**Course Description Form**

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| 1. Course Name: Engineering and Numerical Analysis
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| 1. Course Code: MPAC300
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| 1. Semester / Year: 2023-2024
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| 1. Description Preparation Date:
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| 1. Available Attendance Forms:
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| 1. Number of Credit Hours (Total) / Number of Units (Total) : 120
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| 1. Course administrator's name (mention all, if more than one name)
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| Name: Samer Aswad Kokz Email: sameralsaeedi@gmail.com  |
| 1. Course Objectives
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| **Course Objectives** | This course aims to provide a good knowledge to the students about the Engineering and numerical analysis with understand the basis of solutions and their application in different branches of engineering / mechanical, material, Civil and power |
| 1. Teaching and Learning Strategies
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| **Strategy** | 1. Understand the methods of solutions for first, second and high ordersdifferential equations and their engineering applications.2. Understand the types and method of solution for Fourier Series and theirengineering applications.3. Understand the methods of solution by Laplace transformation and theirapplications.4. Understand the methods of solution for partial differential equation andtheir engineering application.1065. Understand the numerical methods for solving linear and non-linearequations and their engineering applications.6. Understand the numerical methods for solving the differential equationsand their engineering applications. |
| 1. Course Structure
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| **Week**  | **Hours**  | **Required Learning Outcomes**  | **Unit or subject name**  | **Learning method**  | **Evaluation method**  |
| **1st week** | **4** | The student understands the subject | First order differential equations, Special cases of first order D.E and their engineering | Theoretical | Assignment and quiz |
| **2nd week** | **4** | The student understands the subject | applications. | Theoretical | Assignment and quiz |
| **3rd week** | **4** | The student understands the subject | Second order linear equation with constant coefficients and their engineering applications. | Theoretical | Assignment and quiz |
| **4th week** | **4** | The student understands the subject | High order linear differential equations , Integral operators and their engineering applications. | Theoretical | Assignment and quiz |
| **5th week** | **4** | The student understands the subject | Fourier series, even and odd functions and their engineering applications. | Theoretical | Assignment and quiz |
| **6th week** | **4** | The student understands the subject | Laplace transformation, Inverse Laplace transformation, Laplace transformation to solution for | Theoretical | Assignment and quiz |
| **7th week** | **4** | The student understands the subject | differential equations and their engineering applications. | Theoretical | Assignment and quiz |
| **8th week** | **4** | The student understands the subject | Partial differential equations, solution by separation method and their engineering applications. | Theoretical | Assignment and quiz |
| **9th week** | **4** | The student understands the subject | Nonlinear equations solution, Simple Iteration, Newton-Raphson, finite difference methods. | Theoretical | Assignment and quiz |
| **10th week** | **4** | The student understands the subject | Solution of simultaneous linear equations, Direct and Indirect methods | Theoretical | Assignment and quiz |
| **11th week** | **4** | The student understands the subject | 10 Interpolation by Lagrangian and Newton methods. | Theoretical | Assignment and quiz |
| **12th week** | **4** | The student understands the subject | Curves fitting analysis by Newton method. | Theoretical | Assignment and quiz |
| **13th week** | **4** | The student understands the subject | Numerical integration, complex numerical integration and their applications. | Theoretical | Assignment and quiz |
| **14th week** | **4** | The student understands the subject | Numerical method to solve partial differential equations by separation method. | Theoretical | Assignment and quiz |
| **15th week** | **4** | The student understands the subject | Numerical method to solve differential equations by Rang-Kotta and Power series. | Theoretical | Assignment and quiz |
| **16th week** | **4** | The student understands the subject | Newton-Raphson method  | Theoretical | Assignment and quiz |
| **17th week** | **4** | The student understands the subject | finite difference method | Theoretical | Assignment and quiz |
| **18th week** | **4** | The student understands the subject | Interpolation | Theoretical | Assignment and quiz |
| **19th week** | **4** | The student understands the subject | Lagrangian method | Theoretical | Assignment and quiz |
| **20th week** | **4** | The student understands the subject | Solution of simultaneous linear equations.  | Theoretical | Assignment and quiz |
| **21st week** | **4** | The student understands the subject | Direct methods. Indirect methods  | Theoretical | Assignment and quiz |
| **22nd week** | **4** | The student understands the subject | Numerical integration. Complex numerical integration, applications | Theoretical | Assignment and quiz |
| **23rd week** | **4** | The student understands the subject | Curves fitting analysis | Theoretical | Assignment and quiz |
| **24th week** | **4** | The student understands the subject | Newton method | Theoretical | Assignment and quiz |
| **25th week** | **4** | The student understands the subject | Numerical method to solve differential equations | Theoretical | Assignment and quiz |
| 26th week | **4** | The student understands the subject | Rang-Kotta method | Theoretical | Assignment and quiz |
| 27th week | **4** | The student understands the subject | Power series method | Theoretical | Assignment and quiz |
| 28th week | **4** | The student understands the subject | Exponential equations | Theoretical | Assignment and quiz |
| 29th week | **4** | The student understands the subject | Frobinous method | Theoretical | Assignment and quiz |
| 30th week | **4** | The student understands the subject | Preparatory week before the final Exam | Theoretical | Assignment and quiz |
| 1. Course Evaluation
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| Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc  |
| 1. Learning and Teaching Resources
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| Required textbooks (curricular books, if any) | 1- Advanced Engineering Mathematics, Erwin Kreyszig , John Wiley & Sons, Inc. - 2- Advanced Engineering Mathematics, Peter V. O’Neil, Thomson Brooks/Cole – 3- Advanced Engineering Mathematics, A.B. Mathur & V.P. Jaggi, Khanna Publishers – 4- Advanced Engineering Mathematics, Wyle Barrett /fifth edition.  |
| Main references (sources) | 1. Numerical Methods for Scientists and Engineers, R.w. Hamming knowledge. –
2. 2- Numerical Analysis, Richard L. Burden & J. Douglas Faires.
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| Recommended books and references (scientific journals, reports...) |  |
| Electronic References, Websites |  |