, d2, d3
3.	morphology and microscopical investigation of medicinal seeds cardamom	1	2	b1, b2, b4, c1, c2, c3, d1, d2, d3
4.	morphology and microscopical investigation of medicinal seeds Black & white mustard	1	2	b1, b2, b4, c1, c2, c3, d1, d2, d3
5.	morphology and microscopical investigation of medicinal fruits Anise	1	2	b1, b2, b4, c1, c2, c3, d1, d2, d3
6.	morphology and microscopical investigation of medicinal fruits Fennel	1	2	b1, b2, b4, c1, c2, c3, d1, d2, d3
7.	morphology and microscopical investigation of medicinal fruits Capsicum	1	2	b1, b2, b4, c1, c2, c3, d1, d2, d3
8.	morphology and microscopical determination of medicinal herbs : Peppermint	1	2	b1, b2, b4, c1, c2, c3, d1, d2, d3
9.	morphology and microscopical investigation of medicinal herbs : Thyme	1	2	b1, b2, b4, c1, c2, c3, d1, d2, d3
10.	investigation of medicinal resin : Myrrh	1	2	b1, b2, b4, c1, c2, c3, d1, d2, d3
11.	investigation of medicinal gum	1	2	b1, b2, b4, c1, c2, c3, d1, d2, d3
PRACTICAL EXAM		1	2	b1, b2, b4, c1, c2, c3, d1, d2, d3
Total		12	24 equivalent to 12 credit hours	

Republic of Yemen
Ministry of Higher Education &
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Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Pharmaceutical Biochemistry

level	Semester	Credit hours		
		Theory	Practical	Total
3	6	2	1	3

X. Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Nucleic acids**	a1, a2, a3, b1, b2, b3, b4,b5	• Basic structures • Types (DNA, RNA), roles , biosynthesis and catabolism • DNA replication and mutation • DNA repair mechanism	2	4
2	**Enzymes**	a1, a2, a3, b1, b2, b3, b4,b5	• Classifications and physiological roles • Nomenclature • Factors affecting enzyme action • Enzyme kinetics • Cytochrome P450 enzymes : classification, roles, stimulation and inhibition • Pathological conditions related to enzymes.	4	8
MID-TERM EXAM				1	2
3	**Hormones and related factors**	a1, a2, a3, b1, b2, b3, b4,b5	Classification, chemical structures, biosynthesis , catabolism and Pathological conditions related to : • Anterior Pituitary gland hormones • Posterior pituitary gland hormones • Corticosteroids • Thyroxin • Insulin • Sex hormones • Others	5	10
4	**Vitamins & minerals & trace elements**	a1, a2, a3, b1, b2, b3, b4,b5	• Vitamins:Classifications , physiological/pathological roles. Sources , chemical structures, absorption, distribution , metabolic pathways . elimination, daily	3	6

			requirements • Minerals and trace elements: physiological/pathological roles. Sources , salts, absorption, distribution , metabolic pathways . elimination, daily requirements		
Course Review		a1, a2, a3, b1, b2, b3, b4,b5	Review of the course topics by discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	4 Units

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
1.	Isolation of DNA from saliva human sample	**1**	2	b4, b5, c1, c2, c3, d1, d2, d3
2.	Identification, isolation and bioassay of liver-related enzymes in blood	**2**	**4**	b4, b5, c1, c2, c3, d1, d2, d3
3.	Identification, isolation and bioassay of Myocardial infarction-related enzymes in blood	**1**	4	b4, b5, c1, c2, c3, d1, d2, d3
4.	bioassay of thyroid hormones	**1**	2	b4, b5, c1, c2, c3, d1, d2, d3
5.	bioassay of sex hormones : testosterone, estrogen in blood	**2**	4	b4, b5, c1, c2, c3, d1, d2, d3
6.	Identification, isolation and bioassay of minerals in urine	**1**	2	b4, b5, c1, c2, c3, d1, d2, d3
PRACTICAL EXAM		**1**	**2**	b4, b5, c1, c2, c3, d1, d2, d3
Total		**9**	**18**	

Republic of Yemen
Ministry of Higher Education &
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Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : First aid

level	Semester	Credit hours		
		Theory	Practical	Total
3	VI	2	-	2

Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction to first-aid**	a1, a2, a3, a4	• Definition, concept and history of fist aid • objectives and responsibilities of first aid • role of pharmacist in assisting health care team in providing first-aid to patients. • General principles of first-aid	2	4
2	**First aid of injuries , bleeding, burn , bites**	a1, a2, a3, a4, b1	• Handling of chemicals • First aid of poisoning • First aid of cuts: injuries, bleeding • first-aid of burns & sunburn & frost • first-aid of animal bites, stings • First aid Hit accident	5	10
Mid-term exam				1	2
3	**First aid of conditions affecting, respiratory systems and CVS and CNS**	a1, a2, a3, a4, b1	• First aid of asphyxia • first aid of hypotension & shock • first aid of cardiac arrest • First aid of seizure • First aid of coma	7	14
Course Review		a1, a2, a3, a4, b1	Review of the course topics by discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	3 Units

Republic of Yemen
Ministry of Higher Education &
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Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Pharmaceutical microbiology II

level	Semester	Credit hours		
		Theory	Practical	Total
3	VI	2	1	3

Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Microbiology relation to pharmacy**	a1, a2, a3, a4, b1, b2, b3, b4, b5, b6 , d2	• Missions of Microbiology lab. as a part of quality control in drug factories • Research : Types of microbiological investigations in relation to pharmaceutical studies (e.g. antimicrobial activity)	1	2
2	**Microbial content**	a1, a2, a3, a4, b1, b2, b3, b4, b5, b6 , d2	• Methods of bacterial investigations counting in a sample of : raw material, air and environment and pharmaceutical product.	2	4
3	**Measurement of antimicrobial activity**	a1, a2, a3, a4, b1, b2, b3, b4, b5, b6 , d2	• Factors to be controlled in the measurement of antimicrobial activity: origin of organism, composition and pH of culture media, exposure and incubation conditions, inoculum concentration and physiological state • Antibiotic biological assay techniques: agar diffusion, disc diffusion , well method, etc.; common control antibiotics for different bacteria and fungi; measurement of inhibition zone, MIC	3	6
Mid-term exam				1	2
4	**Microbiological quality of pharmaceutical materials.**	a1, a2, a3, a4, b1, b2, b3, b4,	➢ Pharmacopeial specifications and tests of **Non-sterile products** ○ Environmental monitoring ○ Detection of specific	4	

		b5, b6 , d2	hazardous organisms ➢ Pharmacopeial specifications and tests of **sterile products** ○ Sterilization methods ○ Sterility tests		8
5	**Preservation Of pharmaceutical products**	a1, a2, a3, a4, b1, b2, b3, b4, b5, b6 , d2	• Preservative: definition, classification; common concentration used • Preservative efficacy test: choice of organism and inoculum; reason that deactivate preservatives	2	4
6	**Evaluation of disinfectant**	a1, a2, a3, a4, b1, b2, b3, b4, b5, b6 , d2	• Common types of disinfectant and their activity against microbes • Testing of disinfectant efficacy	1	2
7	**Microbial resistance**		• Biological and other reasons of microbial resistance to antimicrobial • Common examples of microbial resistance • General measure to reduce microbial resistance	1	2
Course Review		a1, a2, a3, a4, b1, b2, b3, b4, b5, b6 , d2	Review of the course topics by discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	7 Units

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
1.	**Preparation of a sample and inoculum for investigation of microbial content of staphylococcus aureus . Samples are (1. raw pharmaceutical material e.g. vitamin c) , 2. air sample**	**2**	**4**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
2.	**Preparation of a sample and inoculum for investigation of microbial content of E.coli Samples is Sterile product: Voltaren ampoule**	**1**		**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
3.	**Antimicrobial activity test test against any available bacteria Test : standard antibiotic vs. ceftriaxone 1 g vial (Disc method)**	**1**	**2**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
4.	**Antimicrobial activity test against any available bacteria test: standard antibiotic vs. tetracycline ointment(Well method)**	**1**	**2**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
5.	**Antimicrobial activity test : standard vs. procaine penicillin vial powder (dilution method)**	**1**	**2**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
6.	**Determination of MIC of antimicrobial**	**1**	**2**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
7.	**Preservative (e.g. benzoic acid) efficacy test**	**1**	**2**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
8.	**Review**	**1**	**2**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
PRACTICAL EXAM		**1**	**2**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
Total		**10**	**20**	

Republic of Yemen
Ministry of Higher Education & Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Pharmacology II

level	Semester	Credit hours		
		Theory	Practical	Total
4	VII	2	-	2

Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**CNS pharmacology**	a1, a2, a3, b1	Introduction to CNS Neurotransmitters in CNS, receptors, …etc	1	2
			Sedatives,hypnotics & anxiolytics Benzodiazepines, barbiturates, newer drugs, …etc	1	2
			Anti-epileptic drugs Phenytoin, carbamazepine, valproic acid, newer drugs	1	2
			Drugs used for Parkinsonism Dopaminergic agonists, central anticholinergic drugs	1	2
			Anti-psychotic drugs Phenothizines, butyrophenones, atypical drugs,	1	2
			Anti-depressant drugs Tricyclic drug, atypical	1	2
			Narcotic analgesics Natural opium alkaloids, synthetic opiates	1	2
			Non-narcotic analgesics NSAIDs	1	2
			Mid-terms exam	1	2
			General anesthetics General anesthesia, preanesthetic medication	1	2
			Local anesthetics , general anesthetic and pre-anesthetic medications	1	2
2	**GIT pharmacology**	a1, a2, a3, b1	Drugs for peptic ulcer and hyperacidity Antiacids, H_2 receptor blockers, proton pump inhibitors, …etc	2	4
			Drugs for constipation Purgative drugs	1	2
			Drugs for diarrhea Anti-diarrheal drugs, rehydration therapy	1	2
FINAL – EXAM				1	2
TOTAL				16	32

