



## Course Specification

I. Course Identification and General Information:						
1	<b>Course Title:</b>	Applied and Evaluation of Pharmaceutical Research				
2	<b>Course Number &amp; Code:</b>	Ph991				
3	<b>Credit hours:</b>	<b>C.H</b>				<b>Total</b>
		<b>Theoretical</b>	<b>Practical</b>	<b>Training</b>	<b>Seminar</b>	
		2				
4	<b>Study level / semester at which course is offered:</b>	Fifth Level / Second Semester				
5	<b>Pre –requisite (if any):</b>	All specialized courses				
6	<b>Co –requisite (if any):</b>	-				
7	<b>Programs in which course is offered:</b>	Bachelor of Pharmacy				
8	<b>Language of teaching the course:</b>	English				
9	<b>Department in which course is offered:</b>	-				
10	<b>Location of teaching the course:</b>	Faculty of Pharmacy- Sana`a University				
11	<b>Prepared by:</b>	Prof. Dr. Maged Alwan				
12	<b>Date of approval:</b>					

I. Course description:	
<p>This study-unit elucidates the application of research methodology to the aspects of pharmaceutical research that focuses on process and service outcomes. Aspects relevant to a robust design of the research project in the areas of pharmaceutical services and in pharmaceutical technology processes are highlighted. Application of research methodology principles in the development of controlled trials, clinical trials and process analysis is presented.</p>	



## II. Intended learning outcomes (ILOs) of the course:

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

1. Describe types of study design and approaches
2. Demonstrate the basic knowledge of research methodology and the principles.
3. Describe research project planning steps.
4. Describe application of biostatistics for data handling.
5. Explain techniques of data handling, analysis and interpretation.
6. Explain and reflect upon limitations of qualitative and quantitative research studies.
7. Appreciate approvals required for research in the field of pharmacy including ethics and data protection boards approvals
8. Analyze literature and study designs
9. Conduct literature review and adopt appropriate referencing techniques
10. Develop research skills as applicable to research in pharmaceutical industry and patient-centred pharmaceutical services
11. Develop scholarly reports and dissemination of research results by adopting academic writing skills.
12. Critically analyze literature and study designs
13. Use a protocol for assessment of research evaluation activities
14. Conduct literature review and adopt appropriate referencing techniques;
15. Conduct research studies and utilize the results in different fields
16. Handle and analyze data.
17. Retrieve information from a variety of sources, including libraries, databases and internet
18. Implement presentation, writing reports and interviewing skills in various research field
19. Apply information and communication technology and work independently or as a part of team in different research fields.

## III. Intended learning outcomes (ILOs) of the course:

### (A) Knowledge and Understanding:

Alignment of Course Intended Learning Outcomes (CILOs) to Program Intended Learning Outcomes (PILOs) in: **Knowledge and Understanding.**

Program Intended Learning Outcomes  
(Sub- PILOs) in:

Course Intended Learning Outcomes (CILOs) in:  
Knowledge and Understanding



Knowledge and Understanding			
After completing this program, students will be able to:		After completing this course, students will be able to:	
<b>A1.</b>	Recognize the principles of physical, chemical, clinical, social, behavioral, health and pharmaceutical sciences.	<b>a1-</b>	Describe types of study design and approaches;
<b>A2.</b>	Recognize the physicochemical properties, preparation, structure activity relationship (SAR), toxicity and the modern methods of analysis of various substances of chemical and natural products of therapeutic potential as well as the basic principle of drug discovery, design and development.	<b>a2-</b>	Demonstrate the basic knowledge of research methodology and the principles.
<b>A3.</b>	Describe the general cellular, biochemical and physiological aspects of human body and recognize the pharmacokinetics, pharmacodynamics, disease pathophysiology, and pharmacogenetic of therapeutic agents to provide pharmaceutical care and facilitate management of patient's medication, rationalize drug use and overall health needs.	<b>a3-</b>	Describe research project planning steps.
<b>A4-</b>	Recognize the pharmaceutical dosage form design and the quality control of pharmaceutical formulations according to GMP and pharmacopeial requirements to support the pharmaceutical industries and research.	<b>a4-</b>	Describe application of biostatistics for data handling.
<b>A5</b>	Demonstrate the basic knowledge of pharmacoeconomics, pharmacovigilance, policy, legislation, marketing, administration and distribution of pharmaceutical and cosmetic products as well as ethics of health care	<b>a5-</b>	Explain techniques of data handling, analysis and interpretation.



		a6-	Explain and reflect upon limitations of qualitative and quantitative research studies.
<b>Teaching And Assessment Methods For Achieving Learning Outcomes:</b>			
<b>Alignment of Learning Outcomes of Knowledge and Understanding to Teaching and Assessment Methods:</b>			
Course Intended Learning Outcomes (CILOs) in Knowledge and Understanding		Teaching strategies/methods to be used	Methods of assessment
completing this course, students will be able to:		Lectures using white board or data show. Case study Discussion session Brain storm	Written mid-term exam Oral exam Quizzes Case study and reports Written final exam
a1-	Describe types of study design and approaches;		
a2-	Demonstrate the basic knowledge of research methodology and the principles.		
a3-	Describe research project planning steps.		
a4-	Describe application of biostatistics for data handling.		
a5-	Explain techniques of data handling, analysis and interpretation.		
a6-	Explain and reflect upon limitations of qualitative and quantitative research studies.		

