**Course Specification**

**(MA 214: Math 3)**

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| --- | --- |
| **University:** | Helwan University |
| **Faculty:** | Faculty of Computers & Information |
| **Department:** | Computer science |

**1. Course Data**

|  |  |
| --- | --- |
| **Code:** | MA 214 |
| **Course title:** | Math 3 |
| **Level:** | 3 |
| **Specialization:** | General |
| **Credit hours:** | 3 hours |
| **Number of learning units (hours):** | (3) theoretical (2) tutorial |

**2. Course Objective**

Students will learn the basic algorithms of numerical computations and understand the theoretical foundations of algorithms and various problems related to the practical implementation of algorithms.

**3. Intended Learning Outcomes:**

1. **Knowledge and Understanding**

A4. Apply the basics of Calculus.

1. **Intellectual Skills**

B2. Select appropriate Mathematical method to solve a specific problem.

1. **Professional and Practical Skills**
2. **General and Transferable Skills**

**4. Course contents**

|  |  |  |  |
| --- | --- | --- | --- |
| **Topic** | **No. of hours** | **Lecture** | **Tutorial/ Practical** |
| **Linear systems**  Linear systems, direct methods, and indirect methods | 6 | 2 | 2 |
| **Quadrature**  Polynomial interpolation methods and adaptive methods | 6 | 2 | 2 |
| **Initial Value Problems of Ordinary Differential Equations**  Basic theory, one-step methods, predictor-corrector methods, and multi-step methods.  Higher order ODEs and systems of ODEs | 12 | 4 | 4 |
| **Boundary Value Problems of Ordinary Differential Equations**  Shooting, finite differences. | 6 | 2 | 2 |
| **Partial Differential Equations**  Basic theory, simple PDEs (Poisson, Heat, Wave). Finite difference algorithms for parabolic, and hyperbolic and elliptic PDEs. | 9 | 3 | 3 |

**Mapping contents to ILOs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Topic | Intended Learning Outcomes (ILOs) | | | |
| Knowledge and understanding | Intellectual Skills | Professional and practical skills | General and Transferable skills |
| **Linear systems** | A4 |  |  |  |
| **Quadrature** | A4 |  |  |  |
| **Initial Value Problems of Ordinary Differential Equations** | A4 | B4, B20, B21 | C22 | D3, D4, D5, D6 |
| **Boundary Value Problems of Ordinary Differential Equations** | A3 | B4 |  |  |
| **Partial Differential Equations** | A4, A27 | B2, B3, B8, B19 | C24 | D3, D4, D5, D6 |

**5. Teaching and Learning Methods**

**4.1-** Class Lectures

**4.2** Use of S/W packages and system for numerical methods and simulation.

**6. Teaching and Learning Methods for students with limited capability**

Using data show

e-learning management tools

**7. Students Evaluation**

**a) Used Methods**

5.1- Problem-solving assignments

**b) Time**

Assessment 1: Test 1 Week 4

Assessment 2: Test 2 Week 7

Assessment 3: Midterm Exam Week 10

Assessment 4: project --

Assessment 5: final written exam Week 16

**c) Grades Distribution**

Mid-term Examination 15 %

Final-Year Examination 70 %

Semester Work 15 %

Project 0%

Total 100%

Any formative only assessments

**List of Books and References**

**a) Notes**

Course Notes

- Handouts

**b) Mandatory Books**

**Title:** Numerical Analysis

**Author(s):** Kincaid & Cheyney

**Publisher:** SIAM, 2004

**ISBN:** 0961408820

**c) Suggested Books**

**Applied Numerical Analysis** by Gerald & Wheatley

**d) Other publications**