**GRAPHIC ERA DEEMED TO BE UNIVERSITY, DEHRADUN**

**Name of Department: -Mathematics**

**Computer Based Numerical and Statistical Techniques**

**TMA 402**

1. Subject Code: Course Title:

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2. Contact Hours: L: T: P:

3. Semester: IV

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4. Credits:

5. Pre-requisite: Basic Knowledge of Mathematics

6. Course Outcomes: After completion of the course students will be able to

1. Develop the notion of errors, finding of errors, roots and apply them in problem solving in concern subject.
2. Use effectively interpolation techniques and use them for numerical differentiation and integration.
3. Interpret asymptotic notation, its significance, and be able to use it to analyse asymptotic performance for basic algorithmic examples.
4. Examine statistical control techniques and be able to relate these to practical examples.
5. Elaborate the basics of regression, curve fitting and be able to apply the methods from these subjects in problem solving.
6. Explain the concepts of numerical solutions of ordinary differential equations.
7. Detailed Syllabus

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| **UNIT** | **CONTENTS** | **Contact Hrs** |
| **Unit - I** | **Errors:** Numbers and their accuracy, Computer Arithmetic, Mathematical preliminaries, Errors and their Computation, General error formula, Error in a series approximation.  **Solution of Algebraic and Transcendental Equation:** Bisection Method, Iteration method, Method of false position, Newton-Raphson method, Muller's method, Rate of convergence of Iterative methods.  **Solution of Linear Equations: Gauss’s elimination method, Gauss’s Jordan method, Gauss’s Seidel method.** | **9** |
| **Unit - II** | **Interpolation:** Finite Differences, Difference tables Polynomial Interpolation:  Newton's forward and backward formula Central difference Formulae: Gauss forward and backward formula, Stirling's, Bessel's, Everett's formula. Interpolation with unequal intervals: Langrange's interpolation, Newton Divided difference formula. | **9** |
| **Unit – III** | **Numerical Integration and Differentiation:**Introduction, Numerical differentiation Numerical Integration: Trapezoidal rule, Simpson's 1/3 and 3/8 rule, Boole's rule, Weddle's rule. | **9** |
| **Unit – IV** | **Solution of differential Equations:**Picard's Method, Euler's Method, Taylor's Method, Runge-Kutta Methods, Milne's Predictor Corrector Methods. | **9** |
| **Unit – V** | **Statistical Computation:**Frequency chart, Curve fitting by method of least squares, fitting of straight lines, polynomials, exponential curves etc, Data fitting with Cubic splines, Regression Analysis, Linear and Non linear Regression, Multiple regression, Statistical Quality Control methods | **9** |
|  | **Total** | **45** |

**Reference Books:**

1. C. B. Gupta, S. R. Singh and Mukesh Kumar, “Engineering Mathematics for Semesters III and IV” McGraw Hill Education, First edition 2016.

* Rajaraman V, “Computer Oriented Numerical Methods”, Pearson Education, 2000.
* Grewal B S, “Numerical methods in Engineering and Science”, Khanna Publishers, Delhi, 2005.
* Goyal, M, “Computer Based Numerical and Statistical Techniques”, Laxmi Publication (P) Ltd., New Delhi, 2005.
* Jain, Iyengar and Jain, “Numerical Methods for Scientific and Engineering Computations”, New Age Int, 2003.
* T Veerarajan, T Ramachandran, “Theory and Problems in Numerical Methods, TM, 2004.
* Francis Scheld, “Numerical Analysis”, TMH, 2010.
* Sastry, S. S, “Introductory Methods of Numerical Analysis”, Pearson Education, 2009.