<b>(B) Intellectual Skills:</b>			
<b>Alignment of Course Intended Learning Outcomes (CILOs) to Program Intended Learning Outcomes (PILOs) in: Intellectual skills</b>			
Program Intended Learning Outcomes (Sub-PILOs) in Intellectual skills		Course Intended Learning Outcomes (CILOs) of Intellectual Skills	
After completing this program, students will be able to:		After completing this course, students will be able to:	
B1.	Consolidate the chemical, biochemical and physiological principles to construct the n pharmacophores of the structure and their effect on the stability, pharmacokinetic and pharmacodynamic profiles of the drug.	b1-	Appreciate approvals required for research in the field of pharmacy including ethics and date protection boards approvals;
B2.	Categorize the synthetic and natural drugs according to their mechanism of action,	b2-	Analyze literature and study designs;



	systemic effect, therapeutic uses, contraindication and toxicity.		
<b>B3.</b>	Design different types of safe and effective pharmaceutical dosage forms and develop novel methods of qualitative and quantitative analytical and biological analysis for pharmaceutical and biopharmaceutical products that support pharmaceutical research.	<b>b3-</b>	Conduct literature review and adopt appropriate referencing techniques;
<b>B4.</b>	Plan a modern system for administration of medical foundations and merge the ethics to business during the drug marketing	<b>b4-</b>	Develop research skills as applicable to research in pharmaceutical industry and patient-centred pharmaceutical services.
<b>B5.</b>	Interpret the prescriptions, patient and clinical data, Analysis all the encountered pharmaceutical problems and plan the strategies for their solution, to develop the health care.	<b>b5-</b>	Develop scholarly reports and dissemination of research results by adopting academic writing skills.
		<b>b6-</b>	Critically analyze literature and study designs

### Teaching And Assessment Methods For Achieving Learning Outcomes:

#### Alignment of Learning Outcomes of Intellectual Skills to Teaching Methods and Assessment Methods:

Course Intended Learning Outcomes (CILOs) in Intellectual Skills.		Teaching strategies/methods to be used	Methods of assessment
<b>After completing this course, students will be able to:</b>		Lectures using white board or data show. Research assignments Case study and Solve problems Discussion session Brain storm	Written mid-term exam Quizzes Case study and reports Written final exam
<b>b1-</b>	Appreciate approvals required for research in the field of pharmacy including ethics and date protection boards approvals;		
<b>b2-</b>	Analyze literature and study designs;		
<b>b3-</b>	Conduct literature review and adopt appropriate referencing techniques;		
<b>b4-</b>	Develop research skills as applicable to research in pharmaceutical industry and patient-centred pharmaceutical services.		
<b>b5-</b>	Develop scholarly reports and dissemination of research results by adopting academic writing skills.		
<b>b6-</b>	Critically analyze literature and study designs		

### (C) Professional and Practical Skills:



**Alignment of Course Intended Learning Outcomes (CILOs) to Program Intended Learning Outcomes (PILOs) in: Professional and Practical Skills**

Program Intended Learning Outcomes (Sub-PILOs) in Professional and Practical Skills		Course Intended Learning Outcomes (CILOs) in Professional and Practical Skills	
After completing this program, students will be able to:		After completing this course, students will be able to:	
C1-	Operate different pharmaceutical equipments and instruments and use emerging technologies in design, synthesis, pre-formulation, formulation, packaging, storage and analysis of pharmaceutical products according to GLP, GSP and cGMP guidelines.	c1-	Use a protocol for assessment of research evaluation activities
C2-	Handle and dispose chemicals and pharmaceutical preparations including radiopharmaceuticals safely and effectively.	c2-	Conduct literature review and adopt appropriate referencing techniques;
C3-	Extract, isolate, purify, identify and formulate the natural products and assure their rational use.	c3-	Conduct research studies and utilize the results in different fields
C4-	Provide patient-oriented pharmaceutical care by collaboration with other health care professionals to optimize therapeutic outcomes.	c4-	Handle and analyse data
C5-	Conduct research studies and utilize the results in different pharmaceutical fields.		

**Teaching And Assessment Methods For Achieving Learning Outcomes:**

Alignment of Learning Outcomes of Professional and Practical Skills to Teaching and Assessment Methods:		
Course Intended Learning Outcomes (CILOs) in Professional and Practical Skills	Teaching strategies/methods to be used	Methods of assessment
After completing this course, students will be able to:	Research assignments Case study Discussion session Brain storm	Written mid-term exam Case study and reports Written final exam
c1-	Use a protocol for assessment of research evaluation activities	
c2-	Conduct literature review and adopt appropriate referencing techniques;	
c3-	Conduct research studies and utilize the results in different fields	
c4-	Handle and analyse data	

**(D) General / Transferable Skills:**





Alignment of Course Intended Learning Outcomes (CILOs) to Program Intended Learning Outcomes (PILOs) in: **General and Transferable skills**

