**KINGDOOM OF SAUDI ARABIA**
**Ministry of Education**
Al-Imam Mohammad Ibn Saud Islamic University
**College of Sciences**
**Department of Mathematics & Statistics**

المملكة العربية السعودية
وزارة التعـلـيـم
جامعة الإمام محمد بن سعود الإسلامية
كلية العلوم
قسم الرياضيات والإحصاء

# SYLLABUS

| Course Code | Course Num. | Course Name | Credit Hours | Lec. | Lab. | Tut. | Private study | Pre-requisites | Course Level | Teaching Language |
|---|---|---|---|---|---|---|---|---|---|---|
| **MAT** | **106** | **Calculus (2)** | **4** | **3** | **0** | **2** | **5** | **MAT 105** | **2[1]** | **English** |

## A. Course Description

Enhance and reinforce the knowledge of Calculus, gained by the Students in Calculus (1), with other topics, which are essential to proceed to next courses in all programs. This course describes the most important ideas, theoretical results, and examples of integration techniques, infinite series, functions of several variables, multiple integrals, and conic sections and polar coordinates. The course includes the essential fundamentals of these topics. The emphasis is on calculations, and some applications of definite integrals are mentioned.

## B. Course Outcomes

At the end of this course the student will be able to:

- Use different techniques of integration.
- Apply definite integrals to Physics and Engineering.
- Develop the basics of the calculus of infinite series, and their applications.
- Work with polar coordinates and parametric representation in plane and space.
- Set up and compute multiple integrals in rectangular, polar, cylindrical and spherical coordinates.

## C. References:

### Required Textbook

*Calculus,* R. T. Smith and R. B. Minton, McGraw-Hill, 4th Edition, 2012.

### Other references
- *Essential Calculus with Application;* Richard A. Silverman, Dover Publications, 1989.
- *Calculus,* O. Swokowski, et al, PWS Pub. Co.; 6th Edition, 1994.
- *Calculus Early Transcendentals,* C. Henry Edwards, David E. Penney, Prentice Hall, 2008.
- *Schaum's Outline of Calculus,* Elliott Mendelson, Frank Ayres, McGraw-Hill, 1999.

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[1] *B.Sc. of Engineering.*

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### D. Topics Outline

1. **Integration Techniques:** Integration by Substitution, Integration by Parts, Integration of Rational Functions Using Partial Fractions, Trigonometric Techniques of Integration, Improper Integrals.

2. **Applications of Definite Integrals:** Area between curves, Volumes by slicing, Volumes using Cylindrical Shells, Disks and Washers, Arc Length and Surface Area, Work, Moments and Center of mass.

3. **Infinite Series:** Sequences of Real Numbers, Convergence and Divergence of Infinite Sequences, Infinite Series, Basic Infinite Series, Convergence Tests for Positive Series, Alternating Series, Absolute and Conditional Convergence, Power Series, and Taylor and Maclaurin Series.

4. **Functions of several variables and Partial Differentiation:** Functions of Several Variables, Limits and Continuity, Partial Derivatives, Differentiability, The Total Derivative, The Directional Derivatives and Gradient, Chain Rule, and Tangent Plane.

5. **Conic Sections and Polar Coordinates:** Conic Sections: The Parabola, Ellipse, and Hyperbola. The translation and rotation of axis. Parametric Representation of Curves in the Plane, Polar Coordinates, and Calculus in Polar Coordinates.

6. **Multiple Integrals:** Double Integrals in Cartesian Coordinates, Iterated Integrals, Areas and Volumes, Double Integrals in Polar Coordinates, Triple Integrals in Cartesian Coordinates, Triple Integrals in Cylindrical and Spherical Coordinates.

### E. Office Hours

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

### F. Exams & Grading System

The semi-official dates of the exams for this course are:

- **Midterm 1:** 6th or 7th week.
- **Midterm 2:** 11th or 12th week.
- **Quizzes & Homework:** During the semester.
- **Final Exam:** 16th week.

Your course grade will be based on your semester work as follows:

| **Midterm 1:** 20 % | **Midterm 2:** 20 % | **Final Exam:** 40 % |
|---|---|---|
| **Quizzes, Homework, Attendance & Participation:** 20 % | | |

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The grading distribution:

| A⁺ | A | B⁺ | B | C⁺ | C | D⁺ | D | F |
|---|---|---|---|---|---|---|---|---|
| [95, 100] | [90, 95) | [85, 90) | [80, 85) | [75, 80) | [70, 75) | [65, 70) | [60, 65) | [0, 60) |

### G. Student Attendance/Absence

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

**Executive Rules for Study Regulations and Exams**
**goo.gl/ykm7t3**