King Fahd University of Petroleum and Minerals

Department of Mathematics

Math 106 Syllabus, Term 232 (Academic Year 2024)

Course Code and Title: MATH-106, Applied Calculus

Course Credit Hours: 3–0–3 (Three lecture hours per week)

Textbook: Introductory Mathematical Analysis for Business, Economics, and the Life and Social Sciences by Haeussler, Ernest F., Richard S. Paul, and Richard J. Wood (13th edition) Pearson, 2014

Course Objective: The objective of the course is to introduce students to the concepts of limits, continuity and differentiation and its applications for functions of single variable and several variables.

Course Description: Limits and Continuity. The derivative. Rules for differentiation. Derivative of logarithmic, exponential, and trigonometric functions. Differentials. Growth and decay models. Definite and indefinite integrals. Techniques of integration. Integrals involving logarithmic, exponential, and trigonometric functions. Integration by tables. Area under a curve and between curves. Functions of several variables. Partial derivatives and their applications to optimization

Prerequisite: One-year preparatory mathematics or its equivalent

Course Learning Outcomes: Upon successful completion of the course, a student should be able to

1. Compute derivative of various functions using appropriate technique.
2. Use concepts of relative minima and/or maxima, absolute minimum and/or maxi mum and inflection points.
3. Solve problems in optimization and exponential growth and decay.
4. Evaluate integral of some algebraic and trigonometric functions and use the Fundamental Theorem of Calculus.
5. Compute area between curves.
6. Calculate partial derivatives of a function of several variables and classify extreme values of a function of two variables and apply them to optimization problems.
7. Use basic concepts of calculus in business and economics.

Grading Policy:

	Date	Time	Place	Material	Percentage
Exam I	TBA	TBA	TBA	Sec. 10.1–12.4	25%(100 Points)
Exam II	TBA	TBA	TBA	Sec. 12.5–14.3	25%(100 Points)
Final Exam	TBA	TBA	TBA	Comprehensive	35%(140 Points)
Homework	The homework will be online via Blackboard.				5%(20 Points)
Class Work	- It is based on quizzes, class tests, or other class activities determined by the instructor. - The average (out of 40) of the class work of each section has to be in the interval $[y - 1, y + 1]$, where $$y = \frac{median(Exam\ I)\% + median(Exam\ II)\%}{5}.$$				10% (40 Points)
Total					100% (400 Points)

Letter Grades: The letter grades will follow a grading curve, which depends on the average of all students enrolled in the course.

Exam Questions: The questions of the exams are similar to the examples and exercises in the textbook.

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

➢ Looking at the papers of other students.
➢ Talking to other students.
➢ Using mobiles, smart watches, or any other electronic devices.

Other Exam Issues:

- ➤ No student will be allowed to take the exam if he/she does not bring his/her KFUPM ID, or National/Iqama ID, or Driver's License with him/her to the exam hall.
- ➤ Students are not allowed to have their mobiles, smart watches, or any electronic device in the exam hall. A violation of this will be considered an attempt of cheating.
- ➤ A student must sit in the seat assigned to him/her. A violation of this will be considered an attempt of cheating.

Missing an Exam: In case a student misses an exam (Exam I, Exam II, or the Final Exam) for a legitimate reason (such as medical emergencies), he/she must bring an official excuse from Students Affairs. Otherwise, he/she will get a score of zero in the missed exam.

Attendance: Students are expected to attend all lectures and lab classes.

- ➤ If a student misses a class/lab, he/she is responsible for any announcement made in that class/lab.
- ➤ After warned **twice** by the instructor, a DN grade will be awarded to any student who accumulates:
  - 9 unexcused absences. (20%)
  - 15 excused and unexcused absences in lecture and lab classes. (33%)

The Usage of Mobiles in Class: Students are not allowed to use mobiles for any purpose during class time. Students who want to use electronic devices to take notes must get permission from their instructor. Violations of these rules will result in a penalty decided by the instructor.

Academic Integrity: All KFUPM policies regarding ethics apply to this course. See the Undergraduate Bulletin on the Registrar's website.

