Course Syllabus

2nd Semester, 2018

1. **Faculty:** Engineering **Department:** Chemical Engineering
2. **Subject:** 01202544 Reactor Scale-Up, Modeling, and Process Optimization 3 credits (3-0)

   Prerequisite -

   Section: 1 **Day and Time:** Monday 9.00-10.30 am, **Room:** E1410

   Thursday 9.00-10.30 pm, **Room:** E1410

3. Lecturer: Assoc. Prof. Dr. Terdthai Vatanatham, Assoc. Prof. Dr. Sunun Limtrakrul, Asst. Prof. Dr. Chanin Panjapornpon

4. Office hours for consultation with students

Everyday in office hours except class time of each lecturers.

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5. Course Objectives

1. Understand and have ability to do programming languages.
2. Be able to solve optimization problems by developing their own codes or using commercial software.
3. Be able to formulate the objective function of the optimization problem and apply the suitable technique to solve whether linear or nonlinear problem.

6. Course Description

A three modules course comprises of reactor scale-up, multiphase reactor modeling, and process optimization. Introduction to chemical reactor scale-up and method, dimensional analysis, geometric similarity, isothermal ideal reactor, non-isothermal reactor, mixing in reactor scale-up, and rate data development. Mathematical modeling of multiphase reactor, dispersion model, packed bed, fluidized bed, and trickle bed reactors. Introduction to numerical methods for continuous optimization for applications in chemical processes, focusing on practical methods, derivative-based methods for constrained and unconstrained multivariate optimization, root-finding, the graphical optimization and parameter estimation.

7. Course Outline

See details in each week of class schedule

8. Student-centered Teaching Method(s)

A combination of lecturing, discussion, self and group study, presentation, term project assignment, and homework exercise with teaching assistants.

9. Teaching Aids/Materials

Computer classroom, LCD projector and white board.

10. Evaluation

	Percent
Exam	
- Optimization	35 %
- Reactor scale up	35 %
- modeling	35 %

11. Course grading

Grading will be on a curve and grade criteria of Faculty of Engineering, Kasetsart University

12. Textbooks and Readings

1. Walas, S.M., Chemical Process Equipment Selection and Design, Butterworth-Heinemann, 1990
2. Peters, M. S., Timmerhaus, and West R.E., Plant Design and Economics for Chemical Engineers, 5th ed., McGraw-Hill, Inc., 2003.
3. Edgar, T.F. and D.M. Himmelblau, *Optimization of Chemical Processes*, McGraw-Hill, Boston, Massachusetts, 2001.
4. Cutlip, M.B. and Shacham, M., Problem Solving in Chemical and Biochemical Engineering with POLYMATH, Excel, and MATLAB, 2nd ed., 2008.
5. ชนินทร์ ปัญจพรผล 2559 “การหาค่าที่เหมาะสมเชิงปฏิบัติด้วยโปรแกรมแมทแลปสำหรับวิศวกรเคมี” ภาควิชาวิศวกรรมเคมี คณะวิศวกรรมศาสตร์ มหาวิทยาลัยเกษตรศาสตร์

13. Class Schedule

Week	D /M/Y	Lecture topics	Activity	Lecturer
1	14-18/01/2019	Introduction and fundamental of O\optimization, review of MATLAB programming & optimization toolbox	Lecture	Dr. Chanin
2	21-25/01/2019	Graphical optimization & root-finding	Lecture	Dr. Chanin
3	28/1-1/02/2019		**Kaset-Fair (25/1-4/02/2019)**	
4	4-8/02/2019	Linear and Nonlinear Regression (Parameter Estimation)	Lecture	Dr. Chanin
5	11-15/02/2019	Linear programming	Lecture	Dr. Chanin

6	18-22/02/2019	Nonlinear Programming (Unconstrained / Constrained Optimization)	Lecture (*Makha Bucha; Mon 1/03/18)	Dr. Chanin
7	25/2-1/03/2019	Scale-up a process, types of reactors and influence of sizing and scaling	Lecture	Dr. Terdthai
8	4-8/03/2019		**Midterm Exam**	
9	9-17/03/2019	Scale-up methods: Experimental and mathematical model methods	Lecture	Dr. Terdthai
10	18-23/03/2019	Scale-up methods: Experimental and mathematical model methods	Lecture	Dr. Terdthai
11	25-29/03/2019	Geometric similarity and dimensional analysis	Lecture	Dr. Terdthai
12	1-5/04/2019	Scale-up of ideal tubular reactor	Lecture	Dr. Terdthai, Dr. Sunun
13	8-12/04/2019	Scale-up of ideal mixed flow reactor	Lecture (*Chakkri; **Mon 8/04/19)**	Dr. Terdthai
14	15-19/04/2019	Scaling of non-isothermal reactor	Lecture (*Songkran Fest.; **13-16/04/19**)	Dr. Terdthai
15	22-26/04/2019	Development of reaction rate data	Lecture	Dr. Terdthai
16	29/4-3/05/2019	Design and scale-up of multiphase reactor	Presentation	Dr. Terdthai
17	6-10/05/2019	Design and scale-up of multiphase reactor (Cont.)	(*Coronation Day; Fri 5/05/17)	Dr. Terdthai
18	13-17/05/2019		**Final Exam**	

Signature .....

January 14, 2019