

**Department of Mining, Petroleum and Metallurgical Engineering**

**Cairo University  
Faculty of Engineering**

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| **Course Specifications** | | | | | | | | | | | | | | | | | |
| **Program(s) on which this course is given:** | | | | | | | Materials and Metallurgical Engineering | | | | | | | | | | |
| **Department offering the program:** | | | | | | | Department of Mining, Petroleum and Metallurgical Engineering | | | | | | | | | | |
| **Department offering the course:** | | | | | | | Engineering Mathematics and Physics | | | | | | | | | | |
| **Academic Level:** | | | | | | | 2nd Year | | | | | | | | | | |
| **Date** | | | | | | | 2014 | | | | | | | | | | |
| **Semester (based on final exam timing)** | | | | | | | Fall Spring | | | | | | | | | | |
| **A- Basic Information** | | | | | | | | | | | | | | | | | |
| **1. Title:** | Mathematics | | | | | | | | | **Code:** | | | MTH 222 | | | | |
| **2. Units/Credit hours per week:** | | Lectures | | | 4 | | | Tutorial | | | 2 | Practical | | **----** | | Total | 5 |
| **B- Professional Information** | | | | | | | | | | | | | | | | | |
| **1. Course description:** | | | | At the end of this course, the student should be able to:   * Understand the algebraic structure of Vector Spaces. * Solve a System of Linear Equations exactly, iteratively, or approximately. * Solve the Eigenvalue Problem of a Square Matrix. * Solve partial differential equations of different types. * Use different types of special functions. | | | | | | | | | | | | | |
| **2. Intended Learning Outcomes of Course (ILOs):** | | | | **a) Knowledge and Understanding** | | | | | | | | | | | | | |
| 1. Concepts and theories of mathematics and sciences, appropriate to the discipline | | | | | | | | | | | | | |
| **b) Intellectual Skills** | | | | | | | | | | | | | |
| **2.**  Select appropriate mathematical and computer-based methods for modeling and analyzing metallurgical problems problems | | | | | | | | | | | | | |
| **c) Professional and Practical Skills** | | | | | | | | | | | | | |
| 3. Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to solve metallurgical engineering problems | | | | | | | | | | | | | |
| **d) General and Transferable Skills** | | | | | | | | | | | | | |
| 4. Communicate effectively | | | | | | | | | | | | | |
| **3. Contents** | | | | | | | | | | | | | | | | | |
| **Topic** | | | | | | **Total hours** | | | **Lectures hours** | | | | | | **Tutorial/ Practical hours** | | |
| **Vector Spaces** | | | | | | 10 | | | 6 | | | | | | 4 | | |
| **Systems of Linear Equations** | | | | | | 16 | | | 10 | | | | | | 6 | | |
| **The Eigenvalue Problem** | | | | | | 16 | | | 10 | | | | | | 6 | | |
| **Matrix Functions and Diagonalization.** | | | | | | 12 | | | 8 | | | | | | 4 | | |
| **Special Functions: Gamma, Beta and Bessel** | | | | | | 10 | | | 6 | | | | | | 2 | | |
| **Classification of Second Order Partial Differential Equations** | | | | | | 6 | | | 4 | | | | | | 2 | | |
| **Exact solutions of Partial Differential Equations** | | | | | | 14 | | | 6 | | | | | | 2 | | |
| **Numerical Solutions of Partial Differential Equations** | | | | | | 14 | | | 10 | | | | | | 4 | | |
| **Total** | | | | | | 90 | | | 60 | | | | | | 30 | | |
| **4. Teaching and Learning Methods** | | | | | | Lectures ( ) | | | Practical Training/ Laboratory ( ) | | | | | | Seminar/Workshop ( ) | | |
| Class Activity ( ) | | | Case Study ( ) | | | | | | Projects ( ) | | |
| E-learning ( ) | | | Assignments /Homework ( ) | | | | | | Other: | | |
| **5. Student Assessment Methods** | | | | | | | | | | | | | | | | | |
| * **Assessment Schedule** | | | | | | | | | **Week** | | | | | | | | |
| -Assessment 1; Class test | | | | | | | | | 12th Week | | | | | | | | |
| -Assessment 2; Project Assignment | | | | | | | | |  | | | | | | | | |
| -Assessment 3; Presentations | | | | | | | | |  | | | | | | | | |
| -Assessment 3; Midterm Exam | | | | | | | | | 9th Week | | | | | | | | |
| -Assessment 4; Final Exam | | | | | | | | | 15th Week | | | | | | | | |
| * **Weighting of Assessments** | | | | | | | | | | | | | | | | | |
| -Mid-Term Examination | | | | | | | | | 20% | | | | | | | | |
| -Final-term Examination | | | | | | | | | 66.67% | | | | | | | | |
| -Project | | | | | | | | |  | | | | | | | | |
| -Class Test | | | | | | | | | 13.33% | | | | | | | | |
| -Presentation | | | | | | | | |  | | | | | | | | |
| -Total | | | | | | | | | 100% | | | | | | | | |
| **6. List of References** | | | | | | | | | | | | | | | | | |
| * **Course Notes** | | | | | | | | | | | | | | | | | |
| * “Mathematics, Second Year for Engineering Students”, Department of Engineering Math. & Physics - Faculty of Engineering – Cairo university. | | | | | | | | | | | | | | | | | |
| * Advanced Engineering Maths. by Erwin Kreyszig 8th ed., 2000 Chapters 5-7 and 12-15 (45/MA) * Elementary Linear Algebra 7th ed. 1994 by Howard Anton (ALG 18) | | | | | | | | | | | | | | | | | |
| **7. Facilities Required for Teaching and Learning** | | | | | | | | | | | | | | | | | |
| * White board, projector | | | | | | | | | | | | | | | | | |
| **Course Coordinator:** | | | Dr. Eman El-Maghraby | | | | | | | | | | | | | | |
| **Head of Department:** | | | **Dr. E. Elbanna** | | | | | | | | | | | | | | |

