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Hunan University
MATH21: Intermediate Calculus

Professor: To be announced
Total contact hours: 54 hours
Credit: 4

Course Description

This course is an important foundation course for higher learning of mathematics. Students review and extend their knowledge of trigonometry and basic analytic geometry. Important objectives of the calculus sequence are to develop and strengthen the students' problem-solving skills and to teach them to read, write, speak, and think in the language of mathematics. In particular, students learn how to apply the tools of calculus to a variety of problem situations.

Required Material

Textbook: *Intermediate Calculus*
Author: Murray H. Protter, Charles B. Morrey Jr.
Edition: 2nd Edition
Publisher: Springer-Verlag
ISBN: 978-1-4612-7006-5

Grading

- Papers 20%
- Quizzes 20%
- Midterm Exam 20%
- Final Exam 40%

A+ 96-100	A 90-95	A- 85-89
B+ 82-84	B 78-81	B- 75-77
C+ 71-74	C 66-70	C- 62-65
D 60-61	F < 60	

Course Schedule

The course has 24 class sessions in total. All sessions are 2 hours and 15 minutes in length.
Note: the course outline and required readings are subject to change.

Class 1:
Introduction to and academic expectations for the course
Chapter 1 Analytic Geometry in Three Dimensions
1. The Number Space R3. Coordinates. The Distance Formula
2. Direction Cosines and Numbers
3. Equations of a Line
4. The Plane

Class 2:
5. Angles, Distance from a Point to a Plane
6. The Sphere. Cylinders
7. Other Coordinate Systems

Class 3:
Chapter 2
Vectors
Directed Line Segments and Vectors in the Plane
2. Operations with Vectors
3. Operations with Plane Vectors, Continued. The Scalar Product
4. Vectors in Three Dimensions
5. Linear Dependence and Independence

Class 4:
6. The Scalar (Inner or Dot) Product
7. The Vector or Cross Product
8. Products of Three Vectors

Class 5:
9. Vector Functions and Their Derivatives
10. Vector Velocity and Acceleration in the Plane
11. Vector Functions in Space. Space Curves. Tangents and Arc Length
Paper 1

Class 6:
Chapter 3
Infinite Series
1. Indeterminate Forms
2. Convergent and Divergent Series
3. Series of Positive Terms

4. Series of Positive and Negative Terms

Class 7:

5. Power Series
6. Taylor's Series
7. Taylor's Theorem with Remainder

Class 8:

8. Differentiation and Integration of Series
9. Validity of Taylor Expansions and Computations with Series
10. Algebraic Operations with Series
11. Uniform Convergence. Sequences of Functions
12. Uniform Convergence off Series

Class 9:

13. Integration and Differentiation of Power Series
14. Double Sequences and Series
15. Complex Functions. Complex Series

Quiz 1

Class 10:

Chapter 4

Partial Derivatives. Applications

1. Limits and Continuity. Partial Derivatives
2. Implicit Differentiation

Class 11:

3. The Chain Rule
4. Applications of the Chain Rule
5. Directional Derivatives. Gradient
6. Geometric Interpretation of Partial Derivatives. Tangent Planes

Class 12:

Class 11:

7. The Total Differential. Approximation
8. Applications of the Total Differential
9. Second and Higher Derivatives
10. Taylor's Theorem with Remainder

Class 13:

11. Maxima and Minima
12. Maxima and Minima by the Methods of Lagrange Multipliers
13. Exact Differentials
14. Definition of a Line Integral
15. Calculation of Line Integral

16. Path-Independent line Integrals
Class 14:
Review and midterm

Class 15:
Chapter 5
Multiple Integration
1. Definition of the Double Integral
2. Properties of the Double Integral
3. Evaluation of Double Integrals. Iterated Integrals
4. Area, Density, and Mass
5. Evaluation of Double Integrals by Polar Coordinates

Class 16:
6. Moment of Inertia and Center of Mass
7. Surface Area
8. The Triple Integral
9. Mass of Region in R2. Triple Integrals in Cylindrical and Spherical Coordinates
10. Moment of Inertia. Center of Mass
Paper 2

Class 17:
Chapter 6
Fourier Series
1. Fourier Series
2. Half-Range Expansions
3. Expansions on Other Intervals
4. Convergence Theorem. Differentiation and Integration of Fourier
5. The Complex Form Fourier Series

Class 18:
Chapter 7
Implicit Function Theorem. Jacobians
1. Implicit Function Theorems
2. Implicit Function Theorems for Systems
3. Transformations and Jacobians

Class 19:
Chapter 8
Differentiation under the Integral Sign. Improper Integrals.
The Gamma Function
1. Differentiation under the Integral Sign
2. Tests for Convergence of Improper Integrals. The Gamma Function
3. Improper Multiple Integrals

4. Functions Defined by Improper Integrals

Class 20:
Chapter 9
Vector Field Theory
1. Vector Functions
2. Vector and Scalar Fields, Directional Derivative and Gradient
3. The Divergence of A Vector Field
4. The Curl of a Vector Formation
5. Line Integrals; Vector Formulation
6. Path-Independent Line Integrals
Quiz 2

Class 21:
Chapter 10
Green's and Strokes' Theorems
1. Green's Theorem
2. Proof of Green's Theorem
3. Change of Variables in a Multiple Integral

Class 22:
4 Surface Elements. Surfaces. Parametric Representation
5. Area of a Surface. Surface Integrals
6. Orientable Surfaces
7. Strokes' Theorem
8. The Divergence Theorem

Class 23:
Matrices and Determinants (Appendix 1)
Overall review

Class 24:
Final Exam

Attending Policy

Regular and prompt attendance is required. Under ordinary circumstances, you may miss two times without penalty. Each absence over this number will lower your course grade by a third of a letter and missing more than five classes may lead to a failing grade in the course. Arriving late and/or leaving before the end of the class period are equivalent to absences.

Policy on "Late Withdrawals"

In accordance with university policy, appeals for late withdrawal will be approved ONLY in case of medical emergency and similar crises.

Academic Honesty

Hunan University expects all students to do their own work. Instructors will fail assignments that show evidence of plagiarism or other forms of cheating, and will also report the student's name to the University administration. A student reported to the University for cheating is placed on disciplinary probation; a student reported twice is suspended or expelled.

General Expectations:

Students are expected to:

— Attend all classes and be responsible for all materials covered in class and otherwise assigned;

— Complete the day's required reading and assignments before class;

— Review the previous day's notes before class and make notes about questions you have about the previous class or the day's reading;

— Participate in class discussions and complete required written work on time;

— Refrain from texting, phoning or engaging in computer activities unrelated to class during the class period;

— While class participation is welcome, even required, you are expected to refrain from private conversations during the class period.

Special Needs or Assistance

Please contact the Administrative Office immediately if you have a learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material. Our goal is to help you learn, not to penalize you for issues which mask your learning.