Coverage Plan

Week	Date (2024)	Sec	Title (# sections)
1	Jan. 14-18	10.1	Limits
		10.2	Limits (Continued)
		10.3	Continuity
2	Jan. 21-25	11.1	The Derivative
		11.2	Rules for differentiation
		11.3	The derivative as a rate of change
3	Jan. 28-Feb. 1	11.4	Product & quotient rule
		11.5	The chain rule & the power rule
4	Feb. 4-8	12.1	Derivative of logarithmic functions
		12.2	Derivative of exponential functions
5	Feb.11-15	12.4	Implicit differentiation
<td colspan="4" align="center">**Exam I: Date; Time; Material:** 10.1–12.4</td>
6	Feb. 18-21	12.5	Logarithmic differentiation (Expressing the percentage rate of change in revenue in terms of the percentage rate of change in price using the elasticity of demand is beyond the scope of the course, since Section 12.3 is not included.)
		12.7	Higher order derivative
SF	**February 22**		**Saudi Founding Day**
7	Feb. 25-29	13.1	Relative extrema
		13.2	Absolute extrema on a closed interval
		13.3	Concavity
8	March. 2-7	13.4	The second derivative test
		13.5	Asymptotes
9	March. 10-14	13.6	Applied maxima and minima
		14.1	Differentials
10	March. 17-21	14.2	The indefinite integral
		14.3	Integration with initial conditions
<td colspan="4" align="center">**Exam II: Date; Time; Material:** 12.5–14.3</td>
11	March. 24-28	14.4	More integration formulas
		14.5	Techniques of integration
RAM	March29-April18		Eid Al-Fitr Holidays (19 Ramadan - 9 Shawwal)
12	April. 21-25	14.7	Fundamental theorem of calculus
		14.9	Area between curves
13	April. 28-May 2	HO	Handouts: Differentiation and Integration of Trigonometric Functions
		15.1	Integration by parts
14	May 5- 9	15.3	Integration by tables
		17.1	Partial derivatives
15	May 12- 16	17.4	Higher order partial derivatives
		17.6	Maxima and minima
16	May 19		A Normal Thursday Class (**Review/ Catching up**)
<td colspan="4" align="center">**Final Exam: Comprehensive**</td>

Suggested Homework and Practice Exercises

Sr.	Sec	Exercises #
1	10.1	4, 8, 17, 23, 36, 42, 44
2	10.2	2, 13, 15, 21, 29, 41, 47, 52, 58
3	10.3	6, 11, 22, 30, 36
4	11.1	12, 15, 18, 20, 25, 27
5	11.2	22, 33, 60, 72, 78, 85
6	11.3	8, 10, 12, 16, 21, 27, 40, 41
7	11.4	9, 15, 28, 37, 57, 66
8	11.5	6, 13, 30, 41, 71, 73
9	12.1	16, 18, 20, 24, 28, 30, 32, 50
10	12.2	10, 14, 16, 22, 28, 30, 38, 39
11	12.4	10, 14, 20, 22, 30, 34
12	12.5	7, 10, 14, 18, 20, 27
13	12.7	2, 8, 14, 30, 33, 35
14	13.1	16, 18, 30, 38, 48, 52
15	13.2	2, 6, 10, 12
16	13.3	12, 28, 40, 42, 60, 68
17	13.4	5, 6, 8, 10, 12
18	13.5	14, 20, 22, 34, 35, 45
19	13.6	4, 15, 18, 22, 26
20	14.1	12, 14, 20, 22, 29
21	14.2	8, 10, 18, 27, 30, 45
22	14.3	5, 7, 11, 14, 15
23	14.4	9, 12, 15, 33, 35, 52
24	14.5	6, 12, 23, 30, 40, 44, 53, 63
25	14.7	16, 36, 42, 44, 48
26	14.9	1, 3, 5, 20, 33, 37, 46, 58
27	15.1	6, 8, 12, 18, 20, 24, 32
28	15.2	1, 5, 6, 7, 8, 17, 31
29	15.3	3, 7, 9, 14, 20, 36, 44, 54
30	17.1	2, 8, 18, 20, 24, 30, 35
31	17.4	6, 8, 12, 18, 20, 21, 23
32	17.6	4, 9, 17, 19, 22, 26, 29

Some tips to enhance your problem-solving skills:

- ❖ Do all homework assignments on time.
- ❖ Practice (but not memorize) more problems than those given in the above list.
- ❖ Solve some review exercises 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 problem, you should try more problems of the same type.
- ❖ Try to make good use of the office hours of your instructor. Always bring your solution trials to discuss them with your instructor.