**NATIONAL UNIVERSITY OF COMPUTER AND EMERGING SCIENCES**

**LAHORE CAMPUS**



Calculus and Analytical Geometry Course Outline according to OBE

FALL-2020

Course Moderator: Dr. Akhlaq Ahmad Bhatti

CS Department Coordinator: Dr. Mubasher Baig

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| **Department** | | Department of Computer Science | **Dept. Code** | CS | | |
| **Course Title** | | Calculus and Analytical Geometry | **Course Code** | MT 101 | | |
| **Pre-requisite(s)** | | - | **Credit Hrs.** | 3 | | |
| **Moderator** | | Dr. Akhlaq Ahmed Bhatti. | | | | |
| **Course Instructors** | | Dr. Akhlaq Ahmed Bhatti, Dr. Qaisar Mahmood, Dr. Muhammad Nasir Ali, Mr. Muzamil Hanif, Dr. Noreen Akram, Ms. Kinza Mumtaz, Ms. Quresha Hanif. Ms. Iffat Fayyaz. | | | | |
| **Note:** | | It is a tentative schedule of the course. It may vary (if required). | | | | |
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| **Course Objective** | | The course is aimed at acquiring the basic techniques of differentiation and integration of functions of single variable. Stress will be given on the concepts of limit continuity and graphing of functions using derivatives. Students will be encouraged to go through the proofs of important theorems and solve some life problems as well. | | | | |
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| **No.** | **Assigned Program Learning Outcome (PLO)** | | | | **Level** | **Tool** | |
| 01 |  | | | |  |  | |
| *I = Introduction, R = Reinforcement, E = Evaluation.*  *A = Assignment, Q = Quiz, M = Midterm, F = Final, L = Lab, P = Project, W = Written Report.* | | | | | | |
| **No.** | **Course Learning Outcome (CLO) Statements** | | | | **Tools** | |
| 01 | * Solve algebraic equations and inequalities by using properties of absolute values. | | | | Q1, M1 | |
| 02 | * Analyze the function and sketching the curve by using properties horizontal/ vertical and compressing / stretching | | | | Q1, A1, M1 | |
| 03 | * Investigation of continuity through limits analytically / graphically. | | | | A1, M1, F | |
| 04 | * Apply the concept of differentiation in real life problem | | | | A2, M1, M2, F | |
| 05 | * Curve sketching using extrema theory | | | | Q2, M2, F | |
| 06 | * Riemann sum, evaluation of definite & indefinite integral and their applications to compute lengths of curves / area of regions / volume of solids. | | | | M2, Q3,A3,F | |
| 07 | * Correctly graphs/formulate the equation of line and plane in R3. | | | | F | |

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| **Pre-requisite(s)** | - | **Credit Hrs.** | 3 |
| **Moderator** | Dr. Akhlaq Ahmed Bhatti | | |
| **Course Instructors** | Ms. Atroobs Saeed(A), Dr. Uzma Bashir(B, G), Mr. Adnan Malik(C), Ms. Noreen Akram(D), Dr. Akhlaq Ahmad Bhatti(E, F), Mr. Qasim Noor (H) | | |
| **Note:** | It is a tentative schedule of the course. It may vary (if required). | | |

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| **Text Book(s)** | **Title** | | Thomas Calculus |
| **Author** | | G. B. Thomas |
| **Edition** | | Latest Edition |
| **Ref. Book(s)** | **Title** | | Calculus and Analytic Geometry Kenneth W. Thomas. |
| **Author** | | Kenneth W. Thomas. |
| **Edition** | | Latest Edition |
| **Title** | | Calculus |
| **Author** | | William E. Boyce & Richard C. DiPrima |
| **Edition** | | Latest Edition |
| **Course Objective** | | The course is aimed at acquiring the basic techniques of differentiation and integration of functions of single variable. Stress will be given on the concepts of limit continuity and graphing of functions using derivatives. Students will be encouraged to go through the proofs of important theorems and solve some life problems as well. | |

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| **Week** | **Section** | **Course Contents** | **Chapter** | **CLO** |
| 01 |  | **Inequalities**  Rules for inequalities, solving inequalities | From previous edition | 1 |
| 02 | 1.1  1.2 | **Functions**  Functions and their graphs:  Combining functions; Shifting and Scaling graphs | 1 | 2 |
| 03 | 2.1  2.2  2.3  2.4 | **Limits and Continuity**  Rates of Change and tangents to curves  Limit of a function and limit laws  The precise definition of a Limit  One sided Limit | 2 | 3 |
| 04 | 2.5  2.6 | Continuity  Limits involving Infinity; Asymptotes of Graphs | 2 | 3 |
| 05 | **3.1**  3.2  3.3  3.4  3.5  3.6  3.7  3.8  3.9 | **Derivatives**  Tangents and derivatives at a point  The derivatives as a function  Differentiation Rules  The derivative as a rate of change  Derivatives of trigonometric functions  The chain rule  Implicit differentiation  Derivatives of inverse functions and logarithms  Inverse trigonometric functions  Related rates | 3 | 4 |
| 06 |  | **MID-TERM-I** |  |  |
| 07 | 4.1  4.2 4.3 | **Application of Derivatives**  Extreme values of functions  The Mean value theorem  Monotonic functions and the first derivative test | 4 | 5 |
| 08 | 4.4 4.5  4.6 | Concavity and Curve sketching  Indeterminate forms and L’Hopital’s Rule  Applied optimization | 4 | 5 |
| 09 | 5.1  5.3 | **Integrals**  Area and estimating with finite sums  The definite integral | 5 | 6 |
| 10 | 5.4 5.5  5.6 | The Fundamental theorem of calculus  Indefinite integrals and the substitution method  Definite integral Substitutions and area between the curves | 5 | 6 |
| 11 | 6.1  6.2 6.3 | **Application of Definite Integrals**  Volumes using cross sections  Volumes using Cylindrical Shell  Arc length | 6 | 6 |
| 12 |  | **MID-TERM-II** |  |  |
| 13 | 7.1  7.2  7.3 | **Integrals and Transcendental Functions**  The Logarithm defined as an integral  Exponential change and separable differential equations  Hyperbolic Functions | 7 | 6 |
| 14 | 8.1  8.2  8.3  8.4 | **Techniques of Integration**  Using basic Integration formulas  Integration by parts  Trigonometric integrals  Trigonometric substitution | 8 | 6 |
| 15 | 8.5  8.6  8.8 | Integration of rational functions by Partial fractions  Reduction formulas  Improper integrals | 8 | 6 |
| 16 |  | **Analytical Geometry**  Straight lines in R3, Equations for planes. | Reference Book | 7 |
|  |  | **FINAL EXAM** |  |  |

**Evaluation Procedure & Marks Distribution:**

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| **Assessment Tools** | **Total No. of** | **Weightage** |
| Quizzes | 3 | 10% |
| Assignments | 3 | 8 % |
| Home work | Every week | 7% |
| Mid Term Exam | 2 (I+II) | 25% |
| Final Exam | 1 | 50% |

**Note:** No homework/ assignment submission after due date.