

**Course Outline of MAT 111**

**(Differential and Integral Calculus)**

**Google classroom**

**Course Name: Differential & Integral Calculus (CSE-Spring19)**

**Class Room Code:**

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| --- | --- |
| Course tutor: | Office: |
| Mohammad Abdul Halim  Sr. Lecturer(Mathematics)  Department Of GED  DIU  Dhanmondi, Dhaka. | Teachers Room, 1st Floor, Exam Building, DIU, Shukrabad.  Day off: Thursday  Cell: 01751471783  Mail: mohiuddin.ged@diu.edu.bd |

Calculus is one of the most crucial and fundamental tool in modern mathematics. It was developed and booked in the 17th century by the two famous mathematician and physicist Sir Isaac Newton and Gottfried Leibniz (For More information visit [*https://en.wikipedia.org/wiki/History\_of\_calculus*](https://en.wikipedia.org/wiki/History_of_calculus)*)*. Calculus deals with infinitesimal quantities that play remarkable roles in Physics and Mathematics. Calculus is the language of engineers, scientists, and economists. The work of these professionals has a huge impact on our daily life - from your microwaves, cell phones, TV, and car to medicine, economy, and national defense.

**Course Objectives:**

After the successful compilation of this course, the students will be able to

1. define functions, curves and their properties;
2. determine domain and Range of different types of functions;
3. sketch graphs of different types of functions;
4. find gradient and tangents at any points on the curves;
5. determine rate of change of any function;
6. evaluate various types of integrals;
7. find area between a curve and any axes, area between two curves, area by revolving a curve;
8. find volume of 3D objects.
9. analyze mathematical and physical objects.

**Course Syllabus:**

**Differential Calculus**: Function; Limit; Continuity and Differentiability; Differentiation of various types of functions with basic concept; Successive differentiations of various types of functions; Leibnitz’s theorem; General theorem and expanions (a) Rolle’s theorem (b) Mean value theorem (c) Taylor’s and Maclaurin’s theorem in finite and infinite forms (d) Lagrange’s form of remainders (e) Cauchy’s form of remainders (f) Expansions of functions; Evaluation of Indeterminate forms (L’ Hospital’s rule) ; Partial differentiation of various types of functions; Maxima and Minima; Concavity; Tangent and Normal; Asymptotes.

**Integral Calculus**: Indefinite Integral; Concept on Integration; Fundamental Integration; Method of Substitution; Integration by parts; Integration of rational fraction; Reduction of Order; Integration of special Trigonometric Function, Definite integral: General Properties of definite integral (a) Gamma and Beta Function; Definite Integral as the Limit of a Sum; Improper Integrals: (a) Gamma and Beta Function; Laplace’s Transforms (introduction); Multiple Integrals; Area; Volume.

**Lecture Schedule:**

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| Number of lecture | Topics to be covered | Learning Outcomes |
| 01-02 | Definition of function, types of functions and their formats | Students will be able to identify whether a relation is a function or not; define and construct different types of functions. |
| 03-4 | Domain and Range of different functions | Students will be able to analyze various functions and find their domains and ranges. |
| 5-6 | Sketch graphs of different functions | Student will be able to draw graphs of various functions in Cartesian and Polar coordinates. |
| 07 | Basic idea of Limits and Limits of indeterminate forms: L’Hospital Rules | Students will be able to analyze and find limiting value of a function and indeterminate functions. |
| 08 | Continuity and differentiability of function | Student will be able to check whether a given function is continuous or differentiable at a particular point or in an interval or anywhere. |
| 09-10 | The Derivative( Rate of change) of functions | Students will be able to differentiate( find derivative) any function. Also use this techniques to solve real-world problems; apply rules of differentiations to find gradient of various functions |
| 11 | Successive Differentiation | Students will be able to derive a general formula for a particular function by which one can find derivatives of any order of that function. |
| 12 | Leibniz Rule | Students will be able to find derivatives of any order for the product of multiple functions. |
| 13 | Roles theorem and Mean Value theorem | Students will be able to apply Roles Theorem and Mean Value Theorem in finding roots of a function within an interval and their Physical meanings. |
| 14 | Taylor and Maclaurin Series | Students will be able to express a function as a series |
| 15 -16 | Finding Maxima and Minima, Tangents , Normal and Asymptote | Students will be able to find Maxima and Minima values of a function, Equation of Tangent and Normal lines on any curve by using Derivative and Asymptote to a curve. |
| 17 | Partial differentiation: Euler’s rule | Students will be able to differentiate a function partially, use Euler’s Theorem to Partially differentiate Implicit functions. |
| 18 | Indefinite Integral: Basic Rules | Students will be able to explain integration and integrating rules. |
| 19-20 | Techniques of evaluating indefinite integrals | Students will be able to apply various techniques to evaluate indefinite integrals. |
| 21 | Techniques of evaluating Definite integrals | Students will be able to apply various techniques to evaluate definite integrals. |
| 22 | Reduction Formula and Improper Integrals | Students will be able to find general formula to evaluate indefinite integrals. |
| 23-24 | Gamma and Beta Functions | Students will be able to deals with gamma and beta functions and their properties. |
| 25-26 | Area between curves and axes, Double Integral | Students will be able to apply various techniques to find areas and evaluate double integrals. |
| 27 | Volume ( Triple Integral),Laplace transformation. | Students will be able to apply various techniques to find volume and evaluate triple integrals. |
| 28 | Summation of series by using definite Integral |  |

