1. **Basic Information**

**Course Title**: Advanced Engineering Mathematics  **Code**: **ENG 501 Units: 3**

**Lecture**: 3 **Tutorial**: - **Practical**: - **Total:** 3

**Program on which the course is given:**  Master of Science in Engineering Mathematics

**Major or minor element of program:** Major

**Department offering the program:** Department of Engineering Mathematics and Physics

**Department offering the course:** Department of Engineering Mathematics and Physics

**Academic year / level:** Academic year2014/2015 First Semester

**Date of specifications approval:**  December 2015

1. **Professional Information**
2. **Overall aims of course**

By the end of the course the students will be able to:

* Recognize Ordinary and partial differential equations.
* Identify Laplace transformations, Special functions, Initial boundary value problems, and Wave equation in spherical and cylindrical coordinates, Fourier series and Fourier integrals, System of linear ordinary differential equations.
* Deal with Numerical methods for solving ordinary differential equations.

1. **Intended Learning outcomes of Course (ILOs)**
2. **Knowledge and Understanding**

2.1.1 Identify theories, fundamentals of solutions of Ordinary and partial differential equations.

2.1.3 Outline the scientific developments to solve Initial boundary value problems.

2.1.4 Summarize the moral and legal principles of Numerical methods for solving ordinary differential equations.

1. **Intellectual Skills**

2.2.5 Assess solutions to ordinary differential equations

1. **Professional and Practical Skills**

2.3.1 Master basic professional and modern skills in solving Wave equation in spherical and cylindrical coordinates

1. **General and Transferable Skills**

2.4.1 Communicate effectively using researches of new topics about Special functions, Initial boundary value problems, Wave equation

2.4.5 Assess the performance of Initial boundary value problems

2.4.6 Work in a group and manage time effectively

1. **Contents**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No** | **Topic** | **No. of hours** | **ILOs** | **Teaching / learning methods and strategies** | **Assessment method** |
| 1 | Introduction | 3 | 2.1.1, 2.1.3 | Lectures | Assignments |
| 2 | Ordinary differential equations | 3 | 2.1.1, 2.1.4 | Lectures | Assignments |
| 3 | Ordinary differential equations | 3 | 2.1.3, 2.2.5 | Lectures | Mid-term exam, Final exam |
| 4 | Partial differential equations | 3 | 2.3.1, 2.4.5 | Lectures | Quiz  Mid-term exam, Final exam |
| 5 | Partial differential equations | 3 | 2.4.1, 2.2.5 | Class activity, Tutorial | Assignments  Mid-term exam, Final exam |
| 6 | System of linear ordinary differential equations | 3 | 2.4.6, 2.3.1, 2.4.1 | Lectures, Tutorial | Mid-term exam, Final exam |
| 7 | Series solution | 3 | 2.4.6, 2.3.1, 2.4.1 | Lectures | Assignments  Mid-term exam, Final exam |
| 8 | Mid-term Exam |  |  | -- | Mid-Term exam |
| 9 | Laplace transformations | 3 | 2.1.4, 2.4.6 | Lectures | Quiz, Final exam |
| 10 | Special functions | 3 | 2.1.4, 2.4.6 | Lectures | Assignments, Final exam |
| 11 | Numerical methods for solving ordinary differential equations | 3 | 2.1.4, 2.4.6 | Lectures | Quiz, Final exam |
| 12 | Numerical methods for solving ordinary differential equations | 3 | 2.1.4, 2.4.6 | Lectures, Tutorial | Assignments, Final exam |
| 13 | Fourier series | 3 | 2.4.1, 2.4.5 | Lectures, Tutorial | Quiz, Final exam |
| 14 | Fourier integrals | 3 | 2.4.1, 2.4.5 | Class activity, Tutorial | Assignments, Final exam |
| 15 | Final Exam |  |  |  |  |

1. **Teaching and Learning Methods**
   1. Lectures
   2. Class activity
   3. Self study
   4. Research assignments and the use of internet. 
2. **Student Assessment Methods**
   1. Homework assignments and others
   2. Quiz to assess student’s creativity and problem assessments.
   3. Final exam to assess understanding and scientific knowledge. 

Assignments to assess 2.1.1, 2.1.3, 2.1.4 2.2.5, 2.3.1, 2.4.1, 2.4.5, 2.4.6 Quiz to assess 2.1.1, 2.1.3, 2.1.4 2.2.5, 2.3.1,Mid-Year exam to assess 2.1.1, 2.1.3, 2.1.4 2.2.5, 2.3.1, Final exam to assess 2.1.1, 2.1.3, 2.1.4 2.2.5, 2.3.1

1. **Assessment schedule**

Assessment 1 All weeks 

Assessment 2 Quizzes

Assessment 3 Final exam on the 15thweek

1. **Weighting of Assessments**

Final- Term Examination 67 %

Oral Examination 00 %

Practical Examination 00 %

Year Work 33 %

Other 00 %

Total 100 %

1. **List of References**
   1. Course Notes

* Lecture material and training sheets
  1. Essential Books (Text Books)
  2. Recommended Books
  3. Periodicals Web sites, etc
* [www.MathematicsResearch.com](http://www.MathematicsResearch.com)
* [www.Google.com](http://www.Google.com)

1. **Facilities Required for Teaching and learning**

White board, prepared notes, Sheets and solving problems.

**Course coordinator:** Prof. Dr. Mohamed Ismail Hussien

**Course instructor:** Prof. Dr. Mohamed Ismail Hussien

**Head of department:**  **Prof. Dr.** Said Abdallah **Date: 28 / 7 / 2015**