Program Intended Learning Outcomes (PILOs) in General / Transferable skills		Course Intended Learning Outcomes (CILOs) in General / Transferable skills	
After completing this program, students will be able to:		After completing this course, students will be able to:	
D1.	Practice independent learning needed for continuous professional development	d1-	Retrieve information from a variety of sources, including libraries, databases and internet
D2.	Employ proper documentation and filing systems in different pharmaceutical fields	d2	Implement presentation, writing reports and interviewing skills in various research field .
D3-	Develop financial, market management, writing, presentation and time management skills as well as creativity, critical thinking, problem solving and decision making abilities	d3	Apply information and communication technology and work independently or as a part of team in different research fields
D4.	Take responsibility for adaptation to change needs in pharmacy practice.		
D5-	Apply information and communication technology and working effectively in a team.		

**Teaching And Assessment Methods For Achieving Learning Outcomes:**

Alignment of Learning Outcomes of General and Transferable skills to Teaching and Assessment Methods:

Course Intended Learning Outcomes (CILOs) in General and Transferable Skills		Teaching strategies/methods to be used	Methods of assessment
After completing this course, students will be able to:		Research assignments Discussion session	Written exam Quizzes Assignments
d1-	Retrieve information from a variety of sources, including libraries, databases and internet		
d2	Implement presentation, writing reports and interviewing skills in various research field .		
d3	Apply information and communication technology and work independently or as a part of team in different research fields		



IV. Course Content:					
1 – Course Topics/Items:					
a – Theoretical Aspect					
Order	Topic List / Units	CILOs (symbols)	Sub-topic List	Number of weeks	Contact hours
1	<b>Introduction Research Concepts</b>	<ul style="list-style-type: none"> <li>- Introduction.</li> <li>- Definitions:</li> <li>- Research Concepts</li> <li>- Attributes of researcher</li> <li>-Motivation of researcher</li> <li>- Research Problem</li> <li>-Source to identify problems</li> <li>-Good problem specification.</li> <li>-Originality of the problems.</li> <li>- Problem f formulation , examples</li> <li>-Determination of problem importance</li> <li>- Criteria of Good Research.</li> </ul>	a2, a3, a4, b2,b4, b5, b6, c1, c2, c3, c4, d1	1	2
2	<b>Research Objectives and Scope</b>	<ul style="list-style-type: none"> <li>-Definition of research method</li> <li>-Physical and moral means.</li> <li>-Theoretical and applied methods</li> <li>example</li> </ul>	a2, a3, b2,b3, c1,c2,d1,d3	1	2





		<ul style="list-style-type: none"> <li>-Research methods components.</li> <li>- Reliability &amp; Validity.</li> <li>- Common characteristics between different approaches.</li> <li>- Research title.</li> <li>-Examples of unacceptable addresses.</li> <li>- Research terms.</li> <li>- Research limitations</li> <li>- Division of limitations.</li> <li>- A good research</li> <li>- Research Process</li> </ul>			
3	<b>Hypothesis and Research Questions</b>	<ul style="list-style-type: none"> <li>- Hypothesis</li> <li>- Types of hypothesis</li> <li>- Foundation of making hypothesis</li> <li>- Research Questions</li> <li>- Research Assumptions</li> <li>- Literature review.</li> <li>- Research literature.</li> <li>- Previous Research.</li> <li>- Criteria for choosing intellectual production</li> <li>- Indications of intellectual production</li> </ul>	a2,a3, b3, c2,c3, d1, d3	1	2
4	<b>Research Tools.</b>	<ul style="list-style-type: none"> <li>- Questionnaire design, cover letter writing</li> <li>- Design a personal interview form and a scientific note.</li> <li>- Identify the types of the sample</li> </ul>	a2,a3,a6, b3, c2,c3, d1, d3	2	4



		<ul style="list-style-type: none"> <li>- Identify the cases that take place in study</li> <li>-Questionnaire, Covering Letter, most prominent conditions of cover letter, Survey form,</li> <li>-Division of the questionnaire, Closed, Open, Open – Closed, Importance questions, multiple choice. Questions.</li> <li>- Condition of the questionnaire</li> <li>- Conditions that should be fulfilled in the questionnaire</li> <li>- Advantages and disadvantages of the questionnaire.</li> <li>- Steps to design the questionnaire.</li> <li>- Pre- testing questionnaire.</li> <li>- Follow- up.</li> <li>-Accuracy and Reliability.</li> <li>- Interview.</li> <li>- Structured Interview.</li> <li>- Unstructured Interview.</li> <li>- Interview terms.</li> <li>- Adv. and disadvantages of the interview.</li> </ul>			
5	<b>Observation.</b>	- Participative and none Observation.	a1-3, b2-3c2-3, d1, d3	1	2



