Jordan University of Science and Technology
Faculty of Engineering
Chemical Engineering Department

ChE 452: Applied Mathematics & Modeling for Chemical Engineers

3 credit hour, 3contact hour lecture, 3 credit hour Eng.

Instructor

Instructor: Prof. Majdi Al-Mahasneh E-mail**:** mmajdi@just.edu.jo

Textbooks & References

A. Textbook

	Textbook 1
Title	Applied Mathematics & Modeling for Chemical Engineers
Author(s)	**R. G. Rice & D. D. Do**
Publisher	Wiley
Year	2012
Edition	2nd

B. References

1. R. K. Sinnott (2005). *Chemical engineering design, Vol. 6* (4th edition). Elsevier.
2. David M. Himmelblau & James B. Riggs (1989). Basic Principles and Calculations in Chemical Engineering**.** Prentice Hall.
3. Luyben, W. L. (1990). *Process modeling, simulation and control for Chemical Engineers* (2nd edition). McGraw-Hill.
4. Jenson, V. G., & Jeffreys, G. V. (1977*). Mathematical Methods in Chemical Engineering* (2nd edition). Academic Press Inc.
5. Kreyszig, E. (2006). *Advanced Engineering Mathematics* (9th edition). John Wiley & Sons.

كامل وقيع الله (2005). *استخدام الحاسوب في موازنات المادة والطاقة لطلاب الهندسة الكيميائية*. الدار العربية للعلوم.

Specific Course Information

A. Course Catalog:

Introduction to mathematical modeling, modeling steady state processes, degree of freedom analysis, heat integration, solution techniques for ODE's, distributed models development, Laplace transformation, modeling dynamic behavior of processes, computer applications for model analysis.

B. Prerequisites or co-requisites

Co-requisites by course ChE 432
Prerequisite for ChE 551

C. Required/Elective or Selected Elective

Required

Objectives and Outcomes*

Objectives	Outcomes
1. Learn how to solve ordinary and partial differential equations analytically and using software pakcages [1,7]	1.1. Learn different methods to solve first and second order ODE's and PDE's [1] 1.2. Use computer packages (MATLAB) and (WolframAlpha) to solve ODE's [7]
2. Understand the concept of modeling and the levels of complexity involved in building models [2,7]	2.1. Learn how to apply a systematic approach to analyse a system in order to build a representative model [1] 2.2. Learn how and why assumptions are used in building models [1] 2.3. Learn how to analyse dynamic systems using Laplace transtroms [1] 2.4. Use computer packages (MATLAB) and (WolframAlpha) to solve the models and analyse the system [1,7]
3. Learn who to analyze a system based on given information and decide if missing information are needed and how the choices made affect the solution [1,2]	3.1. Review the concept of degrees of freedom [1,2] 3.2. Analyze a process flow sheet and decide if the given information are sufficient to solve the problem [2] 3.3. Setup a modular solver based on process flow sheet based on the degree of freedom analysis and available information [2,7]

Contribution of Course to Meeting the Professional Component

Relationship to Student Outcomes (%)

1	2	3	4	5	6	7
40	40					20

Relationship to Chemical Engineering Program Objectives

PEO1	PEO2	PEO3	PEO 4	PEO 5	PEO 6
√	√			√	

Topics Covered

Week	Topics	Chepters in Text (s)
1	Introduction and fundamentals	Handout
2 – 3 1, 2, 4	Differential equations	R 2–4; K
4 – 6 1–3**;** L 1-3	Mathematical Modeling	R 1–4; J
7 – 11 W 1,2; C 2-4	Process analysis	C 1; H 5;
12 – 13	Dynamic systems	R 9, 10
15	PDE's	Handout

* Number in brackets refer to the Program outcomes