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Phytochemistry I

level	Semester	Credit hours		
		Theory	Practical	Total
4	VII	2	1	3

IV. Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction to phytochemistry**	a1, a2, a3, a4	Definition, brief history, types (conventional, medicinal) Scope of medicinal phytochemistry Phytochemicals : Definition , evolution process, clarification, chemical classification , physicochemical properties	1	2
2	**Extraction of phytochemicals**	a1, a2, a3, a4	**Extraction techniques** Maceration, percolation, soxhlet extractor: principle, apparatus, applications Spouted bed extraction Superficial fluid extraction Solid-phase microextraction	2	4
3	**Separation and isolation of phytochemicals**	a1, a2, a3, a4	**Sublimation , Distillation , Fractional liberation , Fractional crystallization :** principle, apparatus, applications **Chromatography** principle, brief history, types and selection of stationary phase and mobile phase, general factors affecting separation **adsorption chromatography**: **Thin layer chromatography** principle and procedures applications preparative TLC illustrative examples of phytochemicals isolated by TLC **partition chromatography: Paper chromatography**: principle , procedures and application	3	6

			□ **Simple Column chromatography**: Introduction and principle, components, procedures.		
MID-TERM EXAM				1	2
4	**Alkaloids**	a1, a2, a3, a4, b1, b2, b3, b4, b5	Introduction:definition,history,occurrence,classification,nomenclature,physical and chemical properties, isolation, purification and detection. □Phenylalkylamine alkaloids (ephedrine, cathinone and capsaicinoide) □ Isochinolin alkaloids(papaverine, morphine,codeine and emetine) □ Tropolon alkaloids(colchicines and demecolcine) □ Amaryllidaceen alkaloids(lycorine and galanthamin) □ Alkaloids derived from tryptophan □ Indol-alkaloids(physostigmine,carboline,ergoline,ajmalicine,yohimbine, ajmaline and strychnine type) □ Chinoline alkaloids(cinchona alkaloids) □ Alkaloids derived from histidine: (pilocarpine,isopilocarpine and pilosine) □ Alkaloids derived from asparagic acid :(ricinine and nicotine alkaloids) □ Alkaloids derived from lysine piperidine alkaloids(piper,lobelia and pomergranate alkaloids) □ chinolizidine alkaloids(lupinine,sparteine and cytosine) □ Alkaloids derived from ornithine:tropan alkaloids(atropine, hyoscyamine , scopolamine and cocaine)chinazoline alkaloids(tetradoxine) □ Alkaloids derived from glycine:purine alkaloids (caffeine,theophylline and theobromine)terpen alkaloids(monoterpen,sesquiterpen and diterpen alkaloids)	4	8
5	**Terpenoids**	a1, a2, a3, a4, b1, b2,	□ Introduction	3	

		b3, b4, b5	(definition,classification,biosynthesis and distribution) □ Monoterpens (regular and irregular monoterpenoids,iridoids,structures,chemical and physical properties and drugs containing monoterpenoids) □ Sequiterpens and sequiterpens lactones(structures,chemical and biological properties and drug containing sequiterpens and sequiterpens lactones) □ Diterpenes(structures,chemical and biological properties and drug containing diterpenes) □ Triterpenes(classification,structures and drug containing triterpenes) Tetraterpenes(chemical and biological properties,vitamin A and drug containing tetraterpenes).		6
Course Review		a1, a2, a3, a4, b1, b2, b3, b4, b5	Review of the course topics by discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	5 Units

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
physicochemical properties , extraction (maceration or percolation or soxhlet extraction) , concentration (if necessary " rotary evaporation', isolation (Thin layer chromatography) and identification of the phytochemicals from crude drugs or parts of medicinal plants				
1.	**alkaloids (Caffeine)**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
2.	**alkaloids (Theophylline)**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
3.	**alkaloids (cathinone)**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
4.	**alkaloids (Trigonelline)**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
5.	**alkaloids (vincristine)**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
6.	**alkaloids (Capsaicin)**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
7.	**Terpenoids : (Prenol)**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
8.	**Terpenoids : (Eucalytol)**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
9.	**Terpenoids : (Retinol)**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
10.	**Terpenoids : (squalane)**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
11.	**Review**		**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
PRACTICAL EXAM		**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
Total		**12**	**24**	

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Toxicology

level	Semester	Credit hours		
		Theory	Practical	Total
4	VII	2	1	3

IV. Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction to toxicology**	a1, a2, a3, a4, , b1	• Definitions • fundamentals and scope of toxicology. • Classification of poisons • Causes of toxicity : accidental, commit suicidal, criminal • General harmful effects of poisons • Approaches to manage poisoning • Mode of actions of poisons • Diagnosis and detection of poisoning • General procedure of management of poisoning	1	2
Sources, mode of action, toxic pathophysiological effects, detection, diagnosis and management of the following types of toxicity					
2	**Poisoning with acids and alkalis**	a1, a2, a3, a4, , b1	• Acids toxicity • Alkalis toxicity • Salts toxicity	1	2
3	**Poisoning with metals and metalloids**	a1, a2, a3, a4, , b1	• Toxicity of copper, selenium, Molybdenum, phosphorus • Iron toxicity	2	4
4	**Poisoning with heavy metals**	a1, a2, a3, a4, , b1	Toxicity of Lead, Mercury and Arsenic	2	4
MID-TERM EXAM				1	2

5	**Poisoning with specific chemicals**	a1, a2, a3, a4, , b1	• Cynide • Hydrogen sulfide • Carbon monoxide	2	4
6	**Poisoning with simple organic compounds**	a1, a2, a3, a4, , b1	• Methanol and Isopropyl Alcohols • hydrocarbons • fuel materials : petroleum , gasoline, etc	2	4
7	**Poisoning with materials killing harmful Living organisms**	a1, a2, a3, a4, , b1	• Rodenticides, • insecticdes • herbicides • Fungicides	2	4
8	**Poisoning with some medicinal agents**	a1, a2, a3, a4, , b1	• Poisoning with opiates, benzodiazepines • Poisoning with paracetamol and aspirin	1	2
Course Review		a1, a2, a3, a4, , b1	Review	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	8 Units

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
Detection of poisons in biological samples (vomits, urine, blood, tissues,etc)				
1.	**Acids**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
2.	**alkalis**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
3.	**Metals**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
4.	**Heavy metals 1**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
5.	**Heavy metals 2**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
6.	**Insecticides**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
7.	**Herbicides**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
8.	**Fungi**cides	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
9.	**diazepam**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
10.	**Aspirin**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
11.	**Pracetamol**		**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
PRACTICAL EXAM		**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
Total		**12**	**24**	

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Medicinal chemistry I

level	Semester	Credit hours		
		Theory	Practical	Total
4	VII	2	1	3

XI. Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
Part I: Introduction to medicinal chemistry					
1	**Medicinal chemistry roles and concepts**	a1, a2, a3	• definitions, brief history, roles in pharmacy • Basics of combinatorial chemistry and drug design : patent burst, synthesis of fragments, etc. • Pharmacophore and Physicochemical properties in relation to biological activity (structure-activity relationship "SAR").	2	4
2	**Drug-receptor interaction &Stereochemistry of drugs**	a1, a2, a3	• binding and drug-receptor interaction : chemical bonding and biological activity • stereochemical aspects of drug action • isosterism and bioisosterism	2	4
3	**chemistry of Drug metabolism**	a1, a2, a3	• phase I reactions • phase II reactions • Metabolites: inactive, active , more active	2	5
Mid-term exam				1	2
Part II: Chemistry of drugs affecting autonomic systems and skeletal muscles					
4	**Drugs acting on the autonomics nervous system**	a1, a2,a3 , b1, b2,	**Physicochemical properties, synthesis, purification, structure-activity relationship, metabolism of drugs acting**	3	

		b3, b4	**on sympathetic system** • Indirectly sympatholytic drugs • Directly sympatholytic drugs : adrenergic blocking agents • Indirectly sympatholytic drugs • Directly sympatholytic drugs : adrenergic blocking agents		6
		a1, a2,a3 , b1, b2, b3, b4	**Physicochemical properties, synthesis, chemical & common names, structure-activity relationship, metabolism of drugs acting on parasympathetic system** • Indirectly parasympathomimetics • Direct parasympathomimetics : cholinergic agonists • Indirectly parasympatholytic drugs • Directly sympatholytic drugs : cholinergic blocking agents • **Drugs acting on autonomic ganglia:** Ganglionic stimulants, ganglionic • **Neuromuscular blocking agents**	2	4
5	**Drugs affecting autacoids**	a1, a2,a3 , b1, b2, b3, b4	**Physicochemical properties, synthesis, chemical & common names, structure-activity relationship, metabolism of drugs acting on parasympathetic system** • Antihistamines • Serotonine agonists and antagonists	1	2
6	**Drugs for Respiratory system disorders**	a1, a2,a3 , b1, b2, b3, b4	**Physicochemical properties, synthesis, chemical & common names, structure-activity relationship, metabolism of** • Drugs for bronchial asthma • Drugs for cough	2	4
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	6 Units

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
1.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: adrenergic agonist : adrenaline**	**1**	**2**	**c1, c2, d1, d2, d3**
2.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: adrenergic blockers : atenolol**	**1**	**2**	**c1, c2, d1, d2, d3**
3.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: parasympathomimetics : neostigmine**	**1**	**2**	**c1, c2, d1, d2, d3**
4.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: cholinergic blockers : atropine**	**1**	**2**	**c1, c2, d1, d2, d3**
5.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: skeletal muscle relaxants suxamethonium**	**1**	**2**	**c1, c2, d1, d2, d3**
6.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: drugs affecting autacoids disorders : chlorpheniramine.**	**1**	**2**	**c1, c2, d1, d2, d3**
7.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: drugs affecting respiratory system: aminophylline**	**1**	**2**	**c1, c2, d1, d2, d3**
8.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: drugs affecting respiratory system: dextromethorphan**	**1**	**2**	**c1, c2, d1, d2, d3**
9.	**Synthesis of drugs**	**1**	**2**	**c1, c2, d1, d2, d3**
10.	**Purification of drugs.**	**1**	**2**	**c1, c2, d1, d2, d3**
PRACTICAL EXAM		**1**	**2**	**c1, c2, d1, d2, d3**

