

Course code and Name: MATH-106, Applied Calculus

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 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.

Course Prerequisite: One-year preparatory mathematics or its equivalent.

Course learning outcomes: At the end of the course the student is expected to be able to:

- Compute derivative of various functions using appropriate technique.
- Use concepts of relative minima and/or maxima, absolute minimum and/or maximum and inflection points.
- Solve problems in optimization and exponential growth and decay.
- Evaluate integral of some algebraic and trigonometric functions and use the Fundamental Theorem of Calculus.
- Compute area between curves.
- 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.
- Use basic concepts of calculus in business and economics.

Grading policy: The following grading policy will be followed.

Class work	Homework	Exam–1, 19/02	Exam–2, 26/03	Final Exam(TBA)
10% (40 Points)	5% (20 Points)	25% (100 Points) Sec. 10.1–12.5	25% (100 Points) Sec. 12.7–14.5	35% (140 Points) Comprehensive

- The questions of all assessments are based on the examples and exercises of the Textbook.
- The average (out of 40) of the class work grade should be in the interval $[28, 30]$, that is, $[70\%, 75\%]$.
- The homework will be online via Blackboard.

Letter Grade: The letter grades are based on curved grading (a grading curve), which will depend on the average of all students taking the course.

Cheating in Exams: Cheating or any attempt of cheating by use of illegal activities, techniques and forms of fraud will result in an “F” grade in the course along with reporting the incident to the higher university administration.

Exam Hall Policy: No student will be allowed to take the exam if not having his/her KFUPM ID card or National/Iqama ID card. Students are not allowed to carry mobile phones and smart watches to the exam halls. Students must take the exam in the place assigned to them.

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 will get zero in the missed exam.

Attendance: Students are expected to attend all classes.

1. If a student misses a class, he is responsible for any announcement made in that class.
2. A student, who has a valid excuse for an absence, must present an officially authorized document to his instructor no later than a week before the date of the Final Exam; no excuses shall be accepted after that date.
3. A DN grade will be awarded after getting two warnings from the instructor, in case a student accumulates
 - 9 unexcused absences in classes.
 - 15 excused and unexcused absences in classes.

Academic Integrity: All KFUPM policies regarding ethics apply to this course. See the Undergraduate Bulletin on the webpage of the Registrar.

Use of Calculator: Calculators are not allowed in all exams.

Table 1: Tentative Classes Pacing Schedule

Week	Dates	Sections	Topics	Suggested Problems
1	Jan. 15 – 19	10.1	Limits	4, 8, 17, 23, 36, 42, 44
		10.2	Limits(Continued)	2, 13, 15, 21, 29, 41, 47, 52, 58
		10.3	Continuity	6, 11, 22, 30, 36
2	Jan. 22 – 26	11.1	The Derivative	12, 15, 18, 20, 25, 27
		11.2	Rules for differentiation	22, 33, 60, 72, 78, 85
		11.3	The derivative as a rate of change	8, 10, 12, 16, 21, 27, 40, 41
3	Jan. 29 – Feb. 2	11.4	Product & quotient rule	9, 15, 28, 37, 57, 66
		11.5	The chain rule & the power rule	6, 13, 30, 41, 71, 73
4	Feb. 5 – 9	12.1	Derivative of logarithmic functions	16, 18, 20, 24, 28, 30, 32, 50
		12.2	Derivative of exponential functions	10, 14, 16, 22, 28, 30, 38, 39

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		12.4	Implicit differentiation	10, 14, 20, 22, 30, 34
5	Feb. 12 – 16	12.5 ¹	Logarithmic differentiation	7, 10, 14, 18, 20, 27
		12.7	Higher order derivative	2, 8, 14, 30, 33, 35
	Feb. 19		Major-1 Exam (10.1–12.4)	
		13.1	Relative extrema	16, 18, 30, 38, 48, 52
6	Feb. 19 – 21	13.2	Absolute extrema on a closed interval	2, 6, 10, 12
	Feb. 22–23		Saudi foundation day holidays	
		13.3	Concavity	12, 28, 40, 42, 60, 68
7	Feb. 26 – Mar. 2	13.4	The second derivative test	5, 6, 8, 10, 12
		13.5	Asymptotes	14, 20, 22, 34, 35, 45
8	Mar. 5 – 9	13.6	Applied maxima and minima	4, 15, 18, 22, 26
		14.1	Differentials	12, 14, 20, 22, 29
9	Mar. 12 – 16	14.2	The indefinite integral	8, 10, 18, 27, 30, 45
		14.3	Integration with initial conditions	5, 7, 11, 14, 15
10	Mar. 19 – 23	14.4	More integration formulas	9, 12, 15, 33, 35, 52
	Mar. 26		Major-2 Exam (12.5–14.5)	
11		14.5	Techniques of integration	6, 12, 23, 30, 40, 44, 53, 63
	Mar. 26 – 30	14.7	Fundamental theorem of calculus	16, 36, 42, 44, 48
		14.9	Area between curves	1, 3, 5, 20, 33, 37, 46, 58
12	Apr. 2 – 6	Handouts	Differentiation and Integration of Trigonometric Functions	
		15.1	Integration by parts	6, 8, 12, 18, 20, 24, 32
13	Apr. 9 – 13	15.3	Integration by tables	3, 7, 9, 14, 20, 36, 44, 54
	Apr. 14 – 27		Eid Holidays	
		17.1	Partial derivatives	12, 8, 18, 20, 24, 30, 35
14	Apr. 30 – May 4	17.4	Higher order partial derivatives	6, 8, 12, 18, 20, 21, 23
		17.6	Maxima and minima	4, 9, 17, 19, 22, 26, 29
15	May 7 – 11		Review	
	May 14		Review	Normal Wednesday classes
16	May 15		Review	Normal Thursday classes

¹Expressing 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.