



North South University

Department of Mathematics and Physics

Spring 2024

MAT130 : Calculus and Analytical Geometry II

Course Name : Calculus and Analytical Geometry - II [*Integral Calculus*]

Course Code : MAT 130

Credit Hours : 3 Credit

Pre-requisite : MAT 120

Course Coordinator

Instructor

Office

Email:

Office Time

**Course Short
Description:**

This course provides students an overview of the basic principle of integral, methodology of finding area between curves, length of a plane curve, surface area and volume by revolving plane curves using integration.

**Course
Objectives:**

1. To classify different types of proper and improper integrals and find the appropriate techniques for finding values of integrals, and to analyse the area of bounded and unbounded regions.
2. To analyse the basic geometric properties of conic sections parabolas, ellipses, and hyperbolas.
3. To demonstrate student' understanding of the relationship between the exponential and hyperbolic functions, their graphs and the application of hyperbolic functions in the real-life problems.
4. To develop the ability to apply the basic principles of integration to find the length of a curve, surface area of revolution, area between two curves and the volume of solids generated by revolution of curves.

**Course Learning
Outcomes:**

Upon successful completion of this course, students will be able to:

- (CO-1) Classify the type of a given integral and apply the appropriate technique for finding the value of the integral.
- (CO-2) Formulate and evaluate integrals to find the length of curves, the area between curves, the area of unbounded regions, and the area of surfaces of revolution.
- (CO-3) Analyze the structure of solids generated by revolution of a region bounded by curves to evaluate volume.
- (CO-4) Illustrate parametric curves and conic sections, and analyze their various properties.
- (CO-5) Develop the ability to apply polar coordinates to find the area of regions bounded by polar curves.

Mapping of Course Outcomes

#	Course Outcomes (CO)	Bloom's taxonomy domain/level (C: Cognitive P: Psychomotor A:Affective)	Delivery methods and activities	Assessment tools
CO-1	Classify the type of a given integral and apply the appropriate technique for finding the value of the integral.	C2, C3	Lecture Group work	Quiz Midterm exam Class performance
CO-2	Formulate and evaluate integrals to find the length of curves, the area between curves, the area of unbounded regions, and the area of surfaces of revolution.	C3, C4, P2	Lecture Group work	Midterm exam Assignment
CO-3	Analyze the structure of solids generated by revolution of a region bounded by curves to evaluate volume.	C3, C4, P2	Lecture Discussion	Group work in class Quiz Assignment
CO-4	Illustrate parametric curves and conic sections, and analyze their various properties.	C4, P2	Lecture Discussion	Assignment Final Exam
CO-5	Develop the ability to apply polar coordinates to find the area of regions bounded by polar curves.	C2, C3, P2	Lecture	Quiz Assignment Final Exam

Marks Distribution: (Subject to change according to the directives from UGC/NSU)

Assessment Strategy and Grading Scheme	
Grading tool	Marks
Attendance and class performances	10%
Assignments (At least 3 assignments)	10%
Quizzes (Best 2 quizzes out of at least 3 quizzes)	20%
Midterm	25%
Final Exam	35%

Text Book:

Author	Howard Anton, Irl Bivens, Stephen Davis
Title	“Calculus, Early Transcendentals”
Edition & Year	10 th edition (Soft copy → 2013 copy right)
Publisher	John Wiley & Sons, Inc
ISBN	978-1-11809240-8

Grading Policies: As per NSU grading policy.

Important dates:

Midterm → TBA in class

Course Final → TBA by the register office

Rules and Restrictions:

- (a) Submit the assignments on recommended date. **No late submission will be accepted.** Make a photocopy of your assignment before submission.
- (b) There is **no scope to retake a quiz.** In case of Mid-terms, exceptional cases* (unfortunate physical inability, accidents, serious illness) may be considered conditionally (with a **penalty of 20% reduced marks**) with proper justification. Dater of final exam will be strictly followed.
- (c) Three consecutive absents need an official clarification.
- (d) Student having attendance **less than 60% of total classes will not be allowed to sit for Final Exam.**
- (e) If you are a **probation/retake student**, I would like to have you in all classes.

