AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH (AIUB)
Faculty of Science and Technology (FST)
Department of Mathematics
Undergraduate Program

COURSE PLAN — SUMMER 2021-2022 SEMESTER

I. Course Core and Title
Mat 1205: Integral Calculus and Ordinary Differential Equations

II. Credit
3 credit hours (3 hours of theory per week)

III. Nature
Core Course for CS and Engineering

IV. Prerequisite
Differential Calculus and Coordinate Geometry.

V. 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.

VI. 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.

II – Course Outcomes (CO) Matrix:

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

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*:

TOPICS	Specific Objective(s)	Time Frame	Teaching Activities	Assessment Strategy(s)	CO mapped
Introduction, Indefinite integrals	Introducing students, the Introduction, standard integrals, integration by substitution.	Week 1	Lecture delivery, Board work, Solving exercises, Discussion	Lecture notes, question-answer session.	CO1
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					

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.

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%
2. Quiz (at least two)……...……..40%
3. 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.

VI – Textbook/ References

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

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