1. **Basic Information**

**Course Title**: Modern Topics in Applied Mathematics   **Code**: **EMM 704 Units: 3**

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

**Program on which the course is given:**  Doctor of Philosophy 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 year 2014 / 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 study of illustrative topics in discrete applied mathematics including sorting algorithms, information theory
* Identify coding theory, secret codes, generating functions, linear programming, game theory coordinates, System of linear equations.
* Deal with Examples of applications come from shock waves, hydraulic jumps., Review to Principles of Applied Mathematics in the last 10 years.

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

2.1.2 Define the basics of applied mathematics.

2.1.3 Summarize the moral and legal principles of coding theory, secret codes, generating functions, linear programming.

2.1.5 Explain the engineering applications related to applied mathematics theories.

1. **Intellectual Skills**

2.2.6 Apply for performance to develop the applications which based on applied mathematics studies

2.2.7 Make professional decisions in solving of System of linear equations.

1. **Professional and Practical Skills**

2.3.3 Assess the importance of applied mathematics in engineering applications.

2.3.4 Use technology to increase the area of benefits

2.3.5 Apply professional practice to develop the importance of applied mathematics theories.

1. **General and Transferable Skills**

2.4.2 Use technology in using linear programming.

2.4.3 Teach and assess the shock waves, hydraulic jumps.

2.4.4 Assess and identify the legal principles of coding theory, secret codes, generating functions,

**3. Contents**

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| **No** | **Topic** | **No. of hours** | **Teaching / learning methods and strategies** | **Assessment method** |
| 1 | Principles of Applied Mathematics is a study of illustrative topics in discrete applied mathematics including sorting algorithms, information theory 1 | 3 | Lectures | Assignments |
| 2 | Principles of Applied Mathematics is a study of illustrative topics in discrete applied mathematics including sorting algorithms, information theory 2 | 3 | Lectures | Assignments |
| 3 | Principles of Applied Mathematics is a study of illustrative topics in discrete applied mathematics including sorting algorithms, information theory 3 | 3 | Lectures | Mid-term exam, Final exam |
| 4 | coding theory, secret codes, generating functions, linear programming, game theory 1 | 3 | Lectures | Quiz  Mid-term exam, Final exam |
| 5 | coding theory, secret codes, generating functions, linear programming, game theory 2 | 3 | Class activity, Tutorial | Assignments  Mid-term exam, Final exam |
| 6 | coding theory, secret codes, generating functions, linear programming, game theory 3 | 3 | Lectures, Tutorial | Mid-term exam, Final exam |
| 7 | Review to Principles of Applied Mathematics | 3 | Lectures | Assignments  Mid-term exam, Final exam |
| 8 | Mid-term Exam |  | -- | Mid-Term exam |
| 9 | mathematical analysis of continuum models of various natural phenomena 1 | 3 | Lectures | Quiz, Final exam |
| 10 | mathematical analysis of continuum models of various natural phenomena 2 | 3 | Lectures | Assignments, Final exam |
| 11 | mathematical analysis of continuum models of various natural phenomena 3 | 3 | Lectures | Quiz, Final exam |
| 12 | Examples of applications come from physics 1 | 3 | Lectures, Tutorial | Assignments, Final exam |
| 13 | Examples of applications come from chemistry 2 | 3 | Lectures, Tutorial | Quiz, Final exam |
| 14 | Review to Principles of Applied Mathematics in the last 10 years. | 3 | 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. 
   5. **Student Assessment Methods**
   6. Homework assignments and others
   7. Quiz to assess student’s creativity and problem assessments.
   8. Final exam to assess understanding and scientific knowledge. 

Assignments to assess 2.1.1, 2.1.3, 2.1.5, 2.2.1, 2.2.5, 2.2.6, 2.3.3, 2.3.4, 2.3.5, 2.4.2, 2.4.3, 2.4.4

Quiz to assess 2.1.1, 2.1.3, 2.1.5, 2.2.1, 2.2.5, 2.2.6, 2.3.3, 2.3.4

Mid-Year exam to assess 2.1.1, 2.1.3, 2.2.1, 2.2.5, 2.2.6, 2.3.3, 2.3.4

Final exam to assess 2.1.1, 2.1.3, 2.1.5, 2.2.1, 2.2.5, 2.2.6, 2.3.3, 2.3.4, 2.3.5

* 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 %

Assignments/Reports 33 %

Other 00 %

Total 100 %

* 1. **List of References**
  2. Course Notes
* Lecture material and training sheets
  1. Essential Books (Text Books)
* The Mathematical Theory Of Cosmic Strings - M. Anderson
* Mathematics of Quantum Computation - G. Chen, R. Brylinski (eds)
* Mathematical Methods of Classical Mechanics, 2nd ed., - V. I. Arnold
* Linear Programming - Foundation and Extensions 2nd ed. - R. vanderbei
  1. Recommended Books
* Applied Mathematics - P. Oliver, C. Shakiban
* Table of Integrals, Series, and Products, Seventh Edition BY I.S. Gradshteyn and I.M. Ryzhik.
  1. Periodicals Web sites, etc.
* Mathematics 9
* [www.Google.com](http://www.Google.com)
  1. **Facilities Required for Teaching and learning**

White board, prepared notes, Sheets and solving problems.

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| **Course coordinator:** |  |
| **Course instructor:** |

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