		<ul style="list-style-type: none"> <li>- Conditions of observation.</li> <li>Population &amp; Research Sample</li> <li>- Definition of research population</li> <li>- Cases in which the entire society is studied.</li> <li>- Types of society, (Homogeneous and (Homogeneous Population).</li> </ul>			
6	<b>Research Sample</b>	<ul style="list-style-type: none"> <li>- Conditions that must be met in the sample</li> <li>- Sample volume</li> <li>- How to choose a sample?</li> <li>- Sample selection ( simple, systematic and stratified Sample).</li> <li>Non -Random Sample (Quota sample, Purposive sample, accidental Sample)</li> </ul>	a1-3, b2-3c2-3, d1, d3	1	2
7	<b>Med Term Exam.</b>		a1-6, b2-6, c1-4	1	2
8	<b>Research Organization and Documentation.</b>	<ul style="list-style-type: none"> <li>- Basics of numbering and arranging tables and figures.</li> <li>- Conditions that must be observed in the printing.</li> <li>- Arrange margins and references.</li> </ul>	a2,a5,a6, b3,b6, c1,c4, d1-3	1	2



		<ul style="list-style-type: none"> <li>- Correct way to write footnotes and a list of references.</li> <li>- Punctuation</li> <li>- Formatting tables and figures to coordination of research chapters, etc..</li> <li>-Documentation methods and elements.</li> <li>- Footnotes.</li> </ul>			
9	<b>Research Reports</b>	<ul style="list-style-type: none"> <li>- Research Proposal</li> <li>- Diagram description.</li> <li>- Advantages of search scheme</li> <li>- Search plan elements</li> </ul>	a1-3, b1-4, c1-3, d3	1	2
10	<b>Examples and characteristics of scientific research.</b>	<p>2. Scientific steps ..</p> <p>3. Scientific procedures ..</p> <p>4. Steps of scientific research.</p> <p>A. Identify the problem:</p> <p>B. Formulate the problem .</p> <p>C. Discovering the problems.</p> <p>1. Experience</p> <p>2-Previous Studies</p> <p>3-Study and Reading:</p> <p>4- Observations:</p> <p>5- Scientific Produres:</p> <ul style="list-style-type: none"> <li>-Organized process:</li> <li>-Logical process:</li> <li>-Experimental process:</li> <li>-Brief and concise process:</li> <li>-Applicable:</li> </ul>	a1-3, b1-4, c1-3, d1,d3	2	4



11	Outline of pharmaceutical research project:	<p>Sources of Information:</p> <p>Gathering information</p> <p>Published Sources</p> <p>Unpublished Sources</p> <p>Extraction Quote</p> <p>Types of citation</p> <p>1. Direct quotation:</p> <p>2. Indirect quotation:</p> <p>Source of quoted information</p> <p>Bibliography:</p> <p>List of sources</p> <p>Record of quotations:</p> <p>A research project.</p> <p>Research Proposal.</p> <p>Outline of the research project:</p> <p>1. Cover page or title.</p> <p>2. Abstract:</p> <p>3. Introduction</p> <p>4. Aim.</p> <p>5. Research problems.</p> <p>6. Research Methods</p> <p>7. Results</p> <p>8. Discussion (Possible outcomes of research and time Table).</p> <p>9. Conclusion</p> <p>10. Recommendation</p> <p>11. Bibliography</p>	a1-6, b5, c2-3, d1-3	3	6
16	Final Exam.		a1-6, b1-6, c1-4	1	2
Number of Weeks /and Units Per Semester				16	32

## V. Teaching Strategies of the Course:



1. Lectures using white board or data show.
2. Research assignments
3. Case study and brain storm
4. Discussion session

### 3-Assessment Methods:

- 1- Written mid-term exam To assess The ability of students to follow-up The course subjects.
- 2- Oral exam To assess The ability of students in expressing and presenting their knowledge clearly and in systematic approach.
- 3-Quizzes To assess Knowledge, understanding, intellectual skills
- 4-Case study and reports To assess the skills of problem-solving and date presentation
- 5- Written final exam To assess The overall outcomes.

## VI. Assignments:

No.	Assignments	Aligned CILOs (symbols)	Week Due	Mark
1	Homework Assignments	a1-4, b1-6, d1-3	Sporadic through the semester	10
2	Reports	c1-4		

## VI. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes (CILOs symbols)
1	Participation and quizzes	1-12	10	10%	a5-6, b4, c3, d1-3
2	Assignments	4-12	10	10%	a1-4, b1-6, c1-4, d1-3
3	Mid-semester exam	8	20	20%	a1-6, b2-6, c1-4
5	Final Exam	16	70	70%	a1-6, b1-6, c1-4
<b>Total</b>			<b>100</b>	<b>100%</b>	





## VII. Students' Support:

Office Hours/week	Other Procedures (if any)
Two contact hours per week	None

## VIII. Learning Resource (MLA style or APA style)S:

### 1- Required Textbook(s) ( maximum two )

- Aparasu R, (2010), Research Methods for Pharmaceutical Practice and Policy, 1st edition, Pharmaceutical Press, London.
- Babar Z, (2015), Pharmacy Practice Research Methods, 1st edition , ADIS, Switzerland.
- Stuart MC, (2007), The complete guide to medical writing, 1st edition, Pharmaceutical Press, London.

### 2- Recommended Readings and Reference Materials

Notes prepared by department staff members.

