Course Description (Practical Org Pharm Chem II) (Practical)

Performance review of higher education institution (assessment of the academic program)

This course description summarizes the key characteristics and anticipated learning objectives for students, assessing their utilization of available learning resources, and must be aligned with the program description.

1. Educational Institution	Al-Zahrawi University College
2. University Department / Center	Pharmacy
3. Course Name / Code	Practical Org Pharm Chem II (Practical)
4. Programs in which it is included	Bachelor of Pharmacy
5. Available Forms of Attendance	Daily Attendance
6. Semester / Year	First Semester, Fourth Stage (2025-2026)
7. Total Number of Study Hours	30 hour
8. Date of preparing this description	2025-2026

9. Course Objectives:

1. Synthesis and Purification: Students will learn to synthesize important pharmaceutical compounds such as salicylic acid, aspirin, nitrobenzene, aniline, and acetanilide, as well as master purification techniques like recrystallization.
2. Analytical Skills: Develop proficiency in assaying pharmaceutical products, including both known and unknown samples of aspirin and sulfa drugs.
3. Advanced Organic Reactions: Gain hands-on experience with complex organic reactions such as chlorosulfonation, amination, and hydrolysis, particularly in the context of sulfonamide synthesis.
4. Pharmaceutical Relevance: Understand the practical applications of organic chemistry in pharmaceutical production by synthesizing and analyzing common drugs and their precursors.

1. Learning Outcomes, Teaching and Learning Methods, and Evaluation

A. Knowledge and Understanding

1. Organic Synthesis Principles: Students will comprehend the fundamental principles and mechanisms behind organic synthesis reactions, particularly those relevant to pharmaceutical compounds such as aspirin, sulfonamides, and their precursors.
2. Purification Techniques: Gain in-depth understanding of various purification methods, with a focus on recrystallization, as applied to pharmaceutically important compounds like salicylic acid, aspirin, and acetanilide.
3. Analytical Methods: Develop a thorough understanding of analytical techniques used for assaying pharmaceutical products, including the ability to analyze both known and unknown samples of common drugs like aspirin and sulfa drugs.
4. Pharmaceutical Relevance: Acquire knowledge about the practical applications of organic chemistry in the pharmaceutical industry, understanding the significance of each synthesized compound and its role in drug development or as an intermediate in drug synthesis.

B. Subject-Specific Skills

1. Organic Synthesis Techniques: Students will gain proficiency in executing various organic synthesis reactions, including esterification (aspirin synthesis), nitration (nitrobenzene preparation), reduction (aniline synthesis), and sulfonation (chlorosulfonation of acetanilide).
2. Purification and Isolation Methods: Develop hands-on skills in purification techniques, with a strong emphasis on recrystallization, as applied to various pharmaceutical compounds such as salicylic acid, aspirin, and acetanilide.
3. Analytical and Assay Procedures: Master the practical skills required for assaying pharmaceutical products, including the ability to analyze both known and unknown samples of common drugs like aspirin and sulfa drugs using appropriate analytical methods.
4. Multi-Step Synthesis: Acquire the ability to perform complex, multi-step organic syntheses, as demonstrated in the preparation of sulfanilamide through a series of reactions including chlorosulfonation, amination, and hydrolysis.

Teaching and Learning Methods

1. Inquiry-Based Learning: Implement inquiry-based approaches where students are given opportunities to design their own experiments or modifications to existing procedures. For example, after learning the basic synthesis of aspirin, students could be challenged to propose and test methods for improving yield or purity.

2. Collaborative Learning: Incorporate group work and peer-to-peer learning activities. Students can work in pairs or small teams on complex multi-step syntheses like the preparation of sulfanilamide, encouraging discussion, problem-solving, and shared responsibility for laboratory outcomes.

3. Technology-Enhanced Learning: Integrate digital tools and resources to support learning. This could include using molecular modeling software to visualize reaction mechanisms, online pre-lab quizzes to ensure preparedness, or digital lab notebooks for data collection and analysis. These tools can enhance understanding of organic chemistry concepts and improve data management skills.

C. Evaluation Methods

1. Practical Assessments: Evaluate students' laboratory skills, techniques, and ability to synthesize and purify compounds through hands-on practical exams. This could include tasks such as synthesizing aspirin or sulfanilamide, performing recrystallization, or conducting assays on unknown samples.