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Pathophysiology

level	Semester	Credit hours		
		Theory	Practical	Total
4	VII	2	-	2

Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
Etiology, risk factors, progress , stages , clinical features , investigation and complications of the following diseases					
1	**Alimentary system diseases/ disorders**	a2, a2, b1, b2, b3, b4, b5, d2	vomiting, diarrhoea , Peptic ulcer, , irritable-bowel syndrome, hepatic failure	2	4
2	**respiratory system diseases/ disorders**	a2, a2, b1, b2, b3, b4, b5, d2	Bronchial asthma , cough	2	4
3	**CVS system diseases/ disorders**	a2, a2, b1, b2, b3, b4, b5, d2	hypertension , angina, arrhythmia, congestive heart failure.	2	4
MID-TERM EXAM				1	2
4	**Renal system diseases/ disorders**	a2, a2, b1, b2, b3, b4, b5, d2	renal failure, patients on haemodialysis	2	4
5	**Endocrinologic diseases/ disorders**	a2, a2, b1, b2, b3, b4, b5, d2	diabetes mellitus, thyroid disorders, infertility	2	4
6	**Neurological diseases/ disorders**	a2, a2, b1, b2, b3, b4, b5, d2	epilepsy, depression , psychosis	1	2
7	**Infective diseases/ disorders**	a2, a2, b1, b2, b3, b4, b5, d2	bacteremia , septicemia, AIDS	2	4

Course Review	a2, a2, b1, b2, b3, b4, b5, d2	Review and discussion session of the studied topics.	1	2
FINAL - EXAM			1	2
TOTAL			16	32
Number of Weeks /and Units Per Semester			16 weeks	7 Units

Republic of Yemen
Ministry of Higher Education & Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Biotechnology

level	Semester	Credit hours		
		Theory	Practical	Total
4	VII	2	-	2

XII. Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction to Biotechnology**	a1, a2, a3, a4, b1, b2	• definition & purposes & brief history. • Relation of biotechnology to advancement in intracellular chemistry, molecular biology, rDNA technology, pharmacogenomics and immunopharmacology. • living organisms used in biotechnology	2	4
2	**Techniques of Biotechnology**	a1, a2, a3, a4, b1, b2	• Classification of biotechnology techniques • Principles, equipments, pharmaceutical applications, comparison , advantages and disadvantages of : ○ recombinant DNA (rDNA). ○ Monoclonal antibodies ○ Polymerase chain Reaction (PCR) ○ Nucleotide blockade/antisense ○ Peptide technology	4	8
3	**Analysis of genes**	a1, a2, a3, a4, b1, b2	• DNA isolation and purification • Genetic analysis	1	2
			• MID-TERM EXAM • Post-exam disussion	1	2
4	**biotechnology produced-Drugs**	a1, a2, a3, a4, b1, b2	• Classification of biotechnology drugs • advantage and disadvantages of biotechnology drug products as compared to classical medications	6	

			• Proteins as the first biotechnology products of biotechnology • Physicochemical properties, Indication, mechanism of action, dose, route of administration, precautions, biotechnology by which is obtained for the following products, : o Anticoagulant drug: Lepirudin (Refludan) ® o Antisense drugs : Fomivirsen sodium (Vitravene), efavirenz (Sustiva)® o Clotting factors : Systemic antihemophilic factors (Kogenate) ® o colony-stimulating factors: granulocyte colony–stimulating factor (Filgrastim)® o Erythropoietins : Epoetin alfa (Epogen, Procrit) ® o Fusion inhibitors: Enfuvirtide (Fuzeon) ® o Growth factor: becaplermin (Regranex) ® o Human growth hormone: ystemic growth hormone (Humatrope, o protropin) ® o Interferons: interferon beta-1b (betaseron), interferon beta-1a (Avonex) ® o Interleukins: Aldesleukin (Proleukin) ® o tissue plasminogen activators: recombinant Alteplase (Activase) ® o Vaccines: hepatitis B vaccine recombinant (Engerix-b) ®, haemophilus B conjugate vaccine (Hibtiter) ®		12
Course Review		a1, a2, a3, a4, b1, b2	Review of the course topics by discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				16	32

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Biiopharmaceutics & Pharmacokinetics I

level	Semester	Credit hours		
		Theory	Practical	Total
4	VII	2	-	2

Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction to biopharmaceutics**	a1, a2, a3, a4, , a6, a7, b1, b2	Definition and significance of biopharmaceutics and bioavailability. relation of biopharmaceutics to other pharmaceutical sciences correlation between bioavailability & dug efficacy Expressions of drug bioavailability factors affecting bioavailability Introduction to steps for drug bioavailability	1	2
2	**Steps and pharmacokinetic processes involved in drug bioavailability**	a1, a2, a3, a4, , a6, a7, b1, b2	**1. Pre-absorption steps (For Non-I.V route)** **Drug Release** Definition, significance , Expression parameters (cumulative % release, drug release rate) Mechanisms and governing equations : Fick`s law, Higuchi equation, Peppas equation (matrix diffusion, membrane diffusion, Fickian, Non-Fickian, controlled) **Drug dissolution** Definition, significance , Expression parameters (cumulative % dissolved, dissolution rate), Mechanisms and governing equations : Noyes-Whitney equation	1	2
		a1, a2, a3, a4, , a6, a7, b1, b2	**2. Pharmacokinetics processes** **Drug absorption** Definition, significance Expression parameters (cumulative % absorbed, absorption rate, absorption rate constant)	2	4

			□ Mechanisms and governing equations , properties and examples of drugs absorbed by each mechanism.Passive diffusion (transcellular) : Fick`s law. o Carrier-mediated : Active transport, facilitated diffusion, o Convective (paracellular) transport, ion-pair transport, endocytosis		
		a1, a2, a3, a4, , a6, a7, b1, b2	**metabolism (biotransformation)** Definition, significance of , Expression parameters: volume of distribution and related equations (related to blood flow, dose and plasma concentration, Mechanisms (passive diffusion, active transport), steps and sites of distribution □ Definition, significance of drug biotransformation, Outcomes (products: active, inactive metabolite) with examples of drugs □ Sites of metabolism: resystemic (first-pass effect), hepatic with examples of drugs highly influenced by presystemic metabolism. □ Mechanisms (phases Reaction): phase I and phase II: types of reactions, examples of drugs , Affecting factors : Biological Factors , pharmaceutical factors and Exogenous factors **drug excretion** □ Definition, significance □ Renal excretion : the nephron anatomy □ Properties of drugs excreted by the kidneys, Mechanisms: glomerular filtration, active tubular secretion, Tubular reabsorption, Factors affecting each excretion mechanism: biological, pharmaceutical and exogenous factors □ Excretion from the liver and other organs and the enterhepatic circulation	2	4
mid-term exam				1	2
3	**Biological factors affecting drug pharmacokinetics**	a1, a2, a3, a4, , a6,	• Anatomical/Physiological factors affecting drug absorption, distribution metabolism, excretion	3	6

	and bioavailability	a7, b1, b2	and bioavailability. • Pathological (Disease) factors affecting drug absorption, distribution metabolism, excretion and bioavailability.biological factors affecting drug metabolism " • Genetic factors affecting drug absorption, distribution metabolism, excretion and bioavailability.		
4	**Pharmaceutical factors affecting drug pharmacokinetics and bioavailability**	a1, a2, a3, a4, , a6, a7, b1, b2	• factors affecting related to drug physicochemical properties • factors related to excipients • factors related to formulation (dosage forms) • factors related to manufacturing method.	2	4
5	**Influence of food and co-administered drugs on a drug pharmacokinetics and bioavailability**		• Food drug-interactions&Drug-drug interactions	1	2
6	**Biopharmaceutical studies**	a1, a2, a3, a4, , a6, a7, b1, b2	• Biopharmaceutical classification scheme • In vivo studies: Pharmacokinetic and pharmacodynamics Bioavailability study (For a new drug): absolute bioavailability, definition, equation, • Bioequivalence study : relative bioavailability, definition, equation • In vitro studies : Drug release and dissolution studies (in fasted and feed state) in fluid simulant to that the g.i.t fluid, In vitro Stability of drug in fluid simulant to those of g.i.t, Permeability studies (partition coefficient determination, Ex vivo permeation studies • IVIVC : in vivo in vitro correlation studies	2	
FINAL - EXAM				1	2
TOTAL				16	32

Republic of Yemen
Ministry of Higher Education & Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Clinical chemistry

level	Semester	Credit hours		
		Theory	Practical	Total
4	VIII	2	-	2

Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1.	**Introduction to Clinical chemistry**	a1, a2	- Role of clinical chemistry in diagnosis of diseases.	1	2
2.	**Disorders of carbohydrates metabolism**	a1, a2	- Glucose level in normal blood, renal threshold, hyper and hypoglycemia and glycosuria. - Intravenous and other types of glucose tolerance tests. - Fructose levels in blood lab diagnosis of early and latent diabetes mellitus. - Diabetic coma, secondary degenerative changes associated with diabetes mellitus. - Glycogen storage disorders.	2	4
3.	**Disorders of lipid metabolism**	a1, a2	- Plasma lipoproteins, cholesterol, triglycerides and phospholipids in health and Diseases. - Disorders cause ketosis, fatty liver, and Ketogenesis. - Abnormalities of essential fatty acid and eicosanoids phospholipids synthesis.	1	2
4.	**Metabolism disorders of Gastrointestinal tract**	a1, a2	- Lab findings and differential. - Diagnosis of jaundice. - Abnormalities in metabolism of bilirubin, cirrhosis, hepatic coma, hepatitis, gall stones, cholecystitis and tumors.	1	2
Mid-term Exam				1	2
5.	**Metabolism disorders of Excretory system**	a1, a2	- Biochemical changes and laboratory findings in acute and chronic renal failure. - Urinary calculi, renal hypertension. - Principles of peritoneal and hemodialysis. - Urinalysis for normal and abnormal constituents.	1	2

6.	**Inherited disorders of metabolism**	a1, a2	- Changes occurring in phenyl ketonuria, alkaptonuria, tyrosinosis, albinism, Hartnup's disease, galactosemia. - Tay-Sach's disease, Niemann, Pick's disease, Hunter's and Hunter's syndrome, Lysh-Nyhan syndrome. - Detection of these abnormalities.	1	2
7.	**Fluid and electrolyte disorders**	a1, a2	- Regulation of fluid and electrolyte. - disturbances of fluid and electrolyte balance. - Laboratory parameters in the diagnosis and management of fluid and electrolyte disorders. - Oral rehydration therapy. - Composition of cerebrospinal fluid (CSF) in normal and diseases. - Laboratory findings of CSF constituents in health and disease.	2	4
8.	**Clinical Enzymology**	a1, a2	- Introduction to Enzyme. - Enzymes of clinical importance and their methods of determination in biofluids. - Importance of estimation of enzyme activity in various disease states.	1	2
9.	**Laboratory tests and analytical methods**	a1, a2	- Used in identification and evaluation of hepatobiliary disorders. - Stomach, pancreas and intestinal tract– procedure and tests used in the diagnosis and treatment of gastro intestinal diseases. - Overview of porphyrins, their precursors, primary and secondary disorders of porphyrin metabolism– diagnostic laboratory methodologies including appropriate specimen collection and preservation techniques related to porphyrins. - Overview of clinical toxicology– Screening procedures for detection of drugs. Drugs of abuse and their evaluation. - Toxic metals– Lead, Mercury, Arsenic, Cadmium and Chromiun– Toxicity and their evaluation.	2	4
10.	**Pediatric Clinical chemistry**	a1, a2	- Problems in specimen collection and capillary specimens. Special problems in pediatrics: ○ Respiratory distress syndrome; - Neonatal hyperbilirubinemia; cystic fibrosis;	2	4

			neuroblastoma (VMA, HVA); ○ Gastrointestinal disease (fat absorption, disaccharide intolerance, protein-losing enteropathy, Down syndrome. ○ Heavy metal poisoning. Neonatal health management; Vaccination in Newborn babies, ○ Recommended immunization schedule.		
11.	**Course Review**	a1, a2	Review of the course topics by discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				17	34
Number of Weeks /and Units Per Semester				17	7 units