### 3- Essential References

### 4- Electronic Materials and Web Sites etc.

[www.pubmed.com](http://www.pubmed.com)

### 5- Other Learning Material:

Study tour :

## I. Facilities Required:

<b>1 - Accommodation:</b>	<ul style="list-style-type: none"> <li>- Well-equipped lecture halls with data show facilities, whiteboards, net connection, etc.</li> <li>- Well-equipped laboratories with all required equipment and reagents.</li> </ul>
<b>2 - Computing resources:</b>	<ul style="list-style-type: none"> <li>- Computer laboratory with internet facilities.</li> </ul>

## II. Course Improvement Processes:



1- Strategies for obtaining student feedback on effectiveness of teaching	
	<ul style="list-style-type: none"> <li>▪ Student-based assessment of the effectiveness of teaching using a questionnaire designed by the Quality Assurance Unit at the end of the semester.</li> <li>▪ Meeting with students and faculty (once per semester).</li> </ul>
2- Other Strategies for Evaluation of Teaching by the Instructor or by the Department.	
	<ul style="list-style-type: none"> <li>▪ Assessment of the course syllabus and contents by the teachers using a questionnaire designed by the Quality Assurance Unit of the university at the end of the semester.</li> <li>▪ Regular meeting and discussion of the course content between the Head of Department and the teaching staff of the course (for theory and practice).</li> </ul>
3- Processes for Improvement of Teaching.	
	<ul style="list-style-type: none"> <li>▪ Revision of the course specification and its teaching strategies every three academic years after consideration of all issues raised by the teachers and/or students during regular meetings and discussions.</li> <li>▪ Exploring any possible defects in the course that might encountered by the teaching staff and their mitigation in subsequent improved versions of course specification.</li> </ul>
4- Processes for Verifying Standards of Students' Achievement	
	<ul style="list-style-type: none"> <li>▪ Checking of a sample of students' work by an independent faculty member.</li> <li>▪ Periodic exchange and check marking of a sample of students' assignments with a faculty member from another institution.</li> <li>▪ Adoption of scoring rubrics to assess the students' achievement (both for ongoing or summative assessments).</li> <li>▪ Regular follow-up of laboratory logbooks to assess the practical achievement of students.</li> </ul>
5- Procedures for Periodically Reviewing of Course Effectiveness and Planning for Improvement	
	<ul style="list-style-type: none"> <li>▪ Student rating and feedback</li> <li>▪ Peer rating and feedback</li> <li>▪ Regular meeting of the Curriculum Committee of the faculty.</li> </ul>
6- Course Development Plans	
	<ul style="list-style-type: none"> <li>▪ Conducting regular workshops for the staff for improving their course specification skills.</li> <li>▪ Regular revision of course specification and syllabus items.</li> </ul>



### VIII. Course Policies: (including plagiarism, academic honesty, attendance etc)

The University Regulations on academic misconduct will be strictly enforced. Please refer to -----

1	<b>Class Attendance:</b> <ul style="list-style-type: none"><li>Attendance of all lectures and practical sessions is required. Unexcused absence exceeding 25% of the lectures or practical sessions will disqualify the student from entering the final exam.</li></ul>
2	<b>Tardy:</b> <p>- Roll will be called in the very beginning of each lecture and practical class. Retardation for more than three weeks without a reasonable excursion, the student involved shall not be allowed to attend the class any longer and consequently shall be considered to be absent.</p>
3	<b>Exam Attendance/Punctuality:</b> <ul style="list-style-type: none"><li>Exam attendance is obligatory unless being excused by the department and faculty.</li><li>Absence from assignments or exams will dealt with according to the general policy of the university.</li></ul>
4	<b>Assignments &amp; Projects:</b> <ul style="list-style-type: none"><li>Assignments: Written and oral; Laboratory logbook signed by the responsible demonstrator.</li><li>Projects: Not applicable.</li></ul>
5	<b>Cheating:</b> <ul style="list-style-type: none"><li>Punishment of cheating will be according to the general policy of the university in this respect.</li></ul>
6	<b>Plagiarism:</b> <ul style="list-style-type: none"><li>Plagiarism in written essays, reports, etc. is not accepted, and students who plagiarize the works of others will be punished according to the general policy of the university.</li></ul>
7	<b>Other policies:</b> <ul style="list-style-type: none"><li>General policies of the Students' Affairs of the University and the Quality Assurance Unit.</li></ul>



### Course Plan of Applied and Evaluation of Pharmaceutical Research

I- Information about Faculty Member Responsible for the Course:							
Name of Faculty Member	Prof. Dr. Maged Alwan	Office Hours					
Location & Telephone No.		SAT	SUN	MON	TUE	WED	THU
E-mail							



## II- Course Identification and General Information:

1-	Course Title:	Applied and Evaluation of Pharmaceutical Research				
2-	Course Number & Code:	Ph991				
3-	Credit hours:	C.H				Total
		Th.	Seminar	Pr.	F. Tr.	
		2	-	-	2	
4-	Study level/year at which this course is offered:	5 <sup>th</sup> level / 1 <sup>st</sup> semester				
5-	Pre –requisite (if any):	All specialized courses				
6-	Co –requisite (if any):					
7-	Program (s) in which the course is offered	Bachelor of Pharmacy				
8-	Language of teaching the course:	English				
9-	System of Study:	Semesters				
10-	Mode of delivery:	Regular				
11-	Location of teaching the course:	Faculty of Pharmacy- Sana`a University				

## III. Course description:

This study-unit elucidates the application of research methodology to the aspects of pharmaceutical research that focuses on process and service outcomes. Aspects relevant to a robust design of the research project in the areas of pharmaceutical services and in pharmaceutical technology processes are highlighted. Application of research methodology principles in the development of controlled trials, clinical trials and process analysis is presented.

