**Numerical Analysis**

**Course Description Form**

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| 1. Course Name: | | | | | | | | |
| Numerical Analysis | | | | | | | | |
| 1. Course Code: | | | | | | | | |
| CIER 311 | | | | | | | | |
| 1. Semester / Year: | | | | | | | | |
| Second semester / Third year | | | | | | | | |
| 1. Description Preparation Date: | | | | | | | | |
| 1/5/2024 | | | | | | | | |
| 1. Available Attendance Forms: | | | | | | | | |
| In class | | | | | | | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total) | | | | | | | | |
| 4 hrs. | | | | | | | | |
| 1. Course administrator's name (mention all, if more than one name) | | | | | | | | |
| Name: Ahmed Mohamed Mutlaq  Email: ahmed.m.mutlak43837@st.tu.edu.iq | | | | | | | | |
| 1. Course Objectives | | | | | | | | |
| **Course Objectives** | | | | 1. Understand and apply theories and methods for solving mathematical problems using numerical techniques. 2. Develop the ability to analyze, evaluate, and expand mathematical equations using appropriate numerical methods. 3. Comprehend interpolation and divergence concepts, and determine interpolated series of points numerically. 4. Approximate functions from a series of points and use these approximations to represent functions. 5. Relate numerical solutions to calculus concepts, including approximating functions with Taylor and Maclaurin series. 6. Solve simultaneous linear equations using numerical approaches. 7. Apply numerical methods to solve problems in differentiation, integration, and differential equations. | | | | |
| 1. Teaching and Learning Strategies | | | | | | | | |
| **Strategy** | | 1. Teaching students to definition of Numerical solutions 2. Encourage students' participation in the exercises, and assignments. 3. expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types exercises and some sampling activities that are interesting to the students. 4. Practice testing (short question answers and exams). | | | | | | |
| 1. Course Structure | | | | | | | | |
| **Week** | **Hours** | | **Required Learning Outcomes** | | **Unit or subject name** | | **Learning method** | **Evaluation method** |
|  | 5 | | Understanding and learn the theories and methods used in solving mathematical problems using numerical methods. | | Introduction to Numerical Problem Solving | | 1. Interactive Learning 2. Experimental Learning 3. Collaborative Learning 4. Technology-enhanced 5. Learning   Problem-based Learning | Several Ways (Exams + Assignments) |
|  | 5 | | Students should understand the relationship between numerical solution and calculus, including the use of Taylor and Maclaurin series to approximate functions. | | Numerical Solutions Using Series Expansion | | Several Ways (Exams + Assignments) |
|  | 5 | | Students should understand the concepts of interpolation and divergence and be able to determine interpolated series of points numerically. | | Numerical Methods for Interpolation and Point Serie | | Several Ways (Exams + Assignments) |
|  | 5 | | Several Ways (Exams + Assignments) |
|  | 5 | | Students should be able to work with approximation of determination function from series of points, and using them to represent functions. | | Function Approximation from Numerical Data | | Several Ways (Exams + Assignments) |
|  | 5 | | Several Ways (Exams + Assignments) |
|  | 5 | | Students should be able to solve simultaneous linear equations using numerical approaches. | | Numerical Methods for Solving Linear Systems | | Several Ways (Exams + Assignments) |
|  | 5 | | Students should be able to solve eigenvalues problem using different methods. | | Solving eigenvalues problem Numerically | | Several Ways (Exams + Assignments) |
|  | 5 | | Students should be understanding the numerical methods for solving and find the roots for non linear equations by numerical methods. | | Root-Finding Techniques in Numerical Analysis | | Several Ways (Exams + Assignments) |
|  | 5 | | Students should be able to solve problems in areas such as numerical differentiation using different methods. | | Numerical Differentiation | | Several Ways (Exams + Assignments) |
|  | 5 | | Several Ways (Exams + Assignments) |
|  | 5 | | Students should be able to solve ordinary differential equations by using numerical methods. | | Ordinary differential equations | | Several Ways (Exams + Assignments) |
|  | 5 | | Several Ways (Exams + Assignments) |
|  | 5 | | Solve the partial differential equations by using numerical methods. | | Partial differential equations | | Several Ways (Exams + Assignments) |
|  | 5 | | Several Ways (Exams + Assignments) |
| 1. Course Evaluation | | | | | | | | |
| 1. Final Exam: 60% 2. Monthly Exams: 15% 3. Reports and Assignments: 10% 4. Attendance and Daily Participation: 10% 5. Oral Evaluation: 5% | | | | | | | | |
| 1. Learning and Teaching Resources | | | | | | | | |
| Required textbooks (curricular books, if any) | | | | | | Numerical Methods by R. W. Hown book | | |
| Main references (sources) | | | | | | Basic Numerical Methods by R. E. Sowaton | | |
| Recommended books and references (scientific journals, reports...) | | | | | |  | | |
| Electronic References, Websites | | | | | |  | | |