**ChE 620 - Applied Engineering Mathematics - Fall 2022**

**Tentative Course Outline**

**Instructor:** Dr. Hamid-Reza Kariminia  
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Office Hours: by appointment

**Course Schedule:**  
Tuesday 3:30-4:50 E6 4022  
Friday 2:00-3:20 E6 4022

**Course Description:** Advanced engineering mathematics for the solution of linear differential equations arising from physicochemical models. Formulation of initial-value and boundary-value problems, ordinary differential equations (ODE), Sturm-Liouville theory and orthogonal functions, partial differential equations (PDE) (separation of variables and Laplace transform) and approximate analytical solutions to ODEs and PDEs.

**Prerequisites:** CHE Grad Students only, all others require permission of Department.

**Course Objectives:**  
The goal of this course is to make students familiar with the formulation and model building of chemical engineering problems and introduce mathematical techniques to solve the problems analytically. By the end of the course students should be able to:  
1. Establish mathematical models for various chemical engineering problems resulting in the formulation of differential equations.  
2. Use mathematical techniques to provide an analytical solution the differential equations arising from the formulation.

**Textbook:**  

**Additional reference:**  

**Course Grading**  
Assignments 25 %  
Midterm 25 %  
Final Exam 50 %

Assignment questions, assignment solutions and any other material related to the course will be posted on the course website on LEARN
Course Topics

This course is focused on exact and approximate analytical solutions to ordinary and partial differential equations of importance to chemical engineering.

- Formulation of physicochemical problems from mass, energy, and momentum balances
- Solutions techniques of ODEs
- Series solution methods and special functions
- Laplace transformation
- Approximate solutions to ODEs
- Solution techniques of PDEs: Combination of variables
- Solution techniques of PDEs: Separation of variables
- Solution techniques of PDEs: Laplace transformation
- Approximate solutions to PDEs

Course Responsibilities

Academic Integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check www.uwaterloo.ca/academicintegrity/ for more information.]

COVID Contingency Plan

If we are required to return to remote teaching-learning all lectures will be held online at the scheduled time, and the exams will be held online. If you are isolating due to covid-like symptoms, please inform your instructor and complete a self-declared verification of illness form. If you are unable to complete any of the course deliverables due to illness or other extenuating circumstances, you should notify your instructor. If your instructor is unable to come to campus, but is well enough to teach they will hold lecture remotely at the regularly scheduled time. You will be notified by email and on LEARN of these arrangements.

Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4, www.adm.uwaterloo.ca/infosec/Policies/policy70.htm

When in doubt, please be certain to contact the Department’s administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity. Check www.uwaterloo.ca/academicintegrity/ to avoid committing an academic offence and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about “rules” for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate Associate Dean. For
information on categories of offences and types of penalties, students should refer to Policy 71, Student Discipline, [www.adm.uwaterloo.ca/infosec/Policies/policy71.htm](http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm). For typical penalties check Guidelines for the Assessment of Penalties, [www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm](http://www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm)

**Appeals:** A decision made or penalty imposed under Policy 70 (Student Petitions and Grievances) (other than a petition) or Policy 71 (Student Discipline) may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72 (Student Appeals) [www.adm.uwaterloo.ca/infosec/Policies/policy72.htm](http://www.adm.uwaterloo.ca/infosec/Policies/policy72.htm)

**Note for Students with Disabilities:** The AccessAbility Services Office, located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.