Republic of Yemen
Ministry of Higher Education & Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Biopharmaceutics & Pharmacokinetics II

level	Semester	Credit hours		
		Theory	Practical	Total
4	VIII	2	-	2

Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction and Mathematical fundamentals**	a1, a2, a3, a4, b1, b2	• Definition and Objectives of pharmacokinetic and biopharmaceutical studies • Common logarithm (log) , natural logarithm (ln), base exponent (e-x) • XY data demonstration: tabular form, graphical form (semilog paper, rectangular coordinate paper), Straight line : general equation, determination of slope and rate constant graphically on, semilog paper, rectangular coordinate paper.	2	4
2	**Clinical aspects of Pharmacokinetic and biopharmaceutical studies**	a1, a2, a3, a4, b1, b2	• **Subjects :** Volunteers specifications: number, gender, weight, height, body surface area, race • **Drug Dosing :** drug administration, water intake, fed/fasting states. • **Post-dosing:** 1- Sampling: blood, urine , others (advantages, disadvantage), interval of sampling, considerations of sampling. 2- Analysis of sample	1	2
3	**Determination of cumulative drug eliminated in urine**	a1, a2, a3, a4, b1, b2	**Analysis of urine samples: urine data:** time of sampling virusAmount excreted at a time (D_t), cumulative amount of drug excreted at a time (Du), excretion rate ($D_t/\Delta t$), total cumulative amount of drug excreted 0- ∞ (Du_∞), Graphical methods	2	4

4	**Order of kinetics and Pharmacokinetics Models**	a1, a2, a3, a4, b1, b2	**The order of kinetic :**definition of kinetic order, significance and types (first order, zero order), mathematical and graphical determination. **Pharmacokinetic models of distribution** Definition of model, significance, types (one-compartment, two compartments, three compartment) and principle of each model, graphical and mathematical determination.	3	6
Mid-term exam				1	2
5	**Pharmacokinetics of drugs given by intravenous(bolus) administration**	a1, a2, a3, a4, b1, b2	**I.V. Bolus** **From Blood data (Cpvs time)** 1- Determine model and order of kinetic 2- General equations of Cp and $Cp^0$for one-compartment model, two compartment model and three compartment model 3- Determine other parameters: elimination rate constant,half-life ($t_{1/2}$), clearance (Cl) distribution rate constant, AUC^{∞}, **Distribution:**volume of distribution (VD)	2	4
6	**Pharmacokinetics of drugs given by intravenous infusion**	a1, a2, a3, a4, b1, b2	**I.V. multiple bolus dosing :** One-compartment assuming first order elimination , general equation of Cp, Determine Cp^0 , determine distribution and elimination parameters, determine specific data (Cmax, Cmin, Cmax∞, Cmin∞, CP∞, Css) **I.V. infusion: one-compartment model at constant infusion rate:** General equation of Cp, specific data (rate of infusion(R), steady state concentration Css, maintenance dose Dm, loading dose D_L) , determine distribution and elimination parameters. **I.V. infusion: one-compartment model at changing infusion rate:**	2	4

			General equation of Cp, specific data (rate of infusion(R), steady state concentration Css, maintenance dose Dm, loading dose D_L), determine distribution and elimination parameters. **I.V. bolus followed by IV. infusion:** General equation of Cp, specific data (rate of infusion(R), steady state concentration Css, maintenance dose Dm, loading dose D_L), determine distribution and elimination parameters.:		
7	**Pharmacokinetics of single dose of given by extravascular (oral, I.M., rectal , etc.)**	a1, a2, a3, a4, b1, b2	**Blood data** • Cp versus time curve • General equation of Cp • **Absorption parameters:**Ka, F, Cmax, Tmax Dab, Dab∞, *f*ab (fraction absorbed) , *f*ua (fraction unabsorbed), • **Elimination parameters:** k, half-life , Cl **Urine data** • One-compartment : first-order elimination, zero order elimination, ARE versus time	2	4
8	**Pharmacokinetics of multiple dosing of drug given by extravascular (oral, I.M., rectal , etc.)**	a1, a2, a3, a4, b1, b2	• One-compartment assuming firstorder elimination: (Cmax, Cmin, Cmax∞, Cmin∞, CP∞, CSS,)	1	2
9	**Specific Pharmacokinetics calculations**	a1, a2, a3, a4, b1, b2	**Calculations of :** • Loading and maintenance doses • Doses and dosage interval at change from I.V. infusion to oral administration. • Changes in plasma concentration with change in route of administration. • Dose in the elderly	1	2

10	**Calculation of bioavailability and bioequivalence**		• Absolute bioavailability • Relative bioavailability • Determination of Bioequivalence • IVIV correlation calculations	1	2
FINAL – EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	10 Units

Republic of Yemen
Ministry of Higher Education & Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Pharmacology III

level	Semester	Credit hours		
		Theory	Practical	Total
4	VIII	2	-	2

Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Cardiovascular and blood pharmacology**	a1, a2, a3, b1	Drugs affecting kidney Diuretics (high efficacy, medium efficacy, adjuvant drugs)	1	2
			Anti-hypertensive drugs ACE-inhibitors, AR-blockers, Ca-channel blockers, …etc.	1	2
			Management of congestive heart failure Cardiac glycosides, inodilators, …etc	1	2
			Anti-arrhythmic drugs Class-I, class-II, class-III, class-IV	1	2
			Drugs for ischemic heart diseases Anti-anginal drugs	1	2
			Drugs affecting blood coagulation Anti-platelet drugs, anti-coagulants, thrombolytics	1	2
			Drugs used for hyper-lipidemia Statins, fibrates, resins, …etc	1	2
			Drugs used for anemia Hematinics, folic acid, vit B12	1	2
			Mid-term exam	1	2
2	**Drugs for endocrine systems disorders**	a1, a2, a3, b1	Pituitary, hypothalamic, thyroid & parathyroid hormones GH, FSH, LH, ACTH, TSH, ..etc, T_3, T_4, calcitonin, parathormone, anti-thyroid drugs	1	2
			thyroid & parathyroid hormones T_3, T_4, anti-thyroid drugs	1	2
			Drugs used for diabetes mellitus Insulin, oral hypoglycemic drugs	1	2
			Sex hormones Female sex hormones , contraceptives	1	2
			Adrenal cortex hormones Glucocorticoids, other immunosuppressant drugs	1	2

			Drugs affecting bone, parathyroid hormones Drugs used for osteoporosis, calcitonin, parathormone, …etc	1	2
FINAL - EXAM				1	2
TOTAL				16	32

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Phytochemistry II

level	Semester	Credit hours		
		Theory	Practical	Total
4	VIII	2	1	3

IV. Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Phenyl propane derivatives**	a1, a2, a3, a4, b1, b2, b3, b4, b5	Introduction(definition, classification, biogenesis) **Hydroxycinnamic acids (** Definition, classification, biosynthesis, chemical structure, physic-chemical properties, extraction , pharmacological properties and uses **Cinnamic aldhydes and monlignols (** Definition, classification, biosynthesis, chemical structure, physic-chemical properties, extraction , pharmacological properties and uses **Coumarins (** Definition, classification, biosynthesis, chemical structure, physic-chemical properties, extraction , pharmacological properties and uses **Stilbenoids (** Definition, classification, biosynthesis, chemical structure, physic-chemical properties, extraction , pharmacological properties and uses	3	6
2	**Volatile oils**	a1, a2, a3, a4, b1, b2, b3, b4, b5	Definition, classification, distribution and occurrence; Extraction : distillation methods and solvent extraction ; Chemical , physical and pharmacological properties examples of crude drugs containing volatile oils	3	6
Midterm exam				1	2
3	**Glycosides**	a1, a2, a3, a4, b1, b2,	Introduction (definition, classification, distribution, extraction, isolation and pharmacological properties)	3	

		b3, b4, b5	**Cardioactive glycosides (**cardinolides, bufadienolides, sugars, structure activity relationship, distribution, extraction, chemical and physical properties, hydrolysis of cardiac glycosides, biogenesis, pharmacological properties , mechanism of action, chemical tests. Chief drugs containing cardiac glycosides (Digitalis, strophanthus, Adonis, Convalaria and squill). **Saponin glycosides** (definition, classification, distribution, structures,biogenesis,chemical , physical properties , characterization, biological and pharmacological properties. Drugs as expectorant ,antitusive, antiexudative, adaptogens and diuretic) **Anthracen glycosides** (classification, distribution, structures, biosynthesis, extraction , chemical, physical properties, characterization, pharmacological properties, Senna, Rhabarub and Aloe) **Flavonoid glycosides**(classification, biosynthesis, chemical structure, physic-chemical properties, rutin, hesperidin and flavonoid containing drugs) **Cynogentic glycosides** (cynogenesis, distribution, structures, biogenesis, detection, extraction, pharmacological activities and cynogenetic drugs) **Glucosinolates**(**Thioglycosides):** definition, distribution, structures, biogenesis , hydrolysis, toxicity and drugs containing glucosinolates.		6 6
4	**Tannins**	a1, a2, a3, a4, b1, b2, b3, b4, b5	definition, classification, structure, distribution, biosynthesis, physic-chemical properties, extraction, biological properties , examples of crude drugs containing tannins	1	2

