University of Jordan
School of Engineering
Chemical Engineering Department

1. **Course number and name: (0915452) Separation Processes (2)**
2. **Prerequisites: Separation Processes (1) (0915451), Process Heat Transfer (0905343)**
1. **Class schedule:** 3 credits
    a. Time and place: Specified according to schedule of the semester
    b. Office hours: : Specified according to schedule of the semester
2. **Instructor:** Determined later
3. **Text book:** Christie John Geankoplis, Transport processes and separation process principles, 5 edition Prentice Hall; (March 15, 2018)

4. **References:**
    1. **J. D. Seader, Ernest J. Henley, D. Keith Roper, separation process principles, Wiley, 2011**
    2. Coulson, J.M.; and Richardson, J.F.; Chemical Engineering Volume 2, 5th Ed., 1999, Butterworth-Heinemann

5. **Course information:**
Humidification: Equilibrium data, adiabatic and non-adiabatic operations, Evaporative cooling, drought towers. Drying Definitions, batch, mechanism of drying, drying at low temperature, continuous drying, material and enthalpy balances, the design of driers. Evaporation: Single and multiple effects, and flow arrangements, heat pumps، barometric condensers. Crystallization: Theory, batch and continuous, equilibrium enthalpy balances, the design of different types of crystallizers. Adsorption: Stage wise adsorptions, continuous adsorption, design using LUB concept and regeneration

6. **Course objectives and Outcomes:**

This course is devoted primarily to the basic principles and practical applications of fluid mechanics. Upon the successful completion of the course, the student will be able to:	**Chemical Engineering program outcomes:**						
	O1	O2	O3	O4	O5	O6	O7
Identify importance, industrial applications, different types, mode of operations, and selection criteria of evaporation, crystallization, adsorption, humidification/dehumidification, and drying processes.	■						
Deal with various phase diagrams, humidity charts, enthalpy-concentration diagrams, steam tables and other chemical engineering tables/diagrams related to the separation processes considered.	■						
Examine both equilibrium controlled separation processes as well as separation processes that involve both heat/mass transport.	■						
Design single stage and multistage equilibrium chemical processes for evaporation, adsorption crystallization, humidification/dehumidification, and drying.		■		■			
Solve separation problems related to evaporation, adsorption, crystallization, humidification, dehumidification, and drying.	■						

7. Topics covered:

Content	Reference(s)	# of lectures
• **Introduction**	Seader et al. (Ch.1)	1
• **Adsorption**	Geankoplis (Ch. 28) Seader et al. (Ch. 15)	8
• **Evaporation**	Geankoplis (Ch. 32) Seader et al. (Ch.17)	8
• **Humidification and cooling towers**	Geankoplis (Ch. 23) McCabe & Smith (Ch. 19) Seader et al. (Ch. 18)	10
• **Drying**	Geankoplis (Ch. 33) Seader & Henley (Ch. 18)	8
• **Crystallization**	Geankoplis (Ch. 29) Seader et al. (Ch. 17) McCabe & Smith (Ch. 27)	9
Final Exam		

8. Minimum student materials: Text book, class handouts, engineering calculator, and an access to Personal Computer with MATLAB and/or Excel.

9. Instructional methods:
Lectures, group assignments, class discussion and problem solving Projects and Assignments

10. Homework Assignments:
Assignments are due at the beginning of the class period on the specified date; late homework will NOT be accepted (i.e it will be awarded a zero). Please write only on one side of the page. Your name and ID number should be clearly written on first page. Start each problem on a new page. Clearly mark your answers in a box (Never use a red pen in your work). Staple the pages together.

11. Assessment & Grading:

Quizzes & Assignments	:	20%
Midterm Exam	:	30%
Final exam	:	50%
Total	**:**	**100%**

12. Relationship to Program Outcomes (%)

O1	O2	O3	O4	O5	O6	O7
√	√					

13. Relationship to Chemical Engineering Program Objectives

PEO1	PEO2	PEO3	PEO 4
√	√	√	√

14. Notes:

a. Discuss the assignments among yourselves. This is helpful to the learning process. However, direct copying of others work will NOT be allowed or tolerated and will result in a reduction of grade.
b. All cases of academic dishonesty will be handled in accordance with university policies and regulations.
c. There will be a number of unannounced quizzes during the semester. Students are expected to be ready to take a quiz any time they have a class. There will be no make-up quizzes.

d. Students are expected to attend EVERY CLASS SESSION and they are responsible for all material, announcements, schedule changes, etc., discussed in class. The university policy regarding the attendance will be strictly adhered

e. Any students with disabilities who need accommodations in this course are encouraged to speak with the instructor as soon as possible to make appropriate arrangements for these accommodations.

f. Exams are scheduled as shown in the syllabus and last 90 minutes. The exams are close textbook and notes. It is your responsibility to bring a calculator, pencils and paper. If you MUST miss one of these exams for an emergency situation, please let me know as soon as possible. If you oversleep or skip an exam you will not have an opportunity to make it up. If you have a valid (according to me) time conflict and you let me know in advance, there is the possibility of taking an exam at an alternate time.

15. ABET Criteria : Outcomes and Assessment: Engineering programs must demonstrate that their graduates have

O1	Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
O2	Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
O3	Communicate effectively with a range of audiences.
O4	Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
O5	Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
O6	Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
O7	Acquire and apply new knowledge as needed, using appropriate learning strategies.