## IV. Intended learning outcomes (ILOs) of the course:

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

- 1- Describe types of study design and approaches
- 2- Demonstrate the basic knowledge of research methodology and the principles.
- 3- Describe research project planning steps.
- 4- Describe application of biostatistics for data handling.
- 5- Explain techniques of data handling, analysis and interpretation.
- 6- Explain and reflect upon limitations of qualitative and quantitative research studies.



- 7- Appreciate approvals required for research in the field of pharmacy including ethics and date protection boards approvals
- 8- Analyze literature and study designs
- 9- Conduct literature review and adopt appropriate referencing techniques
- 10- Develop research skills as applicable to research in pharmaceutical industry and patient-centred pharmaceutical services
- 11- Develop scholarly reports and dissemination of research results by adopting academic writing skills.
- 12- Critically analyze literature and study designs
- 13- Use a protocol for assessment of research evaluation activities
- 14- Conduct literature review and adopt appropriate referencing techniques;
- 15- Conduct research studies and utilize the results in different fields
- 16- Handle and analyze data.
- 17- Retrieve information from a variety of sources, including libraries, databases and internet
- 18- Implement presentation, writing reports and interviewing skills in various research field
- 19- Apply information and communication technology and work independently or as a part of team in different research fields.

## V. Course Content:

### 1 – Course Topics/Items:

#### a – Theoretical Aspect

Order	Topic List / Units	CILOs (symbols)	Sub-topic List	Week Due	Contact hours
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1	<b>Introduction Research Concepts</b>	<ul style="list-style-type: none"> <li>- Introduction.</li> <li>- Definitions:</li> <li>- Research Concepts</li> <li>- Attributes of researcher</li> <li>-Motivation of researcher</li> <li>- Research Problem</li> <li>-Source to identify problems</li> <li>-Good problem specification.</li> <li>-Originality of the problems.</li> <li>- Problem f formulation , examples</li> <li>-Determination of problem importance</li> <li>- Criteria of Good Research.</li> </ul>	a2, a3, a4, b2,b4, b5, b6, c1, c2, c3, c4, d1	1	2
2	<b>Research Objectives and Scope</b>	<ul style="list-style-type: none"> <li>-Definition of research method</li> <li>-Physical and moral means.</li> <li>-Theoretical and applied methods example</li> <li>-Research methods components.</li> <li>- Reliability &amp; Validity.</li> <li>- Common characteristics between different approaches.</li> <li>- Research title.</li> <li>-Examples of un-acceptable addresses.</li> <li>- Research terms.</li> </ul>	a2, a3, b2,b3, c1,c2,d1,d3	2	2



		<ul style="list-style-type: none"> <li>- Research limitations</li> <li>- Division of limitations.</li> <li>- A good research</li> <li>- Research Process</li> </ul>			
3	<b>Hypothesis and Research Questions</b>	<ul style="list-style-type: none"> <li>- Hypothesis</li> <li>- Types of hypothesis</li> <li>- Foundation of making hypothesis</li> <li>- Research Questions</li> <li>- Research Assumptions</li> <li>- Literature review.</li> <li>- Research literature.</li> <li>- Previous Research.</li> <li>- Criteria for choosing intellectual production</li> <li>- Indications of intellectual production</li> </ul>	a2,a3, b3, c2,c3, d1, d3	3	2
4	<b>Research Tools.</b>	<ul style="list-style-type: none"> <li>- Questionnaire design, cover letter writing</li> <li>- Design a personal interview form and a scientific note.</li> <li>- Identify the types of the sample</li> <li>- Identify the cases that take place in study</li> <li>-Questionnaire, Covering Letter, most prominent conditions of cover letter, Survey form,</li> <li>-Division of the questionnaire, Closed, Open, Open – Closed, Importance questions, multiple choice. Questions.</li> </ul>	a2,a3,a6, b3, c2,c3, d1, d3	4-5	4



		<ul style="list-style-type: none"> <li>- Condition of the questionnaire</li> <li>- Conditions that should be fulfilled in the questionnaire</li> <li>- Advantages and disadvantages of the questionnaire.</li> <li>- Steps to design the questionnaire.</li> <li>- Pre- testing questionnaire.</li> <li>- Follow- up.</li> <li>-Accuracy and Reliability.</li> <li>- Interview.</li> <li>- Structured Interview.</li> <li>- Unstructured Interview.</li> <li>- Interview terms.</li> <li>- Adv. and disadvantages of the interview.</li> </ul>			
5	<b>Observation.</b>	<ul style="list-style-type: none"> <li>- Participative and none Observation.</li> <li>- Conditions of observation.</li> <li>Population &amp; Research Sample</li> <li>- Definition of research population</li> <li>- Cases in which the entire society is studied.</li> <li>- Types of society, (Homogeneous and (Homogeneous Population).</li> </ul>	a1-3, b2-3c2-3, d1, d3	6	2



