**NATIONAL UNIVERSITY OF MODERN LANGUAGES ISLAMABAD**

**DEPARTMENT OF SOFTWARE ENGINEERING – BSSE PROGRAM**

**CALCULUS AND ANALYTICAL GEOMETRY (SECA-122)** **– COURSE OUTLINE**

1. **Course Details**

|  |  |
| --- | --- |
| **Credit Hours:** | 3+0 |
| **Pre-requisites:** | None |
| **Instructor:** | Muneeb Mehmood Abbasi |
| **Recommended Book(s):** | Calculus by Howard Anton (8th and higher editions) |
| **Reference Books:** | Advanced Engineering Mathematics, Author Erwin Kreyszig, Publisher John Wiley & Sons, Limited, 2019, ISBN, 111957109X, 9781119571094 |

1. **Course Learning Outcomes (CLO)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CLOs** | **Description** | **Domain** | **Taxonomy level** | **PLOs** | **Assessment** |
| **CLO1** | **Apply** the concepts of Graphs of Functions, limits and continuity to solve problems | Cognitive | 2 | 1,2 | A1,Q1,Mid |
| **CLO2** | Solve problems related to derivation, integration, Maxima, and Minima. | Cognitive | 3 | 1,2 | A2,Q2,Mid, End |
| **CLO3** | Use vector calculus and analytical geometry in high dimension dimensions. | Cognitive | 3 | 1,2 | A3,Q3.End |

1. **Course Assessment**

|  |  |  |
| --- | --- | --- |
| **Evaluation Methods** | **Theory weight (%) [T]** | **Lab Weight (%) [L]** |
| **Quizzes** | **10** |  |
| **Assignments** | **10** |  |
| **Mid Term** | **30** |  |
| **Final Term** | **50** |  |
| **Total** | **100** |  |
| **Total = T+L** |  |  |

1. **Grading Policy**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Grade** | **A1** | **A2** | **A3** | **B1** | **B2** | **B3** | **C1** | **C2** | **D** | **F** |
| **%age** | >=90 | 80-89 | 77-79 | 74-76 | 70-73 | 67-69 | 64-66 | 60-63 | 50-59 | <50 |
| **GPA** | 4.00 | 4.00 | 3.66 | 3.33 | 3.00 | 2.66 | 2.33 | 2.00 | 1.50 | 0.00 |

1. **Course Contents**

Introduction to functions, Even and Odd Functions, Domain and Range of Functions, Piecewise Continuous Functions and Discontinuous functions, Periodic Function, Inverse functions, Logarithmic and Exponential Functions, Inverse Trigonometric Functions, Hyperbolic Functions and Inverse Hyperbolic Functions, Graphs of Function, Shifting of Graph and Scaling of Graphs, Continuity, Graphs of continuous and discontinuous, Relation Between Differentiability and Continuity, Introduction to limits, Sandwich Theorem, One sided limit, Derivatives, geometrical meaning of the derivative, general Theorems of derivatives, partial derivatives, Trigonometric functions, explicit and implicit functions and its derivatives, second order and higher order derivatives, Tangents and Normal Lines, Application of Derivatives, Max-Min Theorem, Absolute Extrema, Local Extrema, Examples, Integration, Techniques of Integration, Basic Integration Formulas, Substitution method, Partial Fraction, Reduction Formula, Integration by Parts, Trigonometric Substitution, Improper integrals, Definite Integrals, Application of Integration, More Techniques of Integration, Conic Section, Parabola, Ellipse, Hyperbola, Classifying Conic Section by eccentricity, discriminant test,, Polar coordinates, Cartesian vs polar coordinates, Spherical, Polar and Cylindrical Coordinates, Vector Calculus, Vectors and analytical geometry in space, zero vector, unit vector, sphere, circle, Multivariable Functions, Partial Derivatives, Parameterizations of Plane Curves, Vectors in Plane, Vectors in space, Lines and Planes in Space, Cross product and Dot Product, Laws, Equations for planes in space.

1. **Weekly Breakdown:**

|  |  |  |
| --- | --- | --- |
| **Week No.** | **CLO** | **Topics** |
| 1 | CLO1 | Introduction to functions, Even and Odd Functions, Domain and Range of Functions |
| 2 | Piecewise Continuous Functions and Discontinuous functions |
| 3 | Periodic Function, Inverse functions, Logarithmic and Exponential Functions, Inverse Trigonometric Functions, Hyperbolic Functions and Inverse Hyperbolic Functions |
| 4 | Graphs of Function, Shifting of Graph and Scaling of Graphs, Continuity, Graphs of continuous and discontinuous, Relation Between Differentiability and Continuity |
| 5 | Introduction to limits, Sandwich Theorem, One sided limit |
| 6 | CLO2 | Derivatives, geometrical meaning of the derivative, general Theorems of derivatives, partial derivatives |
| 7 | Trigonometric functions, explicit and implicit functions and its derivatives, second order and higher order derivatives |
| 8 | Tangents and Normal Lines, Application of Derivatives, Max-Min Theorem, Absolute Extrema, Local Extrema, Examples |
| 9 | Integration, Techniques of Integration, Basic Integration Formulas, Substitution method |
| 10 | Partial Fraction, Reduction Formula, Integration by Parts, Trigonometric Substitution |
| 11 | CLO3 | Improper integrals, Definite Integrals, Application of Integration, More Techniques of Integration |
| 12 | Conic Section, Parabola, Ellipse, Hyperbola, Classifying Conic Section by eccentricity, discriminant test, |
| 13 | Polar coordinates, Cartesian vs polar coordinates, Spherical, Polar and Cylindrical Coordinates |
| 14 | Vector Calculus, Vectors and analytical geometry in space, zero vector, unit vector, sphere, circle, Multivariable Functions, Partial Derivatives, Parameterizations of Plane Curves, |
| 15 | Vectors in Plane, Vectors in space, Lines and Planes in Space |
| 16 | Cross product and Dot Product, Laws, Equations for planes in space |