南京航空航天大学
Nanjing University of Aeronautics and Astronautics

# Syllabus

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|---|---|---|---|---|---|
| **Course No.** | 1900705W | **College** | Science | **Dept.** | Mathematics |
| **Teacher** | Tong Wang | | | | |
| **Time** | 2022.12.19—2023.01.06 | | | | |
| **Course Name** | **English** | Calculus II | | | |
| | **Chinese** | 微积分 II | | | |
| **Course credit hours** | **Total** | **Theory** | **Office Hour or Practice** | **Credits** | |
| | 70 | 60 | 10 | 12.0 | |

**Course description**: Describe the nature, academic status, and aims of the course (theory, ability and technique)

**1. Course nature and academic status**

This is the second of three courses in the calculus sequence. Topics include integration methods and applications, infinite series, polar coordinates, parametric equations, vectors in plane and space, and lines and planes in space.

**2. Course aims (theory, ability and technique)**

(1). Students will be able to use various integration methods:

a. Find volumes of solids of revolution by disks and cylindrical shells.
b. Find work and average value of a function.
c. Perform integration by parts, trigonometric substitution, and integration by partial fractions.
d. Use parametrically defined curves to find tangents, areas, arc-lengths and surface areas of surfaces of revolution.

(2) Students will be able to analyze the properties of sequences and infinite series. Students will display proficiency by demonstrating the following competencies:

a. Define and evaluate limits of sequences of numbers.
b. Determine whether a sequence is bounded or unbounded. Find the Least Upper Bound lower bound and the Greatest Lower Bound of a sequence.
c. Find the formula of an infinite series given by numbers.
d. Determine whether a series of nonnegative terms is convergent or divergent.
e. Determine whether an alternating series is convergent or divergent.
f. Find the interval and radius of convergence of a power series.

g. Write Taylor and Maclaurin series of a given single-variable function.

(3). Students will be able to sketch the graphs using polar coordinates and utilize integration techniques to find areas bounded polar functions. Students will display proficiency by demonstrating the following competencies:

a. Identify and plot points in polar coordinates.
b. Find rectangular (polar) coordinates when a point or function is given in polar (rectangular) coordinate system.
c. Sketch the graphs of simple polar functions.
d. Find areas bounded by polar graphs using integration.

(4). Students will be able to perform basic vector calculus. Students will display proficiency by demonstrating the following competencies:

a. Plot vectors in plane and in space.
b. Find length of a vector.
c. Find the unit vector in the direction of a vector.
d. Find velocity and acceleration of motion using vectors.
e. Find the angle between two vectors.
f. Perform the calculation of the dot and the cross product.
g. Find lines and planes in space.

**Requirements for courses; ability and knowledge in advance**

The prerequisites are motivation and a good working knowledge of calculus I.

**Course structure explanation**:
Make clear the necessary parts, optional parts, distribution of hours. Courses with experiments or practice are expected to explain credit hours needed, content, scheme and functions.

1.Introduction, review, and areas between curves (1 credit hour)
2.Volumes of solids of revolution by disks and cylindrical shells (2 credit hours)
3.Work and average value of a function (1 credit hour)
4.Integration by parts and trigonometric integrals (3 credit hours)
5.Trigonometric substitution (2 credit hours)
6. Integration by partial fractions (2 credit hours)
7. Integration using tables and approximate integration (1 credit hour)
8. Improper integrals and arc-length (2 credit hours)
9. Areas of surfaces of revolution (1 credit hour)
10. Applications of integration to physics, engineering, economics, biology and probability (2 credit hours)
11. Parametrically defined curves including tangents, areas, arc-lengths and surface areas of surfaces of revolution (4 credit hours)

12. Polar coordinates including polar curves, tangents, areas, and arc-lengths (4 credit hours)
13. Sequences (1 credit hour)
14. Series, the integral test and estimating sums (2 credit hours)
15. Comparison tests and alternating series. Absolute convergence and root tests (4 credit hours)
16. Power series and the functions they define. Taylor and McLaurin series and applications of Taylor polynomials (2 credit hours)
17. Three-dimensional space and vectors (1 credit hour)
18. The dot product and cross product (1 credit hour)
19. Equations of lines and planes (2 credit hours)
20. Review (2 credit hours)

**Teaching methods (Lectures, practice, etc.)**

Lectures and self-study

**Forms of evaluation and requirements**
**Structure of the final grade(including presence, class performance, ), focus of exam, forms of exam(test, interview, final report, etc)**

Homework and final exam

| | **Name** | **Publisher** | **Author** | **Year** | **Price** |
|---|---|---|---|---|---|
| **Textbook** | Thomas' Calculus (Part II) | Higher Education Press | Finney, Weir, Giordano | 2004 | ¥50 |
| **References** | **Name** | **Publisher** | **Author** | **Year** | **Price** |
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| **Website** | | | | | |
| **Course members** | | | | | |
| **College** | | | | | |