

King Fahd University of Petroleum and Minerals

Department of Mathematics

Math 102 Syllabus, Term 242 (2025)

Coordinator: **Dr. Khalid Ali Alanezy** (alanezy@kfupm.edu.sa)

Course Code and Title: Math 102, Calculus II

Course Credit Hours: 4-0-4

Textbook: Larson, R. & Edwards, B., Calculus: Early Transcendental Functions, Metric Version, 7th edition, 2019.

Course Objective: The objective of the course is to introduce students to the concepts of integration and series and their applications.

Course Description: Definite and indefinite integrals of functions of a single variable. Fundamental Theorem of Calculus. Techniques of integration. Hyperbolic functions. Applications of the definite integral to area, volume, arc length and surface area. Improper integrals. Sequences and series: convergence tests, integral, comparison, ratio and root tests. Alternating series. Absolute and conditional convergence. Power series. Taylor and Maclaurin series.

Prerequisite: Math 101.

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

1. Estimate areas and definite integrals by Riemann sums.
2. Apply the Fundamental Theorem of Calculus.
3. Evaluate integrals using various techniques of integration.
4. Calculate the average value of a function, areas between curves, length of curves, volumes and surface areas of solids of revolutions.
5. Evaluate improper integrals and limits of sequences.
6. Apply convergence tests of series and evaluate sum of some selected convergent series.
7. Find interval and radius of convergence of a power series and express a function as a power series (Taylor and Maclaurin).

Grading Policy:

	Date	Time	Place	Material	Percentage
Exam I (14 MCQ)	Wednesday February 19, 2025	TBA	TBA	[5.2, 7.1]	70 Points (23.33%)
Exam II (14 MCQ)	Monday, April 14, 2025	TBA	TBA	[7.2, 8.7]	70 Points (23.33%)
Final Exam (20 MCQ)	TBA	TBA	TBA	Comprehensive	100 Points (33.33%)
Online Homework	On Blackboard				15 Points (5%)
Rec. Lab	Assessment: Midterm Exam: 7 points, 7 MCQ, Week 8. Final Exam: 8 points, 8 MCQ, Week 15.				15 Points (5%)
Class Work	<ul style="list-style-type: none"> ▪ It is based on quizzes, class tests, or other class activities determined by the instructor. ▪ The average x (out of 30) of the class work of each section has to be in the interval $[y - 1, y + 1]$, where $y = \frac{3 (\text{median (Exam I)\%} + \text{median (Exam II)\%})}{20}$ 				30 Points (10%)
Total					300 Points (100%)

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

Exam Questions: All exam questions should originate from the course material, including examples, suggested homework problems, or exercises from the book.

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 lecture 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
 - 12 unexcused absences in lecture and lab classes. (20%)
 - 20 excused and unexcused absences in lecture and lab classes. (33.3%)

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 take 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 in the Registrar's website.

Pacing Schedule

Week	Date (2025)	Sec#	Title (28 sections)
1	Jan. 12-16	5.2	Area
		5.3	Riemann Sums and Definite Integrals
2	Jan. 19-23	5.4	The Fundamental Theorem of Calculus + Exercise # 114
		5.5	Integration by Substitution
3	Jan. 26-30	5.5	Continued
		5.7	The Natural Logarithmic Function: Integration
4	Feb. 02-06	5.8	Inverse Trigonometric Functions: Integration
		5.9	Hyperbolic Functions (Integration: Theorem 5.21)
5	Feb. 09-13	7.1	Area of a Region Between Two Curves
Exam I: Wednesday February 19, 2025; Material: [5.2, 7.1]			
6	Feb. 16-20	7.2	Volume: The Disk Method
		7.3	Volume: The Shell Method
Sunday, Feb. 23: Saudi Founding Day Holiday			
7	Feb. 24-27	7.4	Arc Length and Surfaces of Revolution
		8.1	Basic Integration Rules
8	Mar. 02-06	8.2	Integration by Parts
		8.3	Trigonometric Integrals
9	Mar. 09-13	8.4	Trigonometric Substitution
		8.5	Partial Fractions
10	Mar. 16-20	8.7	Rational Functions of Sine & Cosine (p. 569 only)
		8.8	Improper Integrals
Mar. 23 – Apr. 03: Eid Al-Fitr Holidays			
11	Apr. 06-10	9.1	Sequences
		9.2	Series and Convergence
Exam II: Monday, April 14, 2025; Material: [7.2, 8.7]			
12	Apr. 13-17	9.3	The Integral Test and p -Series
		9.4	Comparison of Series
13	Apr. 20-24	9.5	Alternating Series
		9.6	The Ratio and Root Tests
14	Apr. 27 - May 01	9.7	Taylor Polynomials and Approx. (Up to Example 7)
		9.8	Power Series

