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	Total Marks
110.		(2 marks)	(4 marks)	Marks
1	Applications of Derivatives	$4 \times 2 = 8$	$3 \times 4 = 12$	20
2	Partial Derivatives	$2 \times 2 = 4$	$2 \times 4 = 8$	12
3	Applications of Anti-derivatives	$3 \times 2 = 6$	$3 \times 4 = 12$	18
4	Differential Equations	$4 \times 2 = 8$	4 x 4 = 16	24
5	Fourier Series	$1 \times 2 = 2$	$1 \times 4 = 4$	6
		$14 \times 2 = 28$	$13 \times 4 = 52$	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.