Engineering Mathematics III

EG2101SH

Year: II **Total: 4 Hrs./week**

Part: I **Lecture: 3 Hrs./week**

Tutorial: 1 Hrs./week

Practical: Hrs./week

Lab: Hrs./week

Course Description:

This course consists of five units namely: Applications of derivatives, Partial derivatives, application of Anti-derivatives, Differential equations and Fourier series; which are basically necessary to develop mathematical knowledge and helpful for understanding as well as practicing their skills in the related engineering fields.

Course Objectives:

On completion of this course, students will be able to understand the concept of the following topics and apply them in the related fields of different engineering areas: Applications of derivatives and anti-derivatives, Partial derivatives, differential equations and Fourier series.

Course Contents:

Theory

Unit 1. Applications of Derivatives [12 Hrs.]

1.1. Derivatives of inverse circular functions and hyperbolic functions
1.2. Differentials, tangent and normal
1.3. Maxima and minima, concavity, increasing and decreasing functions
1.4. Rate measures
1.5. Indeterminate forms: $\frac{0}{0}$, $\frac{\infty}{\infty}$ and $\infty - \infty$, L'Hospital's Rule (without proof)

Unit 2. Partial Derivatives [6 Hrs.]

2.1. Functions of more than two variables
2.2. Partial derivative from First principles
2.3. Partial derivatives of First and higher orders
2.4. Euler's theorem for function of two variables
2.5. Partial derivatives of composite functions

Unit 3. Applications of Anti-derivatives [8 Hrs.]

3.1. Standard Integrals, related numerical problems
3.2. Basic idea of curve sketching**:** odd and even functions, periodicity of a function, symmetry (about *x*-axis, *y*-axis and origin), monotonicity of a function, sketching graphs of polynomial, trigonometric, exponential, and logarithmic functions (simple cases only)
3.3. Area under a curve using limit of sum (without proof)
3.4. Area between two curves (without proof)
3.5. Area of closed a curve (circle and ellipse only)

Unit 4. Differential Equations [14 Hrs.]

4.1. Ordinary Differential Equations (ODEs)
  4.1.1. Definitions, order and degree of differential equation
  4.1.2. Differential equation of First order and First degree
  4.1.3. Variable separation and variable change methods

4.1.4. Homogeneous and linear differential equation of First order
4.1.5. Exact differential equation, condition of exactness
4.1.6. Simple applications of First order differential equations

4.2. Partial Differential Equations (PDEs)
4.2.1. Basic concepts, definition and formation
4.2.2. General solution of linear PDEs of first order (Pp + Qq = R form)

Unit 5. Fourier Series **[5 Hrs.]**

5.1. Periodic functions and fundamental period of periodic functions
5.2. Odd and even functions with their properties
5.3. Trigonometric series
5.4. Fourie's series in an interval of period 2π (arbitrary range is not required)

Tutorial: **[15 Hrs.]**

1. Applications of Derivatives [4 Hrs.]
2. Partial Derivatives [2 Hrs.]
3. Applications of Anti-derivatives [3 Hrs.]
4. Differential Equations [5 Hrs.]
5. Fourier Series [1 Hrs.]

Evaluation Scheme:

Unit wise Marks division for Final

S. No.	Units	Short questions (2 marks)	Long questions (4 marks)	Total Marks
1	Applications of Derivatives	4 x 2 = 8	3 x 4 = 12	20
2	Partial Derivatives	2 x 2 = 4	2 x 4 = 8	12
3	Applications of Anti-derivatives	3 x 2 = 6	3 x 4 = 12	18
4	Differential Equations	4 x 2 = 8	4 x 4 = 16	24
5	Fourier Series	1 x 2 = 2	1 x 4 = 4	6
		14 x 2 = 28	**13 x 4 = 52**	**80**

References:

1. Thapa et al., Engineering Mathematics (Volume I, Three Years Diploma), Sukunda Pustak Bhawan, Bhotahity, Kathmandu, Nepal
2. Bajracharya et al., Basic Mathematics (Grade XI/XII), Sukunda Pustak Bhawan, Bhotahity, Kathmandu, Nepal
3. Kryszig E., Advanced Engineering Mathematics, wile-Easter Publication, New Delhhi, India
4. Nath et al., Engineering Mathematics III, Vidhyarthi Publisher & distributors, Kathmandu, Nepal
5. Other references selected by the related lecturer(s) from among the texts available in the market that meet the content of this subject.