MATH 232 Engineering Mathematics

(3 Lecture– 3 Credits)

Prerequisite: MATH 112

Course Catalog Description:

This course introduces students to selected topics from mathematical analysis with engineering applications. The first part is a calculus part which covers the definition of functions of several variables and their domain and range. Also, the course discusses limits, continuity, partial derivatives, gradient vectors, and multiple integrals for functions of several variables. The second part of the course deals with Fourier analysis including complex numbers, Fourier series, Fourier integrals, and Fourier transforms.

Textbook:

Calculus by James Stewart, Publisher: CENGAGE Learning, 8th Edition (Metric Version), 2016. ISBN: 9781305266728.

Advanced Engineering Mathematics by Erwin Kreyszig, Publisher: Wiley, 10th Edition, 2011. ISBN: 9780470458365.

Reference Materials: None

Course Topics:

1. Introduction to Complex Numbers (3 lectures)
   - Complex arithmetic, complex argument, and polar form.
   - Complex powers, roots, trigonometric and exponential functions.
2. Partial Derivatives
   - Functions of several variables. (1 lecture)
   - Limits and continuity (examples only). (3 lectures)
   - Partial derivatives. (2 lectures)
   - Tangent Planes and Linear Approximation (examples only). (2 lectures)
   - Chain Rule. (2 lectures)
   - Gradient vector and directional derivatives. (2 lectures)
   - Minimum and Maximum values. (3 lectures)
3. Multiple Integrals
   - Double integrals over rectangles. (1 lectures)
   - Iterated integrals. (2 lectures)
   - Double integrals over general regions. (2 lectures)
   - Double integrals in polar coordinates. (1 lecture)
   - Applications of double integrals. (2 lectures)
   - Surface area. (1 lecture)
   - Triple integrals in cylindrical and spherical coordinates. (6 lectures)
4. Fourier Analysis
   - Introduction to Fourier Series. (1 lecture)
   - Periodic functions, Fourier sine and cosine series. (3 lectures)
   - Complex Fourier series, Parseval's theorem. (3 lectures)
   - Fourier integrals, Fourier cosine and sine transforms. (3 lectures)
   - Complex Fourier transform, convolution. (2 lectures)

Structure and Learning Methodologies:

Lectures are either be 3 x 50 minutes or 2 x 75 minutes per week. Lectures are presented using the whiteboard, and may be complemented with handouts and/or PowerPoint slides.

Assessment:

All course learning outcomes are assessed using the following assessment tools.

Coursework (Quizzes and Homeworks,)	40%
Semester Examination(s)	25%
Final Examination	35%

Contribution to General Education Learning Outcomes (GELOs):s

1A	1B	1C	1D	1E	2A	2B	2C	2D	2E	3A	3B	3C	3D	3E
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H – High M – Medium L – Low

Course Learning Outcomes & GELOs:

No.	Course Learning Outcomes	GELOs
1.	Define and perform calculations involving functions of complex numbers.	1B
2.	Define and perform calculations involving series of complex numbers in the context of trigonometric and exponential functions.	1B
3.	Compute limits, partial derivatives, and directional derivatives of functions of several variables.	1B
4.	Identify and classify relative and absolute extrema of functions of several variables.	1B, 2C
5.	Apply various multiple integration techniques including iterated integrals, double integrals, and integration in spherical and cylindrical coordinates.	1B
6.	Analyze periodic waveforms and represent them in a Fourier series.	1B, 3A