

# King Fahd University of Petroleum and Minerals

## Department of Mathematics & Statistics

### Math 201 – Syllabus

#### Semester 202

Coordinator: **Prof. Jawad Abuhlail**

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**Title:** Calculus III

**Credit:** 3-0-3

**Textbook:** J. Stewart, Calculus (Early Transcendental) 8th edition, Brooks/Cole.

**Description:** Polar coordinates, polar curves, area in polar coordinates. Vectors, lines, planes, and surfaces. Cylindrical and spherical coordinates. Functions of two and three variables, limits, and continuity. Partial derivatives, directional derivatives. Extrema of functions of two variables. Double integrals, double integrals in polar coordinates. Triple integrals, triple integrals in cylindrical and spherical coordinates.

#### Learning Outcomes:

Upon completion of the course, students should be able to:

1. Describe curves given by parametric and polar equations in the plane and calculate areas, slopes, surface area, arc length for such curves.
2. Describe regions and quadric surfaces in the space.
3. Perform vector operations in the space and find equations of lines and planes in the space.
4. Determine the limits and continuity of multivariable functions.
5. Calculate partial and directional derivatives, tangent planes, and gradient vectors.
6. Find extreme values of functions of two/three variables with constraints (Lagrange multipliers) or without constraints.
7. Evaluate multiple integrals in rectangular, polar, cylindrical, and spherical coordinate systems.

#### Grading Policy:

In-Person Midterm Exam Common MCQ Test	<b>Date:</b> TBA <b>Time:</b> TBA	<b>Material:</b> 10.1 – 14.2	<b>30%</b> (90 points)
In-Person Final Exam Common MCQ Test	<b>Date:</b> TBA <b>Time:</b> TBA	<b>Material:</b> Comprehensive	<b>40%</b> (120 points)
Online Homework	TBA		<b>15%</b> (45 points)
Classwork	It is based on quizzes, assignments, or other activities determined by the instructor. The average $x$ (out of 45) of Class Work <b>for each section</b> must be in the interval $[31.5, 33.75]$ .		<b>15%</b> (45 points)

**Exam Questions:** The questions of the exams are based on the examples, homework problems, and exercises in the textbook.

**Cheating:** Cheating or any attempt of cheating by use of illegal activities, techniques and forms of fraud will result in a grade of **F** in the course along with reporting the incident to the higher university administration. Cheating in exams includes (but is not limited to):

- Looking at the papers of other students
- Talking to other students
- Using mobiles or any other electronic devices
- Violating any exams/quizzes regulations (in-person or online)

**Academic Integrity:** All KFUPM policies regarding ethics apply to this course. (See the Undergraduate Bulletin).

**Remark:** The midterm and the final exams will be held **in-Person (not online)**. The dates and the locations shall be announced by the registrar.

**Attendance:** KFUPM policy applies to all virtual and face-to-face classes:

"If the number of **unexcused absences** for a student **exceeds 20% of the lecture** and laboratory sessions scheduled for a course, then he is not allowed to continue in the course or take the final examination and shall be given a **DN grade** by the course instructor with the department Chairman's approval."

## Pacing Schedule

Week	Section	Topics (24 Sections)
1	10.1 10.2	Curves Defined by Parametric Equations Calculus with Parametric Curves
2	10.3	Polar Coordinates
3	10.4 12.1	Areas and Lengths in Polar Coordinates Three-Dimensional Coordinates Systems
4	12.2	Vectors <i>Review</i>
5	12.3 12.4	The Dot Product The Cross Product
6	12.5 12.6	Equations of Lines and Planes Cylinders and Quadric Surfaces
7	14.1 14.2	Functions of Several Variables Limits and Continuity
<b>Midterm Exam: 10.1 – 14.2, Date &amp; Location: TBA</b>		
8	14.3 14.4	Partial Derivatives Tangent Planes & Linear Approximation
9	14.5 14.6	The Chain Rule Directional Derivatives and the Gradient Vector
10	14.7	Maximum and Minimum Values
11	14.8	Lagrange Multipliers <i>Review</i>
12	15.1 15.2	Double Integrals over Rectangles Double Integrals over General Regions
13	15.3	Double Integrals in Polar Coordinates
14	15.6 15.7	Triple Integrals Triple Integrals in Cylindrical Coordinates
15	15.8	Triple Integrals in Spherical Coordinates <i>Review / Catching up</i>
<b>Final Exam: Comprehensive, Date &amp; Location: TBA</b>		

## Suggested Practice Problems

10.1	2, 3, 5, 7, 8, 10, 12, 14, 19, 24
10.2	4, 6, 8, 11, 15, 17, 19, 31, 41, 42, 61, 63, 66
10.3	1, 3, 5, 9, 10, 11, 13, 15, 17, 25, 35, 39, 40, 57, 61
10.4	3, 5, 8, 9, 24, 27, 29, 31, 37, 38, 45
12.1	3, 5, 6, 7, 8, 11, 12, 13, 22, 23, 31, 35, 45
12.2	2, 3, 4, 6, 7, 9, 13, 15, 17, 19, 21, 23, 25, 26, 29, 41, 43, 45
12.3	1, 3, 5, 7, 9, 11, 17, 19, 22, 23, 25, 26, 39, 43, 45, 47, 55, 64.
12.4	1, 3, 5, 14, 17, 19, 28, 29, 33, 36, 37, 43, 44
12.5	1, 3, 4, 5, 6, 7, 10, 11, 13, 15, 16, 20, 23, 25, 26, 27, 30, 31, 33, 35, 45, 48, 53
12.6	4, 6, 11, 13, 21-28, 32, 33, 35, 38, 47
14.1	9, 11, 13, 15, 16, 17, 19, 45, 47
14.2	1, 9, 11, 15, 33, 34, 36, 43
14.3	15, 16, 19, 29, 21, 22, 25, 27, 29, 31, 33, 34, 35, 41, 53, 61, 63, 69
14.4	3, 5, 11, 13, 19, 21, 25
14.5	1, 3, 5, 7, 9, 10, 21, 23, 31, 34, 39
14.6	7, 9, 11, 12, 15, 17, 20, 21, 24, 27, 28, 29, 38, 41
14.7	6, 9, 11, 16, 31, 33, 41, 43, 48, 51, 53
14.8	4, 6, 7, 15, 20, 21, 31, 34
15.1	2, 10, 11, 12, 19, 23, 30, 32, 42, 43, 48
15.2	3, 5, 7, 9, 11, 12, 15, 17, 19, 21, 25, 27, 29, 45, 49, 50, 52, 61
15.3	5, 8, 12, 13, 16, 19, 20, 26, 30, 33, 39
15.6	5, 6, 7, 8, 9, 11, 13, 14, 19, 21, 22, 29, 33
15.7	1, 3, 5, 6, 7, 9, 11, 15, 19, 21, 24, 29
15.8	2, 4, 5, 7, 10, 13, 17, 22, 23, 29, 30, 35, 41, 43

### Tips on how to enhance your problem-solving abilities:

Do all homework assignments on time.

Practice (but not memorize) more problems than those in the above list.

Solve review problems available at the end of each chapter.

Solve the problems on your own before reading the solution or asking for help.

If you find it difficult to handle a certain type of problems, you should try more problems of the same type.

Review the last lecture before each class.

Practicing homework problems and reviewing the class lectures will make exam problems easier to tackle.

Visit your instructor in his office hours. Always bring partial solution of the questions that you want to discuss with your instructor.