1. **Basic Information:**

|  |  |
| --- | --- |
| **Program Title** | **Civil Engineering** |
| **Department Offering the Program** | **Civil Engineering** |
| **Department Responsible for the Course** | **Basic Science and Engineering** |
| **Course Title** | **Numerical Methods in Engineering** |
| **Course Code** | **MTH302** |
| **Year/Level** | **Level: 2** |
| **Specialization** | **Major** |
| **Authorization Date of Course Specification** | **-** |

|  |  |  |  |
| --- | --- | --- | --- |
| **Teaching hours** | **Lectures** | **Tutorial** | **Practical** |
| 2 | 2 | - |

1. **Course Aims:**

|  |  |
| --- | --- |
| **No.** | **Aims** |
| 1 | Apply knowledge of mathematics and numerical methods aided by technology to solve algebraic, transcendental, and differential equations to calculate derivatives and integerals. |

1. **Intended Learning Outcomes (ILO’S):**
2. **Knowledge and understanding:**

|  |  |
| --- | --- |
| **No.** | **Knowledge and understanding** |
| A1 | Define concepts and theories of mathematics for numerical methods analyses |

1. **Intellectual Skills:**

|  |  |
| --- | --- |
| **No.** | **Intellectual Skills** |
| B1 | Study appropriate mathematical and computer-based methods for analysis |

1. **Professional Skills:**

|  |  |
| --- | --- |
| **No.** | **Professional Skills** |
| C1 | Apply knowledge of mathematics, and information technology practice integrally to solve numerical problems. |
| C7 | Apply numerical modeling methods to engineering problems. |

1. **General Skills:**

|  |  |
| --- | --- |
| **No.** | **General Skills** |
| D6 | Effectively manage tasks, time and resources. |

**4. Course Contents:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No.** | **Topics** | **Lectures** | **Tutorial** | **Practical** |
| 1 | Numerical solution of linear and nonlinear systems | 4 | 4 |  |
| 2 | Numerical differentiation and integration | 6 | 6 |  |
| 3 | Curve fitting and interpolation | 10 | 10 |  |
| 4 | Numerical solution of initial value problems | 4 | 4 |  |
| 5 | Boundary and Eigen value problems | 4 | 4 |  |
| Total | | 28 | 28 |  |

**5. Teaching and learning methods:**

|  |  |
| --- | --- |
| **No.** | **Teaching Methods** |
| 1 | Lectures |
| 2 | Discussion sessions |
| 3 | Information collection from different sources |
| 4 | Research assignment |

**6. Teaching and learning methods for disable students:**

|  |  |  |
| --- | --- | --- |
| **No.** | **Teaching Methods** | **Reason** |
| 1 | Presentation of the course in digital material | Better access any time |
| 2 | Wed communication with students | Better communication with certain cases |
| 3 | Asking small groups to do assignments; each composed of low ,medium and high performance students | Knowledge and skills transfer among different levels of students |

7**. Student evaluation:**

**7.1 Student evaluation method**:

|  |  |  |
| --- | --- | --- |
| **No.** | **Evaluation Method** | **ILO’s** |
| 1 | Midterm examination | A1 ,C1 |
| 2 | Semester work | B1 , C1 |
| 3 | Final term examination | A1 , B1 , C1 , C7 |

**7.2 Evaluation Schedule:**

|  |  |  |
| --- | --- | --- |
| **No.** | **Evaluation Method** | **Weeks** |
| 1 | Midterm examination | 8th |
| 2 | Semester work | 2nd -7th - 9th -14th |
| 3 | Final term examination | 15th |

**7.3 weighting of Evaluation:**

|  |  |  |
| --- | --- | --- |
| **No.** | **evaluation method** | **Weights** |
| 1 | Midterm examination | 20 |
| 2 | Semester work | 20 |
| 3 | Final term examination | 60 |

**8. List of References:**

|  |  |
| --- | --- |
| **No.** | **Reference List** |
| 1 | http://www.chemweb.com |
| 2 | Kiusalaas, Jaan. Numerical methods in engineering with Python 3. Cambridge university press, 2013.‏ |
| 3 | Desai, Chandrakant S., and John F. Abel. Introduction to the finite element method: A numerical method for engineering analysis. Van Nostrand Reinhold, 1972.‏ |
| 4 | E. Kreyszig "Advanced Engineering Mathematics" 11th edition, John Wiley and Sons, Inc. 2009 |

**9. Facilities required for teaching and learning:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No.** | **Facility** |  | **No.** | **Facility** |
| 1 | Lecture classroom |  | 4 | Data show system |
| 2 | Presenter |  | 5 | Sound system |
| 3 | White board |

**10. Matrix of knowledge and skills of the course:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **No.** | **Topic** | **Aims** | **Knowledge and understanding** | **Intellectual Skills** | **Professional Skills** | **General Skills** |
| 1 | Numerical solution of linear and nonlinear systems | 1 | A1 |  |  |  |
| 2 | Numerical differentiation and integration | 1 | A1 |  |  |  |
| 3 | Curve fitting and interpolation | 1 | A1 |  |  |  |
| 4 | Numerical solution of initial value problems | 1 | A1 | B1 | C1 |  |
| 5 | Boundary and eigen value problems | 1 | A1 | B1 | C1 |  |

**Course Coordinator: Dr. Mohamed Shokry**

**Head of Department: Prof. Dr. Mohamed Saad Elkady**

**Date of Approval:**