

King Fahd University of Petroleum & Minerals  
Department of Mathematical Sciences

MATH 311(062)

Course Syllabus

**Course Instructor:** Dr.Abdul Rahim Khan

**Recommended Text:** “A First Course in Real Analysis” by Protter & Morrey, 2<sup>nd</sup> Ed, Springer (1991)

**Main Topics to be Covered:** The Real Number System, Continuity and Limits, Basic Properties of Functions on  $\mathbf{R}^1$ , Elementary Theory of Differentiation, Elementary Theory of Integration.

**Course Objectives:** This course is designed to provide a rigorous mathematical basis for the analysis of “Functions of One Variable”. Theorems usually stated without proof in elementary calculus courses will be completely proved in this course.

**Reference :** Introduction to Real Analysis by Bartle and Sherbert (2<sup>nd</sup> ed. 1992) .

**Students Learning Outcome:** After completion of the course, the students should be able to

- Identify hypothesis and conclusion(s) from the statement of a mathematical result
- Compose the arguments leading to the proof of a mathematical statement
- Acquire, whenever appropriate, a geometrical feeling of a statement
- Apply the results to solve exercises, mostly theoretical in nature

**Computer Usage:** The course does not require any kind of computer software. However, software such as matlab, maple or mathematica may, in some cases, provide a deeper understanding of the theoretical concepts involved in this course.

**Course Evaluation Policy:**

Exam I      22 %    Exam II    22 %      Final Exam    40%    Homework 16 %

**Attendance :** According to the University rules, a student missing 9 classes during the term without a valid excuse will be awarded “DN Grade” . A student coming late in the class will be awarded ½ absence.

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**Office Hours:** SUMW: 2:00-2:50 p.m. , Tuesday 9:00-10:50 a.m., or by appointment.

### Weekly Coverage of Course Material

Week	Date	Section	Topic
1	Feb 17-21	1.1 1.2	Axioms for a Field Natural Numbers and Sequences
2	Feb 24-28	1.3 1.4	Inequalities Mathematical Induction
3	Mar 3-7	1.4 2.1	Mathematical Induction (contd.) Continuity
4	Mar 10-14	2.2 2.3	Limits One-Sided Limits
5	Mar 17-21	2.4 2.5	Limits at Infinity; Infinite Limits Limits of Sequence
6	Mar 24-28	3.1 3.2	The Intermediate-Value Theorem Least Upper Bound; Greatest Lower Bound
7	Mar 31- Apr 4	3.3 3.4	The Bolzano-Weierstrass Theorem The Boundedness and Extreme-Value Theorems
8	Apr 7-11	3.5	Uniform Continuity
9	Apr 16-18	3.6	The Cauchy Criterion
10	Apr 21-25	3.7	The Hein-Borel and Lebesgue Theorems
11	Apr 28- May 2	4.1	The Derivative in $\mathbf{R}^1$
12	May 5-9	4.2	Inverse Functions in $\mathbf{R}^1$
13	May 12-16	5.1	The Darboux Integral for Functions on $\mathbf{R}^1$
14	May 19-23	5.2	Continued The Riemann Integral
15	May 26-30	5.3	Continued
16	June 2-3		Review