

AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH (AIUB)

Faculty of Science and Technology (FST)

Department of Mathematics

Undergraduate Program



**COURSE PLAN**

**SUMMER 2021-2022** SEMESTER

1. Course Core and Title

**Mat 1205: Integral Calculus and Ordinary Differential Equations**

1. Credit

**3 credit hours (3 hours of theory per week)**

1. Nature

**Core Course for CS** and Engineering

1. Prerequisite

**Differential Calculus and Coordinate Geometry.**

1. **Vision:**

Our vision is to be the preeminent Department of Mathematics through creating recognized professionals who will provide innovative solutions by leveraging contemporary research methods and development techniques of computing that is in line with the national and global context.

1. **Mission:**

The mission of the Department of Mathematics of AIUB is to educate students in a student-centric dynamic learning environment; to provide advanced facilities for conducting innovative research and development to meet the challenges of the modern era of computing, and to motivate them towards a life-long learning process.





**I - Course Description:**

* Idea about Indefinite and definite integrals.
* Comprehend numerical integrations.
* Comprehend improper integrals and application of integration.
* Define and explain multiple integrals.
* Solutions of different types of ordinary differential equations and their applications.
* Comprehend System of linear ordinary differential equations.

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**II – Course Outcomes (CO) Matrix:**

By the end of this course, students should be able to:

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| --- | --- | --- | --- | --- | --- | --- |
| **COs**\* | **CO Description** | Level of Domain\*\* | | | | PO  Assessed\*\*\* |
| C | P | A | S |
| CO1 | Know different techniques of integrations and ODE. | 2 |  |  |  | PO-a-2 |
| CO2 | Use definite integrals multiple integrals in different applications. |  | 3 |  |  | PO-b-2 |
| CO3 | Formulate and solve different types of ordinary differential equations, system of linear differential equations. |  |  | 4 |  | PO-b-2 |

*C: Cognitive; P: Psychomotor; A: Affective; S: Soft-skills (CT: Critical Thinking, TS: Teamwork)*

*\* CO assessment method and rubric of COs assessment is provided in Appendix section*

*\*\* The numbers under the ‘Level of Domain’ columns represent the level of Bloom’s Taxonomy each CO corresponds to.*

*\*\*\* The numbers under the ‘PO Assessed’ column represent the PO (appendix) each CO corresponds to.*



**III – Topics to be covered in Theory class\*:**

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| --- | --- | --- | --- | --- | --- |
| **TOPICS** | **Specific Objective(s)** | **Time**  **Frame** | **Teaching Activities** | **Assessment**  **Strategy(s)** | **CO mapped** |
| Introduction, Indefinite integrals | Introducing students, the |  |  |  | CO1 |
| Introduction, standard integrals, integration by substitution. | Week 1 | Lecture delivery, Board work, Solving exercises, Discussion | Lecture notes, question- answer session. |
| Definite integrals | Riemann sum, Fundamental theorem of calculus, definite integrals and its properties, numerical integration by Trapezoidal rule and application. | Week 2 | Lecture delivery, Board work, Solving exercises, Discussion | Quiz 1  Lecture notes, question- answer session | CO1, CO2 |
| Application of integration | Area between two curves in Cartesian and Polar coordinates. Volume of a solid obtained by rotation, center of mass. | Week 3  & 4 | Lecture delivery, Board work, Solving exercises, Discussion | Quiz 2  Lecture notes,  question-  answer session. | CO1, CO2 |
| Improper integrals | Introduction. Beta function and Gamma function. | Week 5 | Lecture delivery, Board work, Solving exercises, Discussion | Lecture notes, question- answer session. | CO1 |
| Methods of Integration | Integration by parts, Integration of trigonometric functions, rational and irrational functions, integration by trigonometric substitution. | Week 6 | Lecture delivery, Board work, Solving exercises, Discussion | Quiz 3  Lecture notes, question- answer session. | CO1 |
| Midterm Week  Week 7 | | | | | |