6	<b>Research Sample</b>	<ul style="list-style-type: none"> <li>- Conditions that must be met in the sample</li> <li>- Sample volume</li> <li>- How to choose a sample?</li> <li>- Sample selection ( simple, systematic and stratified Sample).</li> <li>Non -Random Sample (Quota sample, Purposive sample, accidental Sample)</li> </ul>	a1-3, b2-3c2-3, d1, d3	7	2
7	<b>Med Term Exam.</b>		a1-6, b2-6, c1-4	8	2
8	<b>Research Organization and Documentation.</b>	<ul style="list-style-type: none"> <li>- Basics of numbering and arranging tables and figures.</li> <li>- Conditions that must be observed in the printing.</li> <li>- Arrange margins and references.</li> <li>- Correct way to write footnotes and a list of references.</li> <li>- Punctuation</li> <li>- Formatting tables and figures to coordination of research chapters, etc..</li> <li>-Documentation methods and elements.</li> <li>- Footnotes.</li> </ul>	a2,a5,a6, b3,b6, c1,c4, d1-3	9	2
9	<b>Research Reports</b>	<ul style="list-style-type: none"> <li>- Research Proposal</li> <li>- Diagram description.</li> <li>- Advantages of search scheme</li> </ul>	a1-3, b1-4, c1-3, d3		



		- Search plan elements		10	2
10	Examples and characteristics of scientific research.	<p>2. Scientific steps ..</p> <p>3. Scientific procedures ..</p> <p>4. Steps of scientific research.</p> <p>A. Identify the problem:</p> <p>B. Formulate the problem .</p> <p>C. Discovering the problems.</p> <p>1. Experience</p> <p>2-Previous Studies</p> <p>3-Study and Reading:</p> <p>4- Observations:</p> <p>5- Scientific Produres:</p> <p>-Organized process:</p> <p>-Logical process:</p> <p>-Experimental process:</p> <p>-Brief and concise process:</p> <p>-Applicable:</p>	a1-3, b1-4, c1-3, d1,d3	11-12	4
11	Outline of pharmaceutical research project:	<p>Sources of Information:</p> <p>Gathering information</p> <p>Published Sources</p> <p>Unpublished Sources</p> <p>Extraction Quote</p> <p>Types of citation</p> <p>1. Direct quotation:</p> <p>2. Indirect quotation:</p> <p>Source of quoted information</p> <p>Bibliography:</p> <p>List of sources</p> <p>Record of quotations:</p> <p>A research project.</p>	a1-6, b5, c2-3, d1-3	13-15	6



		<p>Research Proposal. Outline of the research project:</p> <ol style="list-style-type: none"> <li>1. Cover page or title.</li> <li>2. Abstract:</li> <li>3. Introduction</li> <li>4. Aim.</li> <li>5. Research problems.</li> <li>6. Research Methods</li> <li>7. Results</li> <li>8. Discussion (Possible outcomes of research and time Table).</li> <li>9. Conclusion</li> <li>10. Recommendation</li> <li>11. Bibliography</li> </ol>			
16	Final Exam.		a1-6, b1-6, c1-4	16	2
<b>Number of Weeks /and Units Per Semester</b>				<b>16</b>	<b>32</b>

## VI. Teaching strategies of the course:

1. Lectures using white board or data show.
2. Research assignments
3. Case study and brain storm
4. Discussion session

### 3-Assessment Methods:

- 1- Written mid-term exam To assess The ability of students to follow-up The course subjects.
- 2- Oral exam To assess The ability of students in expressing and presenting their knowledge clearly and in systematic approach.
- 3- Quizzes To assess Knowledge, understanding, intellectual skills
- 4- Case study and reports To assess the skills of problem-solving and date presentation
- 5- Written final exam To assess The overall outcomes.





## VI. Assignments:

No.	Assignments	Aligned CILOs (symbols)	Week Due	Mark
1	Homework Assignments	a1-4, b1-6, d1-3	Sporadic through the semester	10
2	Reports	c1-4		

## VII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes (CILOs symbols)
1	Participation and quizzes	1-12	10	10%	a5-6, b4, c3, d1-3
2	Assignments	4-12	10	10%	a1-4, b1-6, c1-4, d1-3
3	Mid-semester exam	8	20	20%	a1-6, b2-6, c1-4
5	Final Exam	16	70	70%	a1-6, b1-6, c1-4
<b>Total</b>			<b>100</b>	<b>100%</b>	

## VIII. Students' Support:

Office Hours/week	Other Procedures (if any)
Two contact hours per week	None

## IX. Learning Resource (MLA style or APA style)S:

### 6- Required Textbook(s) ( maximum two )

- Aparasu R, (2010), Research Methods for Pharmaceutical Practice and Policy, 1st edition, Pharmaceutical Press, London.
- Babar Z, (2015), Pharmacy Practice Research Methods, 1st edition , ADIS, Switzerland.
- Stuart MC, (2007), The complete guide to medical writing, 1st edition, Pharmaceutical Press, London.



