DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING
MECHANICAL ENGINEERING PROGRAM, BSC.

Course Syllabus

1. **Course number and name**
   ME 223 Advanced Engineering Mathematics 2

2. **Credits and contact hours**
   (3+0) 3 credit hours, 3 contact hours

3. **Course type**
   Blended Learning Course (2+1)

4. **Instructor's or course coordinator's name**
   Dr. Mohammad Nasir

5. **Textbook information**
   Advanced Engineering Mathematics, by Erwin Kreyszig, John Wiley & Sons, Inc
   10th Edition International Student Version
   ISBN10 0470646136

   a. **Other supplemental materials**
      Instructor's notes

6. **Specific course information**
   a. **Catalog description**
   The course includes the following topics: Complex analysis, Power Series, Taylor Series, Fourier analysis and partial differential equations, heat, and wave equations

   b. **Prerequisites or co-requisites**
      Prerequisite: CEE 203 Advanced Engineering Math I

   c. **The course is:**
      Required in Mechanical Engineering program.

7. **Specific goals for the course**
   a. **Course outcomes:**
   After completion of the course, students are expected to be able to:
   1- Students analyze complex systems and apply them in engineering functions.

2- Imply Fourier Series to facilitate solving complex mathematical models.
3- Analyze response of the system (signals) using Fourier transform and use its capability to extract the signal's data.
4- Derive mathematical models (PDE) for simple engineering problems and solve them analytically.

b. The following student outcomes are addressed by the course:

SO-(2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

SO-(4) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environmental, and societal context.

SO-(pc) The structure of the curriculum must provide both breadth and depth across the range of engineering topics implied by the title of the program.

8. Learning Outcomes and their Alignment with Program Educational Objective (PEO's), Methods of Delivery, and Assessment Methods:

Learning Outcomes	Program PEOs	Method of Delivery	Assessment Method
Course Outcomes			
CO-(1): Students analyze complex systems and apply them in engineering functions.	-	Lectures (Example and Problems)	Midterm Exam
CO-(2): Imply Fourier Series to facilitate solving complex mathematical models.	-	Lectures (Example and Problems)	Assignment
CO-(3): Analyze response of the system (signals) using Fourier transform and use its capability to extract the signal's data.	-	Lectures (Example and Problems)	Final Exam
CO-(4): Derive mathematical models (PDE) for simple engineering problems and solve them analytically	-	Synchronous	Project

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Student Outcomes			
SO-(2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	2	Lectures (Example and Problems)	Midterm Exam
SO-(4) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environmental, and societal context.	1, 3	Term Project	Term Project-Part 2
SO-(pc) The structure of the curriculum must provide both breadth and depth across the range of engineering topics implied by the title of the program.	1	Term Project	Term Project-Part 1

9. Weekly Teaching Plan

Week No.	Lecture	Topic	Method of Delivery
1	Sun (9-10)	Introduction to Complex Numbers and Functions	Lecture
	Tue (9-10)	Introduction to Complex Numbers and Functions	Lecture
	Thu (9-10)	Interactive videos- Chapter 1 math applications	synchronous active learning
2	Sun (9-10)	Complex Numbers and Functions	Lecture
	Tue (9-10)	Complex Numbers and Functions	Lecture
	Thu (9-10)	Case studies	Asynchronous active learning
3	Sun (9-10)	Complex Differentiation	Lecture
	Tue (9-10)	Complex Differentiation	Lecture
	Thu (9-10)	examples	Online Lecture/ synchronous

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4	Sun (9-10)	Taylor Series and it's applications	Lecture
	Tue (9-10)	Taylor Series and it's applications	Lecture
	Thu (9-10)	Examples	Online Lecture
5	Sun (9-10)	ODE Revision	Lecture
	Tue (9-10)	ODE Revision	Lecture
	Thu (9-10)	examples	Online Lecture
6	Sun (9-10)	Solving ODE using Power Series	Lecture
	Tue (9-10)	Solving ODE using Power Series	Lecture
	Thu (9-10)	Examples	Online Lecture
7	Sun (9-10)	Fourier Series	Lecture
	Tue (9-10)	Fourier Series	Lecture
	Thu (9-10)	examples	Online Lecture
8	Sun (9-10)	Fourier sine and cosine Series	Lecture
	Tue (9-10)	Fourier sine and cosine Series	Lecture
	Thu (9-10)	Case studies	Online Lecture
9	Sun (9-10)	Complex Fourier Series	Lecture
	Tue (9-10)	Complex Fourier Series	Lecture
	Thu (9-10)	Complex Fourier Series	Online Lecture
10	Sun (9-10)	Solving ODE using Fourier Series	Lecture
	Tue (9-10)	Solving ODE using Fourier Series	Lecture
	Thu (9-10)	Examples	Online Lecture

11	Sun (9-10)	Fourier Integral	Lecture
	Tue (9-10)	Fourier Integral	Lecture
	Thu (9-10)	Fourier Integral	Asynchronous active learning
12	Sun (9-10)	Fourier transform	Lecture
	Tue (9-10)	Fourier transform	Lecture
	Thu (9-10)	Examples	Synchronous active learning
13	Sun (9-10)	ODE with Boundary value problems	Lecture
	Tue (9-10)	ODE with Boundary value problems	Lecture
	Thu (9-10)	Examples	synchronous active learning
14	Sun (9-10)	Partial Differential Equations (PDEs) Heat	Lecture
	Tue (9-10)	Partial Differential Equations (PDEs): Heat	Lecture
	Thu (9-10)	Examples	synchronous active learning
15	Sun (9-10)	Partial Differential Equations (PDEs): Wave equation	Lecture
	Tue (9-10)	Partial Differential Equations (PDEs): Wave equation	Lecture
	Thu (9-10)	Case study and project presentations	synchronous active learning

10. Grade Distribution:

Assessment	Grade	Week No.
- Midterm Exam	30%	7th Week
-Assignments (Reports /Quizzes/ Seminar / Tutorials/ Home works ….)	20%	1-16th Week
- Final Examination	50%	16th Week

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Note: Make-up exams will be offered for valid reasons. It may be different from regular exams in content and format.