King Mongkut's University of Technology Thonburi
Faculty of Engineering, Computer Engineering Department
Course Syllabus, 1/2016

Course CPE 605 Mathematical Modeling in Computer Engineering

Credit Hours 3/0/6 **Classroom** 1116 **Time** Mon. 18.00-21.00

Instructor Asst. Prof. Dr. Santitham Prom-on (santitham.pro@kmutt.ac.th)

Course Website MyLE, Facebook Group: CPE605_2016

Course Materials

Dennis G. Zill (2009). A First Course in Differential Equations With Modeling Applications, 9th ed., Brooks/Cole, ISBN: 978-0-495-10824-5

Frederick S. Hillier, and Gerald J. Lieberman (2010) Introduction to Operations Research, 9th ed., McGraw-Hill, ISBN: 978-007-126767-0

Course Description

Mathematical modeling is a representation of a natural/artificial phenomenon. It bridges the gap between problems and computational infrastructures. It provides a means to simulate those processes underlying the problem using computers. Understanding the concepts of mathematical modeling is essential for computer engineers to be able to see through the mechanisms of nature and capture the core processes using mathematics.

This course discusses relevant mathematical modeling methods commonly used in computer engineering applications. Topics include discrete structures, probabilistic models, and dynamical system models. Example applications for each method will also be provided, including hardware and software design, computer architecture, networking, artificial intelligence, pattern recognition, and computer graphics. Students will be asked to pick topics to model engineering problems.

Department Policy on Academic Dishonesty

- All types of academic misconduct will be treated seriously. If there are evidences of plagiarism, cheating, or fabrication in any work, the score of that work will be set to zero. Continuing to do so will result in failing this course.
- Late assignments will be accepted only within the next 24 hours while scores for late assignments will be deducted 25% as a penalty.

Grading

Examinations (midterm, final)	50%
Assignments	30%
Modeling Project	20%

Tentative Course Outline & Schedule

Week	Date	Topic
1	1 Aug 2016	Introduction to mathematical modeling
2	8 Aug 2016	Python tutorial
3	15 Aug 2016	Modeling changes (ordinary differential equation)
4	22 Aug 2016	Modeling dynamical systems (a set of differential equations)
5	29 Aug 2016	Model fitting and evaluation (a least square method)
6	5 Sep 2016	General linear (regression) model
	19 Sep 2016	Midterm Examination
7	3 Oct 2016	Time-series models (AR, MA, ARMA, ARIMA)
8	10 Oct 2016	Simulation models (discrete-event simulation)
9	17 Oct 2016	Probabilistic models (Markov chain)
10	24 Oct 2016	Discrete optimization models (linear programming)
11	31 Oct 2016	Continuous optimization models (gradient descent)
12	7 Nov 2016	Functional models (neural network)
	21 Nov 2016	Final Examination