**University of Management and Technology**



**School of Science**

***Department of Mathematics***

**Course Code:** MTH-509 / 709

**Course Title: Advanced Numerical Analysis**

**Program: MS MA**

**Course Outline (Spring 2021)**

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| **Course Coordinator** | Dr. Muhammad Aziz-ur-Rehman | | **Contact** | | Ext 3601  Cell: 0333-4481003 |
| **Course**  **Description** | This course is a study of mathematical techniques used to model  engineering systems. It involves the development of mathematical models  and the application of the computer to solve engineering problems using  the following computational techniques: Taylor Series approximation,  numerical differentiation, root-finding using bracketing and open methods,  linear and polynomial curve fitting, solution methods for matrix equations,  numerical integration, and the solution of differential equations. Laboratory  sessions involve the application of numerical analysis to physical systems  involving statics, dynamics, fluid dynamics, heat transfer, electrical circuits,  and vibratory systems. | | | | |
| **Outlines** | * **Gauss Elimination Method (Partial pivoting) Jacobi and Gauss Seidal Methods (with convergence). Successive over Relaxation (SOR) of non-Linear Equations in one variable.** * **Bisection method, Regula False Position Method, Secant method Newton-Raphson Method with improvements and error analysis, Newton-Raphson Method for Multiple roots.** * **Eigen values and eigen vectors, eigen functions, Power method, System of nonlinear equations. Interpolation: Lagrange’s interpolation. Hermite interpolation Cubic splines,** * **Numerical integration: Simpson’s Method. Romberg Method,** * **Numerical solutions of Differential Equations: Euler’s Method, R-K Method, Adam Bashforth Method, System of Differential Equations, Milnes Method (Along with their Computer programs)** | | | | |
| **Text**  **Book(s)** | This course is research based. Latest published literature will be followed. | | | | |
| **Reference books/ research Papers:** | * **Numerical Analysis by Burden R L, Faires J. D** * **Numerical Methods for Mathematical Science and Engineering by John. H. M** * **Numerical Analysis by I. Jacques and Colin Judd** * **Numerical Analysis by V. N. Vedemorthy** | | | | |
| **Assignments** | 6 Assignments | **Project/Presentation** | | 1 project from advanced topics and/Presentation from research paper | |
| **Mid Term**  **Examination** | 1 Midterm Exam | **Final**  **Examination** | | 1 Final Examination | |
| **Attendance**  **Policy** | SA would be reported if 20% classes are missed without any accidental or medical or any extreme family matters. | | | | |
|  | **Grading Policy** | | | | |
| **Assignments** | 15% | **Project/Presentation** | | 15% | |
| **Mid Term**  **Examination** | 30% | **Final**  **Examination** | | 40% | |