5	**Steroids**	a1, a2, a3, a4, b1, b2, b3, b4, b5	Definition, classification, structures , biogenesis, chemical and physical properties and characterization.	1	2
6	**Miscellaneous e.g. bitter principles**	a1, a2, a3, a4, b1, b2, b3, b4, b5	Definition, classification, structures , biogenesis, chemical and physical properties and characterization.	1	2
Course Review		a1, a2, a3, a4, b1, b2, b3, b4, b5	Review of the course topics by discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	6 Units

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
physicochemical properties , extraction (maceration or percolation or soxhlet extraction) , concentration (if necessary " rotary evaporation', isolation (Thin layer chromatography) and identification of the phytochemicals from crude drugs or parts of medicinal plants				
1.	Phenyl propane derivatives : **(cinnamic aldehyde)**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
2.	**Volatile oils (peppermint oil)**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
3.	**Volatile oils (clove oil)**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
4.	**Saponins (**Glycyrrhizin**)**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
5.	**Flavonoids (**Hesperetin**)**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
6.	**Flavonoids (apigenin)**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
7.	**Anthracin Glycoside (sennosides)**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
8.	**Cardiac Glycoside (digoxin)**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
9.	**Tannins in Tea**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
10.	**Miscellaneous: bitter principles (Khellin)**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
11.	**Review**	**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
PRACTICAL EXAM		**1**	**2**	b2, b4, b5, c1, c2, c3, d1, d2, d3
Total		**12**	**24**	

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Medicinal Chemistry II

level	Semester	Credit hours		
		Theory	Practical	Total
4	VIII	2	1	3

Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
Physicochemical properties, synthesis, chemical & common names, structure-activity relationship, metabolism of					
	Drugs used for CNS disorders	a1, a2, a3, b1	Sedatives, hypnotics & anxiolytics Benzodiazepines, barbiturates, newer drugs, …etc	1	2
			Anti-epileptic drugs Phenytoin, carbamazepine, valproic acid, newer drugs	1	2
			Drugs used for Parkinsonism Dopaminergic agonists, central anticholinergic drugs	1	2
			Anti-psychotic drugs Phenothizines, butyrophenones, atypical drugs,	1	2
			Anti-depressant drugs Tricyclic drug, atypical	1	2
			Narcotic analgesics Natural opium alkaloids, synthetic opiates	1	2
			Non-narcotic analgesics NSAIDs	1	2
			General anesthesia, preanesthetic medication	1	2
			Mid terms exam	1	2
			Local anesthetics	1	2
			General anesthetics	1	2
2	**Drugs used for GIT disorders**	a1, a2, a3, b1	Drugs for peptic ulcer and hyperacidity Antiacids, H_2 receptor blockers, proton pump inhibitors, …etc	2	4
			Drugs for constipation Purgative drugs	1	2
			Drugs for diarrhea Anti-diarrheal drugs, rehydration therapy	1	2

FINAL - EXAM	1	2
TOTAL	16	32
Number of Weeks /and Units Per Semester	16 week	2 Units

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Course Intended Learning Outcomes PILOs
1.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: CNS drugs diazepam**	**1**	**2**	**c1, c2, d1, d2, d3**
2.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: CNS drugs carbamazepine**	**1**	**2**	**c1, c2, d1, d2, d3**
3.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: of CNS drugs : tramadol**	**1**	**2**	**c1, c2, d1, d2, d3**
4.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: CNS drugs : Ibuprofen**	**1**	**2**	**c1, c2, d1, d2, d3**
5.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: CNS drugs : paracetamol**	**1**	**2**	**c1, c2, d1, d2, d3**
6.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: GIT drugs: Ranitidine**	**1**	**2**	**c1, c2, d1, d2, d3**
7.	**Pharmacopeial physicochemical properties , chemical ,**	**1**	**2**	**c1, c2, d1, d2, d3**

	chromatographic or spectroscopy identification of: omeprazole			
8.	**Synthesis of drugs**	**2**	**4**	**c1, c2, d1, d2, d3**
9.	**Purification of drugs.**	**2**	**4**	**c1, c2, d1, d2, d3**
PRACTICAL EXAM		**1**	**2**	**c1, c2, d1, d2, d3**
Total		**12**	**24**	

Republic of Yemen
Ministry of Higher Education & Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Parasitology

level	Semester	Credit hours		
		Theory	Practical	Total
4	VIII	2	1	3

V. Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction to medical parasitology**	a1, a2, a3	Definition of parasitology Types of parasite (Ecto, endo ,obligate ,facultative) Types of host(Mechanical and biological) and Host parasites relationship Effect of parasite on the host (Mechanical effect, effect on cell ,invasion and destruction ,inflammatory reaction to the parasite or production ,competition for host nutrient and toxic effect) Types of vector (obligate ,facultative) Source of infection (food& drink, soil and water, vector ,direct contact and congenial) Mode of infection Classification of parasites (protozoa, helminthes , arthropods) classes and example for all class	4	8
2	**Techniques for sampling and detection of parasites -**	a1, a2, a3	Type of specimens (urine, stool, blood, etc.) Collection, transport and preservation of samples. Microscopic examination Direct Smear Method	1	2
3	**Protozoa** (introduction	a1, a2, a3, b3, b4	General characteristic of protozoa(morphology, biological	1	

	+ Amoeba)		feature, multiplication ,nutrient, and locomotion) □ Classification (amoebae ,ciliate, flagellate, sporozoa) □ Amoebae o Entamobeahistolytica (Morphology ,life cycle, pathogenesis, Diagnosis, prevention and control) o Difference between Entamobeahistolytica and Entamobea. Coli		2
MID-TERM EXAM				1	2 2
3	**Protozoa (**Ciliate)		• Bantium coli (Morphology ,life cycle, pathogenesis Diagnosis, prevention and control)	1	2
	Protozoa (intestinal and genital Flagellates)	a1, a2, a3, a4, b3, b4	• Intestinal flagellates: Giardia lamblia (Morphology ,life cycle, pathogenesis ,Diagnosis, prevention and control • Genital : Trichomnasvaginalis Morphology ,life cycle, pathogenesis ,Diagnosis, prevention and control	1	2
	Protozoa (blood Flagellates)	a1, a2, a3, a4, b3, b4	• Leishmanias (Visceral and cutanouse) Morphology ,life cycle, pathogenesis ,Diagnosis, prevention and control) • Trypanosoma (all types Morphology ,life cycle, pathogenesis ,diagnosis, prevention and control	1	2
	Protozoa (Sporozoa)	a1, a2, a3, b3, b4	• Malaria parasites (Plasmodium falciparum, vivax, ovali , malareae) Morphology ,life cycle, pathogenesis ,Diagnosis, prevention and control	1	2
4	**Helminthes**	a1, a2, a3, b1, b2, b3, d2	• Classification of helminthes (common worms (Nematodes), schistosoma, tape worms (Trematodes), filariasis. • Morphology ,life cycle, pathogenesis, Diagnosis, prevention and control of helminthes from each class.	2	4

5	**Arthropods**	a1, a2, a3, b3, b4	• classification, morphology, life cycle, pathogenicity, prevention and treatment	1	2
Course Review		a1, a2, a3, b3, b4	Review of the course topics by discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	5 Units

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
12.	**investigation of Enatamopea histolytica & Enatamopea coli**	**1**	**2**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
13.	**investigation of Giardia**	**1**	**2**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
14.	**investigation of Trichomonas**	**1**	**2**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
15.	**investigation of Leishmania**	**1**	**2**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
16.	**investigation of Malaria spp (with preparation of blood smear)**	**1**	**2**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
17.	**investigation of Ascaris&Anchylostoma**	**1**	**2**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
18.	**investigation of Teaniaspp**	**1**	**2**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
19.	**investigation of H. nana**	**1**	**2**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
20.	**investigation of schistosoma**	**1**	**2**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
21.	**investigation of Arthropodes**	**1**	**2**	**b1, b2,b4, ,c1, c2, c4, d1, d2, d3**
PRACTICAL EXAM		**1**	**2**	
Total		**12**	**24 equivalent to 12 credit hours**	
Number of Weeks			**12**	

Republic of Yemen
Ministry of Higher Education & Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Applied Pharmacognosy I

level	Semester	Credit hours		
		Theory	Practical	Total
5	IX	2	1	3

IV. Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction to applied complimentary & alternative medicine**	a2, a3, a4, b2	The complementary and alternative : definition and concept The need to complementary and alternative medicines Classification of methods of complementary and alternative medicine : medicinal-based , non-medicinal based , traditional medicine , evidence-based therapies.	3	6
2	**Non-herbal Evidence-based Applied Pharmacognosy**	a2, a3, a4, b2	Principles , applications , benefit/risks of different types of complementary and alternative medicine: 1- Physiotherapy techniques including Chinese acupuncture 2- Homeopathy and anthroposophy 3- Hydrotherapy 4- Other therapies : e.g. electrotherapy	6	12
3	**Herbal medicine & Phytotherapy** Regulations, risks and specifications and Q.C	a2, a3, a4, b2	• **Introduction:** Definitions: (herbal medicines, phytotherapy), global use • **Regulations and Reliable sources of information :** -International (WHO monographs), (US-FDA /Medscape), (European union regulations), (UK regulations), other international regulations. - Local (in Yemen) Regulatory • **Risks of herbal medications:** (1)Problems of unregulated herbal medications: substitutions,	6	12

			adulteration, adulteration with toxic substances or synthetic drugs (2) Potential adverse effects of herbal products (3) Risks of herbal medications on : pregnant and lactating women, pediatric, older patients a, cancer patients and other patients (4) Potential Herb-drug interactions • **Quality specifications :** o Pharmacopeial and other regulatory specifications o Licensing herbal medications o Licensed vs unregulated herbal medical products o Clinical-based evidences of herbal medications.		
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	4 Units

B - Practical Aspect:

Quality control specifications & adulteration of herbals

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
1.	Medicinal flowers	2	4	a2, a3, a4, b2, c1, c2
2.	Medicinal barks	2	4	a2, a3, a4, b2, c1, c2
3.	Medicinal roots	2	4	a2, a3, a4, b2, c1, c2
4.	Medicinal leaves	3	6	a2, a3, a4, b2, c1, c2
5.	Medicinal fruits	2	4	a2, a3, a4, b2, c1, c2
PRACTICAL EXAM		1	2	a2, a3, a4, b2, c1, c2
Total		12	**24 equivalent to 12 credit hours**	
Number of Weeks			**12**	

