**National University**

**O f C o m p u t e r & E m e r g i n g Sciences**

| **Department** | Department of Computer Science | **Dept. Code** | CS |
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| **Course Title** | Calculus and Analytical Geometry | **Course Code** | MT 1003 |
| **Pre-requisite(s)** | None | **Credit Hrs.** | 3 |



| **PLO** | **Program Learning Outcome (PLO) Statement** | **Level** | **Tools** |
| --- | --- | --- | --- |
| 01 | Ability to apply knowledge of mathematics, science and engineering fundamentals and an engineering  Specialization to the solution of complex engineering problems. | E | Q, A, M, F |
| *I = Introduction, R = Reinforcement, E = Evaluation.*  *A = Assignment, Q = Quiz, M = Midterm, F=Final, L = Lab, P = Project, W = Written Report.* | | | |

| **CLO** | **Course Learning Outcome (CLO)** | **Domain** | **Taxonomy level** | **PLO** | **Tools** |
| --- | --- | --- | --- | --- | --- |
| 01 | Define the ideas of derivatives and anti-derivatives (integrals) using the concept of limits & continuity and sigma | Cognitive | C1 | PLO-1 | M, F, A, Q |
| 02 | Translate the learning of vector calculus and analytical geometry in multiple dimensions | Cognitive | C1 | PLO-1 | F, A, Q |
| 03 | Apply derivatives and integrals for solving different problems arising in computer sciences. | Cognitive | C1 | PLO-1 | M, F, A, Q |

| **Text Book(s)** | **Title** | Calculus Early Transcendental 10th Edition |
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| **Author** | Howard Anton, IRl Bivens, Stephen Davis |
| **Publisher** | JOHN WILEY |
| **Ref. Book(s)** | **Title** | Calculus & Analytical Geometry 9th Edition |
| **Author** | George B. Thomas, Ross L. Finney |
| **Publisher** |  |
|  | **Title** | Calculus Early Transcendental 8thEdition |
| **Author** | James Stewart |
| **Publisher** | Thomson, 2008 |

| **Week** | **Contents/Topics** | **Exercises/Questions** | **CLO** |
| --- | --- | --- | --- |
| 1 | Interval, Inequality, Relation and Functions vertical line test, Piecewise, Absolute value, Introduction to functions Domain and Range, One-One and onto function. Symmetry ,Even/odd function, Asymptote | Appendix  **0.1** (1-04, 7-10, 27,28)  **0.2** (27-34, 53-63, 66,67) | **-** |
| 2 | Concepts of limit. Evaluation of limits. Continuity and points of discontinuity. Types of discontinuity. | **1.1** (1-16)  **1.2** (1-32)  **1.5** (1-6,11-22,  29,30,35,36) | **01** |
| 3 | Secant line, Equation of Normal and tangent line, Slope, Rate of change. Concept and idea of differentiation. Geometrical meaning of derivatives. Rules and techniques of differentiation. | **2.1** (11-18),  **2.2** (9-20,46-48),  **2.3** (1-24, 41-47) | **01** |
| 4 | Product and quotient rule. Derivative of trigonometric and logarithm function, Chain rule | **2.4** (1-24)  **2.5** (1-24)  **2.6** (7-40)  **3.1** (3-18,25-28) | **01** |
| 5 | Chain rule, Implicit differentiation. Local Linear approximation. Indeterminate forms, L’ Hospital Rule | **3.5** (5-16,23-33, 39-  46)  **3.6** (7-45) | **01** |
| 6 | **Mid-Term I** | | |
| 7 | Application of derivatives, Role’s and Mean Value’s Theorem. | **3.4** (10-20),  **4.8** (1-8) | **03** |
| 8 | Concavity, Increasing and Decreasing. Relative Extreme (1st and 2nd derivative test) Absolute Maxima and Minima | **4.1** (15-30)  **4.2** (7-12, 25-36) | **03** |
| 9 | Riemann sums and definite integral | **5.5** (13-24) | **01** |
| 10 | Area bounded by the curves. Volume by Disk and washer method | **6.1** (1-18),  **6.2** (1-26) | **03** |
| 11 | **Mid-Term II** | | |
| 12 | Techniques of integration, Basic Integration, Integration by parts Reduction formula, Trigonometric substitution | **7.1** (1-30),  **7.2** (1-30, 61,62,63)  **7.4** (1-25,37-48) | **01** |
| 13 | Integration of Rational function by Partial fraction, u= tan(x/2) substitution, Improper integrals. | **7.5** (9-30),  **7.6** (65-70)  **7.8** (3-32) | **01** |
| 14 | Parametric equations of lines in 3D, Plane in 3-space | **11.5**(3-10,15-22,29-34) | **02** |
| 15 | Distance Problems involving planes, Intersecting planes. | **11.6**(11-20, 41-48) |
| 16 | **Final Exam** | | |

**Marks Distribution:**

| Sessional I | 15 |
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| Sessional II | 15 |
| Assignment | 10 |
| Quiz | 10 |
| Final | 50 |
| Total | 100 |