<b>7- Recommended Readings and Reference Materials</b>	
	Notes prepared by department staff members.
<b>8- Essential References</b>	
<b>9- Electronic Materials and Web Sites etc.</b>	
	<a href="http://www.pubmed.com">www.pubmed.com</a>
<b>10- Other Learning Material:</b>	
	Study tour :

<b>X. Facilities Required:</b>	
<b>1 - Accommodation:</b>	<ul style="list-style-type: none"> <li>- Well-equipped lecture halls with data show facilities, whiteboards, net connection, etc.</li> <li>- Well-equipped laboratories with all required equipment and reagents.</li> </ul>
<b>3 - Computing resources:</b>	<ul style="list-style-type: none"> <li>- Computer laboratory with internet facilities.</li> </ul>
<b>XI. Course Improvement Processes:</b>	
<b>6- Strategies for obtaining student feedback on effectiveness of teaching</b>	
	<ul style="list-style-type: none"> <li>▪ Student-based assessment of the effectiveness of teaching using a questionnaire designed by the Quality Assurance Unit at the end of the semester.</li> <li>▪ Meeting with students and faculty (once per semester).</li> </ul>
<b>7- Other Strategies for Evaluation of Teaching by the Instructor or by the Department.</b>	
	<ul style="list-style-type: none"> <li>▪ Assessment of the course syllabus and contents by the teachers using a questionnaire designed by the Quality Assurance Unit of the university at the end of the semester.</li> <li>▪ Regular meeting and discussion of the course content between the Head of Department and the teaching staff of the course (for theory and practice).</li> </ul>
<b>8- Processes for Improvement of Teaching.</b>	
	<ul style="list-style-type: none"> <li>▪ Revision of the course specification and its teaching strategies every three academic years after consideration of all issues raised by the teachers and/or students during regular meetings and discussions.</li> </ul>



	<ul style="list-style-type: none"> <li>Exploring any possible defects in the course that might encountered by the teaching staff and their mitigation in subsequent improved versions of course specification.</li> </ul>
<b>9- Processes for Verifying Standards of Students' Achievement</b>	
	<ul style="list-style-type: none"> <li>Checking of a sample of students' work by an independent faculty member.</li> <li>Periodic exchange and check marking of a sample of students' assignments with a faculty member from another institution.</li> <li>Adoption of scoring rubrics to assess the students' achievement (both for ongoing or summative assessments).</li> <li>Regular follow-up of laboratory logbooks to assess the practical achievement of students.</li> </ul>
<b>10- Procedures for Periodically Reviewing of Course Effectiveness and Planning for Improvement</b>	
	<ul style="list-style-type: none"> <li>Student rating and feedback</li> <li>Peer rating and feedback</li> <li>Regular meeting of the Curriculum Committee of the faculty.</li> </ul>
<b>6- Course Development Plans</b>	
	<ul style="list-style-type: none"> <li>Conducting regular workshops for the staff for improving their course specification skills.</li> <li>Regular revision of course specification and syllabus items.</li> </ul>

## IX. Course Policies: (including plagiarism, academic honesty, attendance etc)

The University Regulations on academic misconduct will be strictly enforced. Please refer to -----

<b>1</b>	<p><b>Class Attendance:</b></p> <ul style="list-style-type: none"> <li>Attendance of all lectures and practical sessions is required. Unexcused absence exceeding 25% of the lectures or practical sessions will disqualify the student from entering the final exam.</li> </ul>
<b>2</b>	<p><b>Tardy:</b></p> <p>- Roll will be called in the very beginning of each lecture and practical class. Retardation for more than three weeks without a reasonable excursion, the student involved shall not be allowed to attend the class any longer and consequently shall be considered to be absent.</p>
<b>3</b>	<p><b>Exam Attendance/Punctuality:</b></p> <ul style="list-style-type: none"> <li>Exam attendance is obligatory unless being excused by the department and faculty.</li> </ul>



	<ul style="list-style-type: none"><li>Absence from assignments or exams will be dealt with according to the general policy of the university.</li></ul>
4	<b>Assignments &amp; Projects:</b> <ul style="list-style-type: none"><li>Assignments: Written and oral; Laboratory logbook signed by the responsible demonstrator.</li><li>Projects: Not applicable.</li></ul>
5	<b>Cheating:</b> <ul style="list-style-type: none"><li>Punishment of cheating will be according to the general policy of the university in this respect.</li></ul>
6	<b>Plagiarism:</b> <ul style="list-style-type: none"><li>Plagiarism in written essays, reports, etc. is not accepted, and students who plagiarize the works of others will be punished according to the general policy of the university.</li></ul>
7	<b>Other policies:</b> <ul style="list-style-type: none"><li>General policies of the Students' Affairs of the University and the Quality Assurance Unit.</li></ul>