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Clinical pharmacy I

level	Semester	Credit hours		
		Theory	Practical	Total
5	IX	2	-	2

Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction to clinical pharmacy**	a1, a2, a3, b1, b2	• Definition • Patients-oriented services: clinical, hospital, community pharmacy; inter-relations and differences • Pharmacy from dispensing service to caregiving • Duties of clinical pharmacist • Clinical pharmacists as drug information center: source of information, types of drug information demanded (indications, contraindications, precautions, drug interactions, etc.) • basic requirements (knowledge and skills) of clinical pharmacist	1	2
2	**Clinical pharmacist as a member of the health care team**	a1, a2, a3, b1, b2	○ sharing in morning rotation and discussion , cooperation with other members ○ patient`s medical record (PMR): components, examples ○ Skills of communication with patients	1	2
3	**Clinical skills of diagnosis and data interpretation**	a1, a4, b1, b2, b3, b5, d4	• Clinical features • Physical (clinical) examinations: methods and interpretation • Vital signs evaluation and interpretation • Clinical lab. Data interpretation: blood analysis (CBC, serology, biochemistry, tumor markers), stool analysis, urine analysis.	**3**	6

			• Clinical instrumental diagnosis: techniques and data interpretation: Radiography, ultrasonography, Computed Tomography Scan (CT scan), Magnetic Resonance Imaging		
4	**Seminar 1**	c1, c2 c3, d1, d2, d3, d4	Interpretation of clinical features, lab. diagnosis and instrumental diagnosis of clinical cases provided by the teacher at the end of previous lecture	**1**	2
Mid-term exam				1	2
4	**Non-pharmacotherapy measures**	a1, a2, a3, a4, c1	• Definition, types • Physiotherapy : role, advantages • Psychotherapy : role, advantages • Life-style changes • Diet control • Other methods	1	2
5	**Benefit: Risk ratio**	a1, a2, a3, a4, c1	• Benefits of medications • Risks of medications • Methods for Assessment benefit: risk ratio **<u>with clinical case`s examples</u>**	1	2
6	**Seminar 2**	c1, c2 c3, d1, d2, d3, d4	Seminar on assessment of benefit: risk ratio for clinical cases provided by the teacher at the end of previous lecture	1	2
7	**Pharmacotherapy for specialized population (1)**	a1, a2, a3, b1, b2	**<u>Pharmacotherapy accompanied withclinical cases for</u>:** 1. **Pregnant women**: Harmful effects on the fetus, Recognition of teratogenic drugs, pharmacokinetics in pregnancy, drugs prescribed in pregnancy (Pregnancy A, B, C, X categories), drugs prescribed for [pain, GIT disorders, diabetes, gestational diabetes, asthma, cough, allergy, urinary tract infection, hypertension, thyroid abnormalities, thromboembolism, inflectional vaginosis, Epilepsy, mental health disorders]	**2**	4

			2. **lactating women:** factors influence the amount of drug an infant will receive through breast-feeding, drugs avoided during lactation, treatment of mastitis, postpartum depression, cessation of lactation)		
8	**Seminar 3**	c1, c2 c3, d1, d2, d3, d4	Seminar to solve clinical cases of pregnant and lactating women	**1**	2
9	**Pharmacotherapy for specialized population (2)**	a1, a2, a3, b1, b2	3. **Pediatrics:** classification of pediatrics (newborn, infant, child), differences of pharmacodynamics and pharmacokinetics and admiration sites of drugs in children, drug efficacy and toxicity, factors affecting pediatric therapy, drugs prescribed for [pain, fever, infections, GIT disorders]. 4. **Geriatrics:** relation of aging to diseases, common physiological changes in aging, alteration of pharmacokinetics and pharmacodynamics of drugs, drugs risks in elderly, drugs avoided in geriatric patients	**2**	4
10	**Seminar 4**	c1, c2 c3, d1, d2, d3, d4	Seminar to solve clinical cases of pregnant and lactating women	**1**	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	10 Units

Republic of Yemen
Ministry of Higher Education &
Scientific Research
Al-Razi University
Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Quality control

level	Semester	Credit hours		
		Theory	Practical	Total
5	IX	2	1	2

VI. Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction to Quality control**	a1, a2, a3, b1, b2	• definition of quality, quality control QC, specifications (qualitative and quantitative) , governmental and drug plant QC lab, Relation and mission of quality management system (QMS), quality assurance (QA), GMP and QC • Pharmacopeias : the References of quality control : BP, USP: contents , volumes , understanding monographs	2	4
2	**Units of QC lab**	a1, a2, a3, b1, b2	**missions of** a) Raw materials unit b) In-process unit c) Validation unit d) Microbiology unit e) Finished-product unit	1	2
3	**Procedures of QC**	a1, a2, a3, b1, b2	• sampling methods, number of samples based on batch size • Checking and calibration of equipments • Validation of results: accuracy, precision • Documenting and reporting • Quarantine, releasing and rejecting	2	4
4	**QC tests of raw materials**	a1, a2, a3, b1, b2, b4	**Tests of pharmacopeial specification of raw materials** identification, assay, microbial content, impurities content, other tests with examples from the pharmacopeia	2	4

			• MID-TERM EXAM • Post-exam discussion	1	2
5	**QC tests of raw In-process products**	a1, a2, a3, b1, b2, b4	Evaluation of specification of products resulting from unit-operations : drying, evaporation, filtration, milling, granulation, mixing	2	4
6	**QC tests of raw finished products , package and labels**	a1, a2, a3, b1, b2, b4	**specific Tests (pharmacopeial specification) finished products including :** • Solutions • Suspensions & emulsions • Semisolid products • Suppositories • Powders • Granules • Tablets • Capsules • Sterile products : parenteral, ophthalmic preparations **Testing of pharmacopeial specifications of :** • Package Labels : information	4	8
Course Review		a1, a2, a3, b1, b2, b4	Review of the course topics by discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	6 Units

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
1.	**QC sampling , checking of equipments & reporting**	**1**	**2**	b3, c1, c2, d1, d2, d3
2.	**QC of raw materials : paracetamol BP**	**1**	**2**	b3, c1, c2, d1, d2, d3
3.	**QC of in-process products after : mixing**	**1**	**2**	b3, c1, c2, d1, d2, d3
4.	**QC of in-process finished products : solution chlorpheniramine syrup BP**	**1**	**2**	b3, c1, c2, d1, d2, d3
5.	**QC of in-process finished products : suspension metronidazole suspension USP**	**1**	**2**	b3, c1, c2, d1, d2, d3
6.	**QC of in-process finished products : creams miconazole cream BP**	**1**	**2**	b3, c1, c2, d1, d2, d3
7.	**QC of in-process finished products : suppositories paracetamol suppositories**		**2**	b3, c1, c2, d1, d2, d3
8.	**QC of in-process finished products : paracetamol tablet friability hardness**	**1**	**2**	b3, c1, c2, d1, d2, d3
9.	**QC of in-process finished products : paracetamol tablet (dissolution, disintegration)**	**1**	**2**	b3, c1, c2, d1, d2, d3
10.	**QC of in-process finished products : capsules amoxicillin capsules USP**	**1**	**2**	b3, c1, c2, d1, d2, d3
11.	**QC labels of labels & package**	**1**	**2**	b3, c1, c2, d1, d2, d3
PRACTICAL EXAM		**1**	**2**	
Total		**12**	**24**	

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Ministry of Higher Education &
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Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Industrial Pharmacy I

level	Semester	Credit hours		
		Theory	Practical	Total
5	IX	2	-	2

VII. Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction to industrial pharmacy and criteria of good practices**	a1, a2, a3, b1	• The need and Significance for large-scale production of drugs • history of large scale manufacturing of drug products. • Criteria of current good practices : good manufacturing practice (cGMP), good storage practice(cGSP)and good laboratory practice (cGLP) to be emplyed in drug plants based on specific guidelines such as WHO, ICH and ISO	4	8
2	**General principles of flow and transfer**	a1, a2, a3, b1	Design, types, advantages, disadvantage, selection of machines used for: a. mass transfer b. fluid flow c. heat transfer	4	8
3	**Fundamental premixing unit operations (applied to fluids)**	a1, a2, a3, b1	Design, types, advantages, disadvantage, selection of machines used for: a. fluid clarification ○ Filtration ○ Centrifugation b. Solvent Extraction c. Evaporation d. Distillation	7	14
FINAL – EXAM				1	2
TOTAL				16	32

Republic of Yemen
Ministry of Higher Education & Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Pharmacology III

level	Semester	Credit hours		
		Theory	Practical	Total
5	IX	2	-	2

Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Cardiovascular and blood pharmacology**	a1, a2, a3, b1	Drugs affecting kidney Diuretics (high efficacy, medium efficacy, adjuvant drugs)	1	2
			Anti-hypertensive drugs ACE-inhibitors, AR-blockers, Ca-channel blockers, …etc.	1	2
			Management of congestive heart failure Cardiac glycosides, inodilators, …etc	1	2
			Anti-arrhythmic drugs Class-I, class-II, class-III, class-IV	1	2
			Drugs for ischemic heart diseases Anti-anginal drugs	1	2
			Drugs affecting blood coagulation Anti-platelet drugs, anti-coagulants, thrombolytics	1	2
			Drugs used for hyper-lipidemia Statins, fibrates, resins, …etc	1	2
			Drugs used for anemia Hematinics, folic acid, vit B12	1	2
			Mid-term exam	1	2
2	**Drugs for endocrine systems disorders**	a1, a2, a3, b1	Pituitary, hypothalamic, thyroid & parathyroid hormones GH, FSH, LH, ACTH, TSH, ..etc, T_3, T_4, calcitonin, parathormone, anti-thyroid drugs	1	2
			thyroid & parathyroid hormones T_3, T_4, anti-thyroid drugs	1	2
			Drugs used for diabetes mellitus Insulin, oral hypoglycemic drugs	1	2
			Sex hormones Female sex hormones , contraceptives	1	2
			Adrenal cortex hormones Glucocorticoids, other immunosuppressant drugs	1	2

			Drugs affecting bone, parathyroid hormones Drugs used for osteoporosis, calcitonin, parathormone, …etc	1	2
FINAL - EXAM				1	2
TOTAL				16	32

