

# King Fahd University of Petroleum & Minerals

Department of Mathematics and Statistics

## MATH 341

**Instructor:** Dr. Salim Messaoudi  
(Office 5-315 – Tel: 4570)

**E-mail:** [messaoud@kfupm.edu.sa](mailto:messaoud@kfupm.edu.sa)

**Course Code:** MATH 341 Location: 63-121 Time: 1: 00-2: 15 PM

**Title:** Advanced Calculus I

**Textbook:** **Introduction to Real Analysis** by Robert G. Bartle and Donald R. Sherbert, 4th Ed, Wiley (2011)

**Catalogue Description**

The real number system.  
Continuity, limits, uniform continuity and differentiability of functions of one variable.  
Definition, existence and properties of the Riemann integral.  
The fundamental theorem of calculus.  
Sequences and series of real numbers.

**Student Learning Outcomes**

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

- Analyze a mathematical statement
- Identify hypothesis and conclusion (s) from the statement of a mathematical result
- Identify the set of mathematical results that lead to the proof of a statement
- 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
- Prepare the students for higher-level analysis courses.

**Grading Policy:** HW & Assignments: 30 %, Midterm 1: 35%, Final: 35%.

| <b>Week #</b> | <b>MATERIAL</b>  |
|---------------|--|
| 1             | 2.1 Algebraic and Order Properties of $\mathbb{R}$<br>2.2 Absolute Value and the Real Line |
| 2             | 2.3 Completeness Property of $\mathbb{R}$<br>2.4 Applications of the Supremum Property     |
| 3             | 3.1 Sequences and Their Limits<br>3.2 Limit Theorems                                       |
| 4             | 3.3 Monotone Sequences<br>3.4 Subsequences and the Bolzano-Weierstrass Theorem             |
| 5             | 3.5 Cauchy Criterion<br>3.6 Properly Divergent Sequences                                   |
| 6             | 4.1 Limits of Functions<br>4.2 Limit Theorems  |
| 7             | 5.1 Continuous Functions<br>5.2 Combinations of Continuous Functions                       |
| 8             | 5.3 Continuous Functions on Intervals<br>5.4 Uniform Continuity                            |
| 9             | 5.6 Monotone and Inverse Functions<br>6.1 The Derivative                                   |
| 10            | 6.2 The Mean Value Theorem<br>6.3 L' Hospital's Rules                                      |
| 11            | 6.4 Taylor's Theorem<br>7.1 Riemann Integral   |
| 12            | 7.2 Riemann Integrable Functions   |
| 13            | <b>7.3</b> The Fundamental Theorem   |
| 14            | 9.1 Absolute Convergence<br>9.2 Tests for Absolute Convergence                             |
| 15            | 9.3 Tests for Non-absolute Convergence<br>9.4 Series of Functions                          |