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| --- | --- | --- | --- | --- | --- |
| Multiple integrals | Iterated integrals, Double and triple integrals. Applications of double and triple integrals (area, volume and surface area, center of mass) | Week 8 | Lecture delivery, Board work, Solving exercises, Discussion | Lecture notes, question- answer session. | CO2 |
| Ordinary Differential Equations | Definition, order, degree of DE. | Week 9 & 10 | Lecture delivery, Board work, Solving exercises, Discussion | Quiz 1  Lecture notes, question- answer session. | CO3 |
| Solution of first-order differential Equations | Separation of variables, Exact DE, Integrating factors, linear and Bernoulli equations, and initial value problem with its application. | Lecture delivery, Board work, Solving exercises, Discussion | Lecture notes, question- answer session. | CO1, CO3 |
| Solution of Higher-order differential equations | Complementary function, particular integral, Inverse operator method, method of undetermined coefficients, variation of parameters and applications | Week 11 & 12 | Lecture delivery, Board work, Solving exercises, Discussion | Quiz 2  Lecture notes, question- answer session. | CO1, CO3 |
| System of linear first-order differential equation | Definition, homogeneous system of two linear first order equations, the general solution, solution for initial value problem, nonhomogeneous system of DE, general solution and application. | Week 13 | Lecture delivery, Board work, Solving exercises, Discussion | Quiz 3  Lecture notes, question- answer session. | CO1, CO3 |
| Final term Week  Week 14 | | | | | |

\* The faculty reserves the right to change, amend, add or delete any of the contents.



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**IV- Course Requirements**

1. Attending at least 80% of the classes.
2. Attending the midterm and final term exams.



**V – Evaluation & Grading System**

The tentative marks distributions for course evaluation are as follows:

1. Attendance & Performance ……………………….……....20%

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1. Quiz (at least two)………………………...………………..40%
2. Midterm/ Final assessment….. …………………..……..….40%

## Total 100

Final Grading: 40% of Mid assessment + 60% of Final assessment



|  |  |  |
| --- | --- | --- |
| **Letter** | **Grade Point** | **Numerical %** |
| A+ | 4.00 | 90-100 |
| A | 3.75 | 85-<90 |
| B+ | 3.50 | 80-<85 |
| B | 3.25 | 75-<80 |
| C+ | 3.00 | 70-<75 |
| C | 2.75 | 65-<70 |
| D+ | 2.50 | 60-<65 |
| D | 2.25 | 50-<60 |
| F | 0.00 | <50(Failed) |
| I | Incomplete | |
| W | Withdrawal | |
| UW | Unofficially Withdrawal | |
|  |  |  |

The evaluation system will be strictly followed as par the AIUB grading policy.

1. Calculus– J. Stewart, - 8th edition, Cengage Learning, Inc.



**VI – Textbook/ References**

2. Differential Equations – P. Blanchard, R. L. Devaney, G. R. Hall.

3. Calculus–H. Anton, I.C. Bivens and S. Davis.-10th edition, John Wiley & Sons Inc.

4. Differential Equations – S.L. Ross.- 3rd edition, John Wiley & Sons Inc.

5. Calculus with Analytical Geometry –G.B. Thomas and R.L. Finny.- 9th edition, Addison-Wesley Publishing Company

6. Differentials and Integral Calculus – F. Ayres (Schaum’s Outline Series).-2nd edition, McGraw Hill.



**VII- List of Faculties Teaching the Course**

|  |  |
| --- | --- |
| Prof. Dr. Mohammed Jashim Uddin (**HEAD**) | 0008-087-2 |
| Prof. Dr. Madhabi Islam | 0805-708-2 |
| Prof. Dr. Khondaker Abdul Maleque | 9610-011-2 |
| Dr. M. Mostafizur Rahman |  |
| Dr. Fatema-Tuz-Zohra | 1001-993-2 |
| Dr. Dilruba Yasmin | 2003-2077-2 |
| Tanzia Zerin Khan | 1001-1010-2 |
| Prodip Kumar Ghose | 1005-1068-2 |
| Md. Mahfuzur Rahman |  |
| Khadiza Akter Mitu | 1805-1884-2 |
| Zasmin Haque |  |
| Shanta Deb |  |



**VIII – Verification:**

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| **Prepared by :**  **Ayesha Siddiqua**  Date:......................................... | **Moderated by :**  **Dr. M. Mostafizur Rahman**  Date:......................................... | **Moderated by :**  **Md. Mahfuzur Rhaman**  Date:......................................... |
| **Checked by:** | **Certified by:** | **Approved by:** |
| .................................................... | ......................................................... | ......................................................... |
| **Dr. Mohammed Jashim Uddin**  *Head*,  *Department of Mathematics* | **Dr. Dip Nandi**  *Director*,  *Faculty of Science & Technology* | **Mr. Mashiour Rahman**  *Associate Dean*,  *Faculty of Science & Technology* |
| Date:.......................................... | Date:............................................... | Date:............................................... |