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Department of Chemical Engineering	
Process Modeling in Chemical Engineering (64452)	
Total Credits	**3**
major compulsory	
Prerequisites	P1 : Mass Transfer (64361) OR Mass Transfer Operations (64461) P2 : Engineering Numerical Analysis (64251) OR Numerical Analysis for Engineers (64203)

Course Contents

1- Introduction to mathematical modeling. 2- Steps in mathematical formulation of chemical and physical problems. 3- Theoretical principles of mathematical models. 4- Mathematical models and examples in chemical engineering problems on : a. Continuity equation. b. Energy equation c. Equation of motion d. Transport equations e. Equation of state f. Equilibrium g. Chemical kinetics 5- Bessel equation and its application in chemical engineering. 6- Introduction to analytical and the numerical solution of partial differential equations. 7- Computer applications and simulation using program packages on the above topics

	Intended Learning Outcomes (ILO's)	Student Outcomes (SO's)	Contribution
1	Apply knowledge of mathematics, science, and engineering to analyze the system or process to be modeled and select important variables and parameters of the system.	A	40 %
2	Apply basic conservation laws to produce and model equations for a system or process in chemical engineering and solve them using different mathematical methods.	E	50 %
3	Use the techniques, skills, and modern engineering tools necessary for engineering practice.	K	10 %

Textbook and/ or Refrences

Textbook: Rice D. Applied mathematics and modeling for chemical engineers Jon Wiley &sons1995. Recommended References: 1- Rasmuson A., Andersson B., Olsson L., and Andersson R., Mathematical Modeling in Chemical Engineering, Cambridge University Press 2014. 2- J. Ingham, I. J. Dunn, Chemical Engineering Dynamics:, 3rd. Edition 2007, WILEY-VCH 3- Ismail Tosun, Modelling in Transport Phenomena, 2nd ed, Elsevier (2007)

Assessment Criteria	Percent (%)
First Exam	20 %
Second Exam	20 %
Homeworks	20 %
Final Exam	40 %

Course Plan

Week	Topic
1	Introduction to mathematical modeling
1	Steps in mathematical formulation of chemical and physical problems
2	Theoretical principles of mathematical models
2_6	Macroscopic mathematical models and examples in chemical engineering problems on Continuity equation, Energy equation, Equation of motion and Equation of state (reactive and non-reactive systems)
6	First Exam
7_11	Microscopic mathematical models and examples in chemical engineering problems on Continuity equation, Energy equation, Equation of motion and (reactive and non-reactive

	systems)
11	Second Exam
12_13	Bessel equation and its application in chemical engineering
13_14	Introduction to solution of partial differential equations
15	Computer applications and simulation
16	Final Exam