2. Lab Reports: Assess students' understanding of experimental procedures, data analysis, and

scientific writing through comprehensive lab reports. These reports should cover the synthesis, purification, and analysis of compounds like salicylic acid, aspirin, and sulfa drugs.

3. Continuous Assessment: Implement ongoing evaluation through pre-lab quizzes, post-lab discussions, and periodic theoretical tests to assess students' preparation, comprehension of underlying principles, and ability to apply knowledge to practical scenarios in organic pharmaceutical chemistry.

D. Thinking Skills

1. Analytical Reasoning: Students will develop the ability to interpret experimental results, analyze data from assays of known and unknown samples, and draw logical conclusions about the purity and identity of synthesized compounds.
2. Problem-Solving: Enhance skills in troubleshooting experimental procedures, optimizing reaction conditions, and addressing challenges that may arise during multi-step syntheses like the preparation of sulfanilamide.
3. Critical Evaluation: Cultivate the ability to critically assess the quality of synthesized products, the efficiency of purification methods, and the accuracy of analytical techniques used in pharmaceutical compound assays.
4. Process Optimization: Develop the capacity to think strategically about improving synthetic routes, enhancing yield and purity, and streamlining analytical procedures for pharmaceutical compounds like aspirin and sulfa drugs.

E. General and Transferable Skills

1. Develop proficiency in laboratory techniques applicable to various scientific and industrial settings.
2. Enhance time management and organizational skills through conducting multi-step syntheses and analyses.
3. Improve scientific communication abilities through writing comprehensive lab reports and discussing results.
4. Cultivate teamwork and collaborative problem-solving skills during group laboratory activities.

11. Course Structure

Weeks	Hours	Required Learning Outcomes	Unit Name / Course or Topic	Learning Methods	Evaluation Method
1	2	Knowledge	Preparation of salicylic acid	Blackboard and Screen Presentations	Daily exam and oral questions
2	2	Knowledge	Preparation of salicylic acid	Blackboard and Screen Presentations	Daily exam and oral questions
3	2	Knowledge	Re-crystallization of salicylic acid	Blackboard and Screen Presentations	Daily exam and oral questions
4	2	Knowledge	Synthesis of aspirin	Blackboard and Screen Presentations	Daily exam and oral questions
5	2	Knowledge	Re-crystallization of aspirin	Blackboard and Screen Presentations	Daily exam and oral questions
6	2	Knowledge	Assay of aspirin (known sample)	Blackboard and Screen Presentations	Daily exam and oral questions
7	2	Knowledge	Assay of aspirin (unknown sample)	Blackboard and Screen Presentations	Daily exam and oral questions
8	2	Knowledge	Preparation of nitrobenzene	Blackboard and Screen Presentations	Daily exam and oral questions
9	2	Knowledge	Assay of nitrobenzene	Blackboard and Screen Presentations	Daily exam and oral questions
10	2	Knowledge	Assay(unknown sample)of nitrobenzene	Blackboard and Screen Presentations	Daily exam and oral questions
11	2	Knowledge	Preparation of aniline	Blackboard and Screen Presentations	Daily exam and oral questions
12	2	Knowledge	Assay of aniline	Blackboard and Screen Presentations	Daily exam and oral questions

13	2	Knowledge	Assay(unknown sample) of aniline	Blackboard and Screen Presentations	Daily exam and oral questions
14	2	Knowledge	Preparation of acetanilide	Blackboard and Screen Presentations	Daily exam and oral questions
15	2	Knowledge	Assay of sulfa drugs (known sample)	Blackboard and Screen Presentations	Daily exam and oral questions

12. Infrastructure	
Required Readings:	**References:** Lab Handbook for Practical Organic Pharmaceutical Chemistry Adopted by the Department
Special Requirements (Workshops, Journals, Software, Websites):	**Electronic Websites:** PubChem for chemical information and properties Royal Society of Chemistry's ChemSpider American Chemical Society's resources for organic chemistry
Social Services (Guest Lectures, Professional Training, Field Studies, Others)	**Organizing workshops and courses for graduates:**

13. Admission:	
Prerequisites	Admission according to the central plan
Minimum Number of Students	/
Maximum Number of Students	Admission exceeds the capacity plan

Name of the Instructor Essa Hamad Abbood.