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Research methodology

level	Semester	Credit hours		
		Theory	Practical	Total
5	IX	2	-	2

Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction to research methodology**	a1, a2, a3, a4, b1, b2	• Definition : research, search, thesis, report, abstracts • Types of research and categories of methodologies : observational, experimental • Data collection tools: experiments, questionnaire, interview, etc	1	2
2	**Research Proposal**	a3, , d2	• Definition, objectives • Components of a proposal • Skills of writing a proposal • Examples of proposal templates • Training on writing a proposal	2	4
3	**Components of a research or a thesis**	a1, a2, a3, a4, b1, b2	Characteristics, academic requirements and details of a thesis/ research project: • Titles • Dedication • Acknowledgment • Contents table • Table of Lists of Abbreviations and symbols • Lists of tables and figures • Abstract • Scope of the work and Objectives • Introduction • materials and methods ○ Materials ○ Instrumentations ○ Methods ○ Experimental studies ○ Clinical studies (study Population/sample/Sampling technique, Sample size, Variables definition ○ Data analysis	5	10

			• Results : presentation of tables and figures • Discussion • Conclusions • Recommendations • References • Appendices • Arabic abstract		
	• MID-TERM EXAM			1	2
4	**Thesis/ research paper for publishing**	a1, a2, a3, a4, b1, b2	• How to write a thesis **paper**, title, abstract, experimental, results & discussion, references, • Publishing of articles and preparation of reports	2	4

5	**Preparation and skills of Presentation**	a1, a2, a3, a4, b1, b2	• Components of a presentation
			• Electronic presentation (power point slides)
			• Characteristics of font, color, background of slides
			• Presentation skills
			  ○ Voice intonation
			  ○ Standing /sitting presentation
			  ○ Commenting on slides contents
				3	6

Course Review		a1, a2, a3, a4, b1, b2	Review of the course topics by discussion session.	1	2
FINAL – EXAM				1	2
TOTAL				16	48

Republic of Yemen
Ministry of Higher Education &
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Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Hospital pharmacy

level	Semester	Credit hours		
		Theory	Practical	Total
5	IX	2	-	2

VIII. Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction**	a1, a2, a3, b1, b3	• definition of hospital, hospital pharmacy hospital pharmacists • difference between community, clinical and hospital pharmacy. • Objectives and responsibilities of hospital pharmacists • Missions of hospital pharmacists • Risks of hospital pharmacy practice • Complexity of hospital pharmacy practice • requirements of a pharmacist to practice	1	2
2	**Organization and management of hospital pharmacy**	a1, a2, a3, b1, b3	• Physical organization: location , area, interior design • Personnel (Staff) organization • Drugs and therapeutics committee (DTC): members, missions, meetings, budget plan and implantation • Hospital formulary : components, missions	1	2
3	**Medical supply, stores and control**	a1, a2, a3, b1, b3	• The structure of medical supply administration • Types and goals and controlling systems in medical supply administration • Systems controlling Flow of medications • Regulations of medications Receiving process • Regulations of medical stores • Principles of issuing medications • Procedure and measures of safety in medical stores • Controlling of leakage of medications	2	4

4	**Specific drug products in the hospital**	a1, a2, a3, b1, b3	Types, examples, Regulation and specific store and dispensing rules of : o Emergency medications o Pre-operative and operative medications o Controlled drugs	1	2
5	**In-patient services (1)**	a1, a2, a3, b1, b3	**1- Distribution of medications to in-patients** **(Drug distribution systems): mechanism,** advantages and disadvantages of floor (ward) stock system, individual prescription system, combined system, unit dose system (procedures). **2- Wards inspection services** 3- **After-hours pharmacy services**	1	2
MID-TERM EXAM				1	2
5	**In-patient services (2)**	a1, a2, a3, b1, b3	**4- Extemporaneous preparations in hospital** (i) Non-sterile : repacking, preparations from raw materials, preparations from available dosage forms (ii) Sterile requirements: aseptic conditions, laminar air flow (iii) IV-admixtures: definition, components, advantages, disadvantages, incompatibility problem (iv) IV-mixtures of electrolytes: calculations and preparation of IV electrolyte salt required daily: calcium, sodium, magnesium, potassium , iron (v) Total parenteral nutrition (TPN): definition, components, indications, calculation of daily requirement of water, lipid, protein and carbohydrates, vitamins.	3	6
5	**In-patient services (3)**	a1, a2, a3, b1, b3	**5- Clinical missions of hospital pharmacist** (i) Checking of prescribed medications (ii) Review patient medication record (iii) Dose adjustment: children, renal failure patients, underweight/overweigh obese/t patient	2	4

			(iv) Drug therapy monitoring		
6	**Outpatient services**	a1, a2, a3, b1, b3	1- Dispensing of medications to outpatients: types of prescriptions, data in prescriptions, checking errors 2- Patient counseling and education 3- Health promotion: family planning, smoking cessation	1	2s
7	**Educative, training and research missions of hospital pharmacists**	a1, a2, a3, b1, b3	○ Education of healthcare professionals about rational drug use ○ Training of undergraduate and pharmacy technicians ○ Research aspects in hospital pharmacy	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	7 Units

Republic of Yemen
Ministry of Higher Education &
Scientific Research
Al-Razi University
Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Medicinal chemistry III

level	Semester	Credit hours		
		Theory	Practical	Total
5	IX	2	1	3

IV. Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
Physicochemical properties, synthesis, chemical & common names, structure-activity relationship, metabolism of drugs					
1	**Cardiovascular and blood Drugs**	a1, a2, a3, b1, b2, b3, b4	Drugs affecting kidney Diuretics (high efficacy, medium efficacy, adjuvant drugs)	1	2
			Anti-hypertensive drugs ACE-inhibitors, AR-blockers, Ca-channel blockers, …etc.	1	2
			Management of congestive heart failure Cardiac glycosides, inodilators, …etc	1	2
			Anti-arrhythmic drugs Class-I, class-II, class-III, class-IV	1	2
			Drugs for ischemic heart diseases Anti-anginal drugs	1	2
			Drugs affecting blood coagulation Anti-platelet drugs, anti-coagulants, thrombolytics	1	2
			Drugs used for hyper-lipidemia Statins, fibrates, resins, …etc	1	2
			Drugs used for anemia Hematinics, folic acid, vit B12	1	2
Mid-term exam				1	2
2	**Drugs for endocrine systems disorders**	a1, a2, a3, b1, b2, b3, b4	Pituitary, hypothalamic, thyroid & parathyroid hormones GH, FSH, LH, ACTH, TSH, ..etc, T_3, T_4, calcitonin, parathormone, anti-thyroid drugs	1	2
			thyroid & parathyroid hormones T_3, T_4, anti-thyroid drugs	1	2
			Drugs used for diabetes mellitus Insulin, oral hypoglycemic drugs	1	2
			Sex hormones Female sex hormones , contraceptives	1	2

			Adrenal cortex hormones Glucocorticoids, other immunosuppressant drugs	1	2
			Drugs affecting bone, parathyroid hormones Drugs used for osteoporosis, calcitonin, parathormone, …etc	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	2 Units

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	AlignedCourse Intended Learning Outcomes PILOs
1.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: CVS drugs: furosemide**	**1**	**2**	**c1, c2, d1, d2, d3**
2.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: CVS drugs: amlodipine**	**1**	**2**	**c1, c2, d1, d2, d3**
3.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: CVS drugs: candesartan**	**1**	**2**	**c1, c2, d1, d2, d3**
4.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: CVS drugs: digoxin**	**1**	**2**	**c1, c2, d1, d2, d3**
5.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: blood drugs: warfarin**	**1**	**2**	**c1, c2, d1, d2, d3**

6.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: blood drugs: tranexmic acid**	**1**	**2**	**c1, c2, d1, d2, d3**
7.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: endocrine drugs: glibenclamide**	**1**	**2**	**c1, c2, d1, d2, d3**
8.	**pharmacopeial physicochemical properties , identification of endocrine drugs: dexamethasone**	**1**	**2**	**c1, c2, d1, d2, d3**
9.	**Synthesis of drugs**	**2**	**4**	**c1, c2, d1, d2, d3**
10.	**Purification of drugs.**	**1**	**2**	**c1, c2, d1, d2, d3**
PRACTICAL EXAM		**1**	**2**	
Total		**12**	**24**	
Number of Weeks			**12**	

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Marketing

level	Semester	Credit hours		
		Theory	Practical	Total
5	X	2	-	2

IX. Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction to marketing**	a1, a2, b1	• definitions, (markets, marketing, promotion, promotional materials, products, competitors, customers, marketing targets, plan and planning • Significance and objectives of marketing	1	2
2	**Requirements of a successful marketing**	a1, a2, b1	• personnel, mental, skills communication and relationship building • Strategy of marketing: planning, execution, evaluation • Designing a marketing plan	2	4
3	**Understanding the customers**	a3, b1	• Types of customers • Dealing with customers • customers need and satisfaction	1	2
4	**Pharmaceutical marketing**	a1, a2, b1	• significance • Who is the med. Rep. ? • ethical issues • Pharmaceutical products: differences from other products, essential information to be full known on pharmaceutical products (pharmaceutical, pharmacological, commercial)properties • Pharmaceutical Promotional materials: brochures, gifts, charts, etc.	3	6
Mid-term exam				1	2

5	**Role play:**	a1, a2, b1	• **Training on visiting to customers (physicians)** : pre-visit preparation ad skills of effective visit (meeting, opening, offering, closing), post-visit evaluation	1	2
6	**Self-marketing { C.V)**	a1, a2, b1	• How to prepare C.V.	1	2
	Self-marketing (Job applications and interview)	a1	• Requirements of successful job application and interview	1	2
7	**Seminar (1)**	c1, d1	• Role play	2	4
	Seminar (2)	c1, d1	• CV preparation	1	4
	Seminar (3)	c1, d1	• Job interview	1	4
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	7 Units

Republic of Yemen
Ministry of Higher Education &
Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Community pharmacy

level	Semester	Credit hours		
		Theory	Practical	Total
5	X	2	-	2

IV. Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Introduction to community pharmacy**	a1, a4, b2	• Brief history • Pharmaceutical care Services offered to patients in community pharmacies • Patient counseling: general rules, response to patients,	2	4
2	**Drug benefit: risk and selection of drugs to specific group of patients**	a1, a4, b2	• Drug benefit: risk ratio • dealing with specific groups of patients: general rules • Selection of medication to pregnant women • Selection of medications for breastfeeding women • Safe drugs and dose for children • Misleading of herbal medications	4	8
3	**Drug information sources**	a1, a4, b2	• Reliable foundations and references drug information sources	1	2
	MID-TERM EXAM			1	2
4	**Introduction to OTC medications**	a1, a2, a4, b2	• Definition • Hoe approve OTC medications • Types of medications (OTC) dispensed without a prescription. • referral to physician	1	2