15	May 04-10	9.9	Representation of Functions by Power Series
		9.10	Taylor and Maclaurin Series; Binomial Series*
16	May 11		(Review/ Catching up)
Final Exam: Comprehensive			

* Students have to **memorize** the power series representations of the functions

$f(x) = \frac{1}{1+x}, e^x, \sin x, \cos x, \arctan x, (1+x)^k$ in page 674.

Suggested Practice Exercises

Sec#	Exercises #
5.2	7, 15, 20, 27, 31, 37, 44, 55, 59, 67 (10 problems)
5.3	3, 10, 13, 17, 23, 35, 43, 48, 52, 66 (10 problems)
5.4	18, 21, 25, 40, 47, 55, 79, 86, 94, 112 (10 problems)
5.5	17, 22, 44, 48, 54, 60, 68, 79, 91, 94, 100 (11 problems)
5.7	14, 15, 28, 32, 33, 39, 47, 55, 70, 76, 83 (11 problems)
5.8	6, 14, 17, 19, 23, 33, 37, 44, 50, 66 (10 problems)
5.9	49, 54, 55, 60 (4 problems)
7.1	5, 10, 14, 18, 24, 38, 42, 52, 58, 61, 69, 82 (12 problems)
7.2	8, 11, 14, 19, 23, 32, 35, 38, 57, 73, 74 (11 problems)
7.3	11, 21, 25, 30, 45, 49, 59 (7 problems)
7.4	7, 14, 20, 37, 41, 46, 57, 60, 63, 71 (10 problems)
8.1	8, 22, 33, 46, 63, 72, 74, 84, 91, 94, 95, 98 (12 problems)
8.2	16, 22, 23, 28, 33, 50, 55, 63, 72, 86, 88(a, b, c), 99 (12 problems)
8.3	6, 10, 14, 25, 29, 45, 53, 58, 66, 72, 75 (11 problems)
8.4	19, 26, 28, 36, 41, 52, 54, 55, 66, 68 (10 problems)
8.5	3, 9, 13, 16, 24, 26, 31, 46, 47(a), 51 (10 problems)
8.7	55, 57, 60, 62 (4 problems)
8.8	7, 22, 27, 28, 38, 44, 47, 49, 67, 69, 70, 102 (12 problems)
9.1	9, 14, 20, 23, 31, 38, 44, 52, 55, 56, 61, 73 (12 problems)
9.2	8, 14, 20, 24, 36, 38, 41, 51, 58, 64, 81, 97 (12 problems)
9.3	4, 15, 24, 25, 33, 38, 45, 49, 66, 76, 77 (11 problems)
9.4	8, 9, 15, 25, 26, 30, 44, 51, 68, 70 (10 problems)
9.5	14, 15, 21, 26, 34, 37, 46, 49, 56, 63, 80, 81 (12 problems)
9.6	21, 30, 37, 44, 51, 61, 68, 78, 86 (9 problems)
9.7	11, 21, 24, 27, 30, 42, 67(a) (7 problems)
9.8	11, 20, 22, 25, 37, 40, 45, 51 (8 problems)
9.9	3, 7, 15, 18, 19, 22, 23, 38, 40, 47, 51 (11 problems)
9.10	6, 11, 14, 15, 25, 26, 33, 35, 43, 51, 53, 56, 58, 60, 68 (evaluate only) (15 problems)

Note: Check also the **True-or-False** exercises in each section.

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 problems, 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.