Faculty of Engineering
University of Windsor

GENG 8010 Engineering Mathematics
Summer 2023

Course outline

Instructor: **Dr. Mohammad Hassanzadeh**
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Webpage http://web2.uwindsor.ca/math/mhassan/
Hassanzadeh's Research Lab www.mlmelab.com

Official Class time:
Section 1, Monday, 7:00 pm -9:50 pm, Toldo Health Education Ctr, room 100
Section 30: Tuesday, 7:00 pm -9:50 pm, Ctr for Engin. Innovation, room 1100
Section 31: Wednesday, 7:00 pm -9:50 pm, Toldo Health Education Ctr, room 100

Lectures Delivery: All classes will be face-to-face.
Class attendance is mandatory.

Office hours:

There will be 3 office hours each week virtually for each section handled by my teaching assistants. You can attend to them for any question or help.

Section	TA	Office Hours on virtual classroom, blackboard
1	TBA	
1		
1		
1		
30		
30		
30		
30		
31		
31		
31		
31		

Course Webpage: https://brightspace.uwindsor.ca
You need to use your UWinsor username and password.

Pre-requisites: None
Restrictions: Open to Masters of Engineering students, excluding students in the MEng Auto Program. Open to engineering MSc/PhD students on permission of the department/faculty as a qualifying course only but cannot be counted as credit towards MSc/PhD degree.

Required textbook:

Greenberg, Michael D.
***Advanced Engineering Mathematics*, 2nd edition, (1998)**

Recommended Practice questions are from Textbook.

Course objectives: The course will develop skills in advanced modern engineering mathematics. It will be taken into consideration that students will need to be brought up to speed on more basic elements of engineering mathematics.

Subjects will be covered (tentative)

- First Order Ordinary Differential (methods of separation of variables, Integration factors, variation of parameters, and exact equations)
- Higher order ODE with constant coefficients (method of undetermined coefficients, method of power series, we also study Taylor series)
- Fourier Analysis, Fourier series
- Partial Differential Equations, Heat, wave, Laplace
- Laplace transformation (ODE with Laplace and convolution theorem)
- Eigenvalue and Eigenfunction problems (Sturm-Liouville problems)
- Numerical method

Evaluation

- **Evaluation:**
- **There will be 2 midterms on (TBA), see the tentative schedule.**
- **Each midterm is worth 30% of the course mark.**
- **There will be a cumulative final exam which is worth 40%. (date will be announce by registrar office, check your uwinsite)**

NOTE: If you miss a test for a valid reason, then you should make it up by arranging with me immediately.
Homework (Practice questions): There will be some extra recommended HMW questions to understand the subjects of the course better. However there will not be marked.

Important Dates
May 22, Victoria Day, university closed
Last day of classes is August 7
Reading week is June 17-25

Other References

1- Kreyszig, Erwin, Advanced Engineering Mathematics
2- Jeffrey, Alan, Advanced Engineering Mathematics

3- James, Glyn; Burley, David; Clements, Dick; Dyke, Phil; Searl, John; Steele, Nigel; Wright, Jerry, Advanced Modern Engineering Mathematics.

4- Kenneth A. Stroud, Kenneth A.; Booth, Dexter J.,Advanced Engineering Mathematics.

Engineers' Canada, Canadian Engineering Accreditation Board (CEAB) Criteria

What are the CEAB Graduate Attributes Criteria? This information, including the CEAB Graduate Attribute Criteria descriptions, is taken from.

> ***The criteria are intended to*** *provide a broad basis for identifying acceptable undergraduate engineering programs, to prevent over-specialization in curricula, to provide sufficient freedom to accommodate innovation in education, to allow adaptation to different regional factors, and to permit the expression of the institution's individual qualities, ideals, and educational objectives. They are intended to support the continuous improvement of the quality of engineering education.*

This course will develop the following CEAB Graduate Attributes Criteria:

CEAB Graduate Attributes Criteria	Course Learning Outcomes
1. A knowledge base for engineering *Demonstrated competence in University level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.*	X
2. Problem analysis *An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions.*	X
3. Investigation *An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data, and synthesis of information in order to reach valid conclusions.*	
4. Design *An ability to design solutions for complex, open-ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, economic, environmental, cultural and societal considerations.*	
5. Use of engineering tools *An ability to create, select, apply, adapt, and extend appropriate techniques, resources, and modern engineering tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations.*	X
6. Individual and team work *An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.*	
7. Communication skills *An ability to communicate complex engineering concepts within the profession and with society at large. Such abilities include reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.*	
8. Professionalism *An understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest.*	
9. Impact of engineering on society and the environment *An ability to analyze social and environmental aspects of engineering activities. Such abilities include an understanding of the interactions that engineering has with the economic, social, health, safety, legal, and cultural aspects of society; the uncertainties in the prediction of such interactions; and the concepts of sustainable design and development and environmental stewardship.*	
10. Ethics and equity *An ability to apply professional ethics, accountability, and equity.*	
11. Economics and project management *An ability to appropriately incorporate economics and business practices including project, risk and change management into the practice of engineering, and to understand their limitations.*	
12. Life-long learning	x

An ability to identify and to address their own educational needs in a changing world, sufficiently to maintain their competence and contribute to the advancement of knowledge.	

Tentative Schedule

Weak	Topic
Week 1, week of May 8	First order ODE, separation of variables and exact integration factor
Week 2, week of May 15	First order ODE, variation of parameters, and exact equations
Week 3, Week of May 22	Higher order ODE, Homogeneous ODE with constant coefficients
Week 4, Week of May 29	**Midterm 1** **TBA ??, from 7:00 to 9:30 pm** **Location will be announced.**
Week 5, Week of June 5	Non-homogeneous ODE with constant coefficients, method of undetermined coefficients
Week 6, Week June 12	Power series, Taylor series, power series method for ODE
Week 7, week of June 19	**Reading week, No class**
Week 8, week of June 26	Laplace Transformations (Friday July 1, Canada Day, no class)
Week 9, Week of July 3	**Midterm 2** **TBA?, from 7:00 to 9:30 pm** **Location will be announced**
Week 10, Week of July 10	Fourier analysis, Fourier series
Week 11, week of July 17	Sturm-Liouville problems
Week 12, Week of July 24	Partial differential equations, heat equations, wave equations, Laplace equations,

Time permitting we learn some subjects in Linear Algebra