5	**OTC medications for pain and fever**	a1, a2, a4, b2	• Types of pain • Types of OTC analgesics/antipyretics • Risks • Selection for specific groups of patients • Selection for toothache, headache, musculoskeletal pain, migraine, dysmenorrhea • Selection for fever • List of trade names	1	2
6	**OTC for oral healthcare**	a1, a2, a4, b2	• Definition and types of mouth ulcers • OTC for different types of mouth ulcer • OTC for bad breath	1	2
7	**OTC products for alimentary system**	a1, a2, a4, b2	Types of OTC, community cases, selection for specific groups of patients and list of trade names for the following cases: • Hyperacidity • Nausea and vomiting • Colic	3	6
8	**Other OTC products**		Other types of OTC products	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	7 Units

Republic of Yemen
Ministry of Higher Education & Scientific Research

Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Medicinal Chemistry IV

level	Semester	Credit hours		
		Theory	Practical	Total
5	X	2	1	3

Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
Physicochemical properties, synthesis, chemical & common names, structure-activity relationship, metabolism of					
	Chemotherapeutic drugs (anti-infectives and anti-cancer)		β-lactam antibiotics Peinicillin antibiotics	2	4
			β-lactam antibiotics Cephalosporins, carbapenems, monobactams, …etc	2	4
			Protein synthesis inhibitors macrolides, lincosamides, aminoglycosides, tetracyclines	1	2
			Nucleic acid synthesis inhibitors Quinolones, sulfonamides, trimethoprim	1	2
			Anti-tubercular / anti-leprosy drugs Isoniazid, dapsone, …etc	1	2
			Anti-malarial drugs	1	2
			Mid-term exam	1	2
			Anti-protozoal drugs Anti-amoebiasis, anti-giaridasis, anti-trichomonal drugs	1	2
			Anthelmintic drugs Drugs that used in treatment of worms infestation	1	2
			Antifungal drugs Drugs used in treatment of fungal infections	1	2
			Antiviral drugs Drugs used in treatment of viral infections	1	2
			Anti-cancer drugs Drugs used in treatment of malignant tumors	2	4
FINAL - EXAM				1	2
TOTAL				16	32

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	AlignedCourse Intended Learning Outcomes PILOs
1.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: amoxicillin**	**1**	**2**	**c1, c2, d1, d2, d3**
2.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: cefixime**	**1**	**2**	**c1, c2, d1, d2, d3**
3.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: of: tetracycline**	**1**	**2**	**c1, c2, d1, d2, d3**
4.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: ciprofloxacin**	**1**	**2**	**c1, c2, d1, d2, d3**
5.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: miconazole**	**1**	**2**	**c1, c2, d1, d2, d3**
6.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: zidovudine**	**1**	**2**	**c1, c2, d1, d2, d3**
7.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of: metronidazole**	**1**	**2**	**c1, c2, d1, d2, d3**
8.	**Pharmacopeial physicochemical properties , chemical , chromatographic or spectroscopy identification of:: chloroquine**	**1**	**2**	**c1, c2, d1, d2, d3**
9.	**Synthesis of drugs**	**1**	**2**	**c1, c2, d1, d2, d3**
10.	**Purification of drugs.**	**2**	**2**	**c1, c2, d1, d2, d3**
PRACTICAL EXAM		**1**	**2**	
Total		**12**	**24**	
Number of Weeks			**12**	

Republic of Yemen
Ministry of Higher Education &
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Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Applied pharmacognosy II

level	Semester	Credit hours		
		Theory	Practical	Total
5	X	2	1	3

Course Content:

A – Theoretical Aspect:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**Herbal medicine & Phytotherapy**	a2, a3, a4, b2	• Aromatherapy • Flower remedy therapy • Phytotherapy • Evidence-based uses of these therapies for : ○ Bacterial infections ○ Cosmetics ○ GIT disorders: peptic ulcer, constipation, diarrhea, vomiting, abdominal colic ○ CVS diseases: hypertension, CHF, angina ○ Respiratory diseases: Bronchial asthma ○ Diabetes mellitus ○ Renal disorders: Renal stones ○	7	14
2	**Therapeutic Screening of herbals**	a1, a2, a3, a4, b2, a4	• Techniques and approaches (from traditional-claim to experimental evidence) by schedule screening of specific types of medications including : ○ Antimicrobial ○ Wounds-healing drugs ○ Antioxidant and anticancers ○ Other drugs	8	16
FINAL - EXAM				1	2
TOTAL				16	32

B - Practical Aspect:

Therapeutic screening of herbals (antimicrobial, antioxidants, sunblock, etc)

Order	Tasks/ Experiments	Number of Weeks	contact hours	Aligned Couse Intended Learning Outcomes PILOs
1.	Medicinal flowers	2	4	a2, a3, a4, b2, c1, c2
2.	Medicinal barks	2	4	a2, a3, a4, b2, c1, c2
3.	Medicinal roots	2	4	a2, a3, a4, b2, c1, c2
4.	Medicinal leaves	3	6	a2, a3, a4, b2, c1, c2
5.	Medicinal fruits	2	4	a2, a3, a4, b2, c1, c2
PRACTICAL EXAM		1	2	a2, a3, a4, b2, c1, c2
Total		12	**24 equivalent to 12 credit hours**	
Number of Weeks			**12**	

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Al-Razi University

Medical Sciences College
Department of Pharmacy
Program of Bachelor of Pharmacy

Course Title : Clinical pharmacy II

level	Semester	Credit hours		
		Theory	Practical	Total
5	X	2	-	2

IV. Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
1	**skills of Assessment of drug therapy(drug therapy monitoring DTM)**	a1, a2, a3, a4, c1	• Objectives • patients need DTM • Drugs require DTM • Steps and methods of DTM • Examples of solved case studies	1	2
2	**Clinical management and pharmacotherapy :** Definition, types, pathogenesis, diagnosis and differentiation, pharmacotherapy (types of drugs, drug selection and algorithm) , non-pharmacotherapy measures				
1.1.	**CVS disorders**	a1, a2, a3, a4, c1	• Hypertension • Angina & Myocardial infarction	2	4
1.2.	**Endocrinal disorders**	a1, a2, a3, a4, c1	• Diabetes mellitus • Thyroid disorders	2	4
1.3.	**Seminar**	c1, c2 c3, d1, d2, d3, d4	Seminar to discuss and solve clinical case studies.	1	
mid-term exam				1	2
1.4.	**Respiratory disorders**	a1, a2, a3, a4, c1	• Bronchial asthma • Chronic Obstructive Pulmonary Disease (COPD)	2	6
1.5.	**Renal disorders**	a1, a2, a3, a4, c1	• Acute renal failure • Chronic kidney disease	2	6
1.6.	**Seminar**		Seminar to discuss and solve clinical case studies.	1	2
1.7.	**Infectious disorders**	a1, a2, a3, a4, c1	Antimicrobial regimen selection	1	2

	Oncologic disorders	a1, a2, a3, a4, c1	• Breast cancer	1	2
	Seminar	c1, c2 c3, d1, d2, d3, d4	Seminar to discuss and solve clinical case studies.	1	2
FINAL - EXAM				1	2
TOTAL				16	32

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Al-Razi University

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Course Title : Industrial Pharmacy II

level	Semester	Credit hours		
		Theory	Practical	Total
5	X	2	-	2

Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
4	**Fundamental premixing unit operations (applied to solids)**	a1, a2, a3, b1	Types, advantages, disadvantage, machine design and operation used for: a. crystallization b. drying c. particle size reduction (milling) d. particle size enlargement (granulation)	3	6
5	**Mixing unit operation**	a1, a2, a3, b1	Types, advantages, disadvantage, machine design and operation used for: a. Solid-solid mixing b. Solid-fluid and fluid-fluid mixing c. Semisolid mixing	2	4
6	**Filling and packaging Processes**	a1, a2, a3, b1	Types, advantages, disadvantage, machine design and operation used for: a. Filling of finished product b. packaging.(including types of packaging materials)	2	4
Course Review		a1, a2, a3, b1	Review of the course topics by discussion session.	1	2
FINAL – EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	6 Units

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Course Title : Professional Ethics & Regulation

level	Semester	Credit hours		
		Theory	Practical	Total
5	X	2	-	2

X. Course Content:

Order	Units/ Topics List	PILOs	Sub Topics List	No. of Weeks	contact hours
Part I: Pharmacy laws, regulations and acts					
1	**Introduction**	a1, a2	• Definition of regulations, act, laws • History of pharmacy regulations	1	2
2	**Foundations and authorities controlling pharmacy profession**	a1, a2	➢ Pharmacy Authority in : • Yemen • Arab countries • International ➢ Pharmacy practice licenses: requirements and procedures in Yemen , Arab countries and international	2	4
3	**Regulations and acts of pharmacy**	a1, a2	Pharmacy Regulations and acts controlling pharmacy profession in Yemen • Local (Yemeni)	3	6
Mid-term exam				1	2
3	**Regulations and acts of pharmacy**		Regulations in Arab countries and global e.g. UK and USA	2	4
Part II: Pharmacy Ethics					
4	**Patients and professional Rights**	a1, a2	• Patient rights • Medical workers rights • Pharmacist rights	3	6

5	**Pharmacy Code of Ethics**	a1, a2	• Old (Oath of Hippocrates) • Arab countries • Asian • Europe • USA • Local (Yemeni) Code of ethics	2	4
Course Review		a1, a2	Review of the course topics by discussion session.	1	2
FINAL - EXAM				1	2
TOTAL				16	32
Number of Weeks /and Units Per Semester				16 weeks	5 Units

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Al-Razi University

Medical Sciences College
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Program of Bachelor of Pharmacy

Course Title : Graduation Research

level	Semester	Credit hours		
		Theory	Practical	Total
5	X		4	4

Course Content:

- Each 2-4 students group is assigned to do a research (experimental or observational) directied by a supervisor of the department teaching staff or outside the faculty.
- The topic of research can be proposed by :
  - The supervisor
  - Or the students after supervisor acceptance
- The topic must be approved by the department/faculty administration.
- Experiments are carried out in the faculty laboratories and if necessary outside the faculty
- The department and the faculty provide the students with necessary instruments and materials
- The research is to be carried out within the period of the term (i.e. 16 weeks) and must be delivered to the department within that period
- The faculty propose the name of committee members to the faculty council . The committee will discuss and judge the research as described below in the assessment schedule .