

**King Fahd University of Petroleum and Minerals**  
**Department of Mathematics and Statistics**  
**SYLLABUS**

**Semester II: 2015-2016(152)**

Coordinator: Dr. Muhammad Yousuf

**Course #:** MATH 301

**Title:** Methods of Applied Mathematics

**Textbook:** Advanced Engineering Mathematics by Zill and Wright (Fifth Edition)

| Week   | Date                 | Sec.         | Topics   | Suggested Homework Problems                        |
|--|----------------------|--------------|--|--|
| 1  | Jan 17 - 21          | 9.1<br>9.5   | Vector Functions<br>The Directional Derivative                             | 1,12,16,17,21,26,33, 41<br>2,7,9,14,17,21,23,32,29 |
| 2  | Jan 24 -28           | 9.7<br>9.8   | Curl and Divergence<br>Line Integrals                                      | 2,6,10,14,17,22,27<br>2,6,8,11,16,19,24,28,33      |
| 3  | Jan 31 -<br>Feb 04   | 9.9<br>9.12  | Independence of the Path<br>Green's Theorem                                | 1,10,15,18,21,26<br>2,4,6,9,18,23,25               |
| 4  | Feb 07 - 11          | 9.13<br>9.14 | Surface Integrals<br>Stokes' Theorem                                       | 2,5,10,13,18,22,25,33<br>1,3,6,8,13,17             |
| 5  | Feb 14 - 18          | 9.16<br>4.1  | Divergence Theorem<br>Definition of the Laplace transform                  | 2,4,7,11,14<br>1,5,14,26,30,37,43                  |
| <b>Major Exam I: Feb 24, 2016. Material 9.1 - 9.16</b> |                      |              |  |  |
| 6  | Feb 21 - 25          | 4.2<br>4.3   | Inverse Transform, Transforms of Derivatives<br>Translation Theorems       | 2,10,19,22,24,32,35<br>2,8,13,20,24,31,37,48,55,63 |
| 7  | Feb 28 -<br>March 03 | 4.4<br>4.5   | Additional Operational Properties<br>The Dirac Delta Function              | 1,10,16,22,27,31,38,46<br>1,4,8,12                 |
| 8  | March 06-<br>10      | 12.1<br>12.2 | Orthogonal Functions<br>Fourier Series                                     | 2,6,11,13<br>1,6,12,17,20                          |
| <b>Midterm Vacation: March 13 - 17, 2016</b>           |                      |              |  |  |
| 9  | March 20-<br>24      | 12.3         | Fourier Cosine and Sine Series   | 1,8,12,16,25,35,38                                 |
| 10   | March 27-<br>31      | 12.5         | Sturm-Liouville Theorem  | 2,4,6,12   |
| <b>Major Exam II: Apr 06, 2016. Material 4.1 -12.5</b> |                      |              |  |  |
| 11   | April 03-07          | 12.6<br>13.1 | Bessel and Legendre Series<br>Separable Partial Differential Equations     | 2,4,6,8,15,20<br>2,8,12,16,22,26,27                |
| 12   | April 10-14          | 13.3<br>13.4 | Heat Equation<br>Wave Equation   | 2,3,6<br>1,6,9,16,23                               |
| 13   | April 17-<br>21      | 13.5<br>14.2 | Laplace's Equation<br>Problems in Cylindrical Coordinates                  | 2,4,7,10,14<br>2,4,9,12                            |
| 14   | April 24-28          | 14.3<br>15.2 | Problems in Spherical Coordinates<br>Applications of the Laplace Transform | 2,5,11,12<br>2,4, 10,14,18,24                      |
| 15   | May 01 - 05          | 15.3<br>15.4 | Fourier Integral<br>Fourier Transforms                                     | 1,4,10<br>1,6,10,12,16                             |
| <b>Final Exam : Wednesday, May 11, 2016, 07:00PM</b>   |                      |              |  |  |

### **Grading Policy:**

|         |     |            |     |
|---------|-----|------------|-----|
| Exam I  | 25% | Final Exam | 35% |
| Exam II | 25% | Class work | 15% |

**Attendance:** Attendance is compulsory. KFUPM policy with respect to attendance will be strictly enforced. Any student accumulating **9 unexcused absences** will be awarded DN Grade in the course.

### **Math 301 Methods of Applied Mathematics**

Upon completion of this course, students will be able to:

1. Recognize the vector fields, find their curl and divergence, and test whether they are conservative.
2. Evaluate the line integral along plane or space curves and the surface integral over surfaces in 3-space.
3. Use Green's, Stokes' and Divergence theorems to relate and evaluate different types of integral.
4. Evaluate the Laplace transform and inverse Laplace transform of a given function.
5. Apply the Laplace transform, inverse Laplace transform, and their operational properties to solve linear initial-value and boundary-value problems.
6. Find the Fourier series, the Fourier cosine and sine series, and the Bessel and Legendre series of a given function.
7. Find the eigenvalues and eigenfunctions for a given Sturm-Liouville boundary-value problem and state their orthogonality relation.
8. Solve separable partial differential equations.
9. Solve boundary-value problems involving the wave, heat and Laplace equations in various coordinate systems.
10. Evaluate the Fourier integral and the Fourier cosine and sine integrals of a given function.
11. Use the Fourier transform, inverse Fourier transform, and their operational properties to solve linear boundary-value problems