Classroom Rules of Conduct (Off line Class):

- 1. Electronic devices e.g. **cell phone, laptop, notepad, iPad, iPod, mp3, etc** are strictly prohibited in the class [on Campus].
- 2. It is imperative that the students maintain absolute discipline in class. Students are also expected to arrive on time for the class, as frequent late attendance will not be accepted.

Academic Integrity Policy: Department of Mathematics and Physics does not tolerate academic dishonesty by its students. At minimum, students must not be involved in cheating, copyright infringement, submitting the same work in multiple courses, significant collaboration with other individuals outside of sanctioned group activities, and fabrications.

Students are advised that violations of the Student Integrity Code will be treated seriously, with special attention given to repeated offences.

Please see the NSU Student Handbook, Sections: “Disciplinary Actions” and “Procedures and Guidelines”.

Course Contents & Lecture Schedule (Tentative):

Lesson	Topics	Learning activities	Assessment tools	Learning Outcome
1	7.1: Integration by Substitution	Lecture	Review	Recalls
2	7.2: Integration by parts	Lecture	Quiz 1, Mid	CO-1
3	7.3: Trigonometric integrals	Lecture	Quiz 1, Mid	CO-1
4	7.3: Trigonometric integrals	Lecture	Quiz 1, Mid	CO-1
5	7.4: Trigonometric substitution	Lecture Class work	Mid, Assignment 1	CO-1
6	7.4: Trigonometric substitution	Lecture Group Activity	Mid, Assignment 1	CO-1
7	7.5: Integrating rational functions by partial fractions	Lecture	Mid Assignment 1	CO-1
8	7.5: Integrating rational functions by partial fractions	Lecture	Mid Assignment 1	CO-1
9	6.9: Hyperbolic functions and hanging cables	Lecture	Mid	CO-1
10	6.9: Hyperbolic functions and hanging cables	Lecture Group Activity	Mid	CO-1
11	6.1: Area between two curves	Lecture	Mid	CO-2
12	6.1: Area between two curves	Lecture Class Work	Mid	CO-2
13	Review for Midterm			
14	Midterm Examination			
15	6.2: Volume of Geometric Shapes by Slicing	Lecture	Quiz 2, Final	CO-3
16	6.2: Volumes by slicing disks	Lecture	Quiz 2, Final	CO-3
17	6.2: Volumes by slicing washers	Lecture Group Activity	Quiz 2, Final	CO-3
18	6.3: Volumes by Cylindrical shells	Lecture	Quiz 2, Final	CO-3
19	6.4: Length of a plane curves	Lecture	Final	CO-2
20	6.5: Area of a surface of revolution	Lecture	Final	CO-2
21	7.8: Improper Integrals	Lecture	Final	CO-1, CO-2
22	7.8: Improper Integrals	Lecture Group Activity	Final Assignment 2	CO-1, CO-2
23	10.1: Tangent lines and arc length for parametric curves	Lecture	Final, Quiz 3	CO-4

24	10.2: Polar coordinates	Lecture	Final, Quiz 3	CO-5
25	10.2: Polar coordinates	Lecture Group Activity	Final, Quiz 3	CO-5
26	10.3: Tangent lines, Area and Length in polar coordinates	Lecture	Final Assignment 3	CO-5
27	10.4: Conic sections, parabola, ellipse, Hyperbola	Lecture	Final Assignment 3	CO-4
28	10.6: Conic sections in polar coordinates	Lecture Class Work	Final	CO-4
29	10.6: Conic sections in polar coordinates	Lecture	Final	CO-4
30	<i>Review</i>			
	<i>Final Exam (Declared by Controller of Examinations)</i>			

Note: 7.3 and the concepts of finding area and volume may be included with the final exam syllabus up to departmental decision.

Notes: At least 3 assignments should be given.

1. Assignment -1 7.4 and 7.5
2. Assignment-2 on 6.2 and 6.3
3. Assignment-3 on 10.3 and 10.4
4. Class Performances are class works that are collected from students
5. Group Activities are problem solving class works which students do in groups

*****Thank You *****