**Books:**

* Calculus, by ***Howard*** ***Anton*** ( 10th Edition).
* Calculus, by ***James Stewart*** ( 6th Edition).
* Calculus with analytic geometry by **Swokowski** (Alternate Edition)
* Advanced calculus and analysis by **Ian Craw**
* Understanding Basic Calculus by **S.K.Chung**
* Introduction to Integral Calculus by **Ulrich L.Rohde**

**Assessment Policy:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Probable Date | Syllabus | Marking Policy/Rubrics | Number of Questions |
| Quiz 01  (15 Marks) | It will be declared on class. | Lecture 01-04 | It will be given in your Google classroom | 3 questions will be set each of 5 marks. |
| Quiz 02  (15 Marks) | It will be declared on class. | Lecture 05-10 |
| Quiz 03  (15 Marks) | It will be declared on class. | Lecture 15-20 |
| Assignment  (5 Marks) | Before Midterm exam | Will be given on class |  |
| Presentation  (8 Marks) | After Midterm exam | Will be given on class |  |
| Midterm Exam  (25 Marks) | According to the date declared by the University | Lecture 01-16 | 6 questions will be set each of 5 marks. You have to answer any 5. |
| Final Exam  (40 Marks) | According to the date declared by the University | Lecture 16-28 | 6 questions will be set each of 8 marks. You have to answer any 5. |
| Class Attendance  (7 Marks) | Total marks will be divided by the total number of classes held and each student will get( 7\*number of class attended/total class) | | | |

**Attention !!**

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| **For Quiz** | Make a Khata of your own including 4-6 pages. Write *Quiz Number, Your Name, Your ID number, Course Code, Course Title, Section, Set and Date* on the top sheet and Staple together. Bring your ***Calculator, Pencil, Eraser, Sharpener and Scale*** of your own. Unless you will not be permitted to sit for the exam. |
| **Assignment** | Make a nice top sheet including*, Title of the Assignment, Your Name, Your ID number, Course Code, Course Title, Section, Date of submission etc.* |
| **Presentation** | Your Presentation should have the followings: (i) *Title of the Presentation, (ii) Brief Description,(iii) Discussion (iv) Example (v) Application (vi) Conclusion.* |

**Test Policy:**

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| * If any student is absent from a test that will not be retaken if prior permission is not availed by the student. * If any student wants to sit for the make-up exam with permission he/she may have to pay the necessary exam fee as decided by the university authority. This fee may not be waived. * Midterm exam will be of 1.5 Hrs duration and the final exam will be of 2 Hrs of duration. * Zero tolerance to any kind of cheating or adopting unfair means in the exam. |

**Grading Policy:**

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| --- | --- | --- |
| **Marks out of 100** | **Letter Grade** | **Grade Point** |
| 80 - 100 | A+ | 4.00 |
| 75 - 79 | A | 3.75 |
| 70 - 74 | A- | 3.50 |
| 65 - 69 | B+ | 3.25 |
| 60 - 64 | B | 3.00 |
| 55 - 59 | B- | 2.75 |
| 50 - 54 | C+ | 2.50 |
| 45 - 49 | C | 2.25 |
| 40 – 44 | D | 2.00 |
| 00 - 39 | F | 0.00 |

* Besides, ‘W’ and ‘I’ grade may be awarded as per university rule.

Marks distribution:

The final course grade will be awarded based on the marks distribution shown in the table above. Percentages of marks for the different heads are given below:

|  |  |
| --- | --- |
| Attendance | 07 % |
| Class Test | 15 % |
| Assignment | 05 % |
| Presentation | 08% |
| Mid Term Exam | 25 % |
| Final Exam | 40 % |
| Total | 100% |

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**Md. Mohiuddin**

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Department of GED

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