**Subject Code: 01MA0281**
**Subject Name: Statistical and Numerical Methods**
**B.Tech. Year – 2 (Semester IV)**

**Objective:**

A good Engineer has to have an excellent background of Mathematics. Numerical and statistical methods are one of the essential tools for learning Technology, Engineering and Sciences.

**Credits Earned: 5** Credits

**Course Outcomes:** After completion of this course, student will be able to

- Understand the basic concepts of probability and distribution.

- Apply the knowledge of Numerical methods in C++, solving linear equations problems in various branch of engineering.

- Apply the concept of and Data representation and analysis in various field of engineering like image processing etc.

- Apply concept of Correlation and Regression in result analysis and Business forecasting using EXCEL.

**Teaching and Examination Scheme**

| Teaching Scheme (Hours) | | | Credits | Theory Marks | | | Tutorial/ Practical Marks | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|
| Theory | Tutorial | Practical | | ESE (E) | Mid Sem (M) | Internal (I) | Viva (V) | Term work (TW) | |
| 4 | 2 | - | 5 | 50 | 30 | 20 | 25 | 25 | 150 |

**Contents:**

| Unit | Topics | Contact Hours |
|---|---|---|
| 1 | **Data representation and Analysis**<br><br>Revision of basic concept of statistics, Measure of central tendency and dispersion, Statistical diagram: scattered diagram, histogram, ogie curve, pai chart…etc, Use of EXCEL software to compute statistical measures and diagrammatic representation, Use of this concept in image processing | **10** |

| 2 | **Regression and Correlation** <br><br> Measure of association between two variables. Types of correlation, Karl Pearson's Coefficient of correlation and its mathematical properties., Spearman's Rank correlation and its interpretations, Spearman's Rank correlation and its interpretations, Regression Analysis: Concept and difference between correlation and regression, linear regression equations, properties of regression coefficients, Use in forecasting and estimation computational through EXCEL. | 10 |
|---|---|---|
| 3 | **Random variable and Probability distribution** <br><br> Revision of elementary concept of Probability, Discrete and continuous random variable, Mass, Density and cumulative distribution functions, expected values and variance of random variable, Standard probability distributions: Uniform, Binomial, Poisson, Exponential and Normal distribution. | 10 |
| 4 | **Errors in Digital computations and solutions of nonlinear equations** <br><br> Concepts and definitions, Representation of numbers in computers, types of errors, Basic sources of errors, significant digits, Computer arithmetic, errors in computations with digital computer ,Least squares curve fitting methods ,linear and nonlinear curve fitting. | 7 |
| 5 | **Interpolation, Curve fitting** <br><br> Finite difference, Forward and backward differences, Interpolation and Extrapolation, Newton's forward interpolation formula, Newton's backward interpolation formula, Lagrange's interpolation formula and Newton's divided difference formula, Least squares curve fitting methods, linear and nonlinear curve fitting. | 11 |
| 6 | **Numerical Integration and solution of differential equations** <br> Numerical Integration: Gaussian integration, Newton – cotes quadrature formula Composite rules: Trapezoidal rule and Simpson's rules    Newton-Raphson, False position (Regula falsi) and Bisection method Solution of ODE by Euler's, Taylor's series, Picard's, Runge kutta ($2^{nd}$ and $4^{th}$ order) methods. | 12 |
| | **Total Hours** | 60 |

**Recommended Textbooks:**

1. Miller and Freund's Probability and Statistics for Engineers: Richard A Johnson, Prentice Hall of India.
2. Introductory Methods of Numerical Analysis: S.S. Sastry, Prentice Hall of India.
3. Computer Oriented Numerical Methods: V. Rajaraman, Prentice Hall of India
4. Numerical methods with programs in C++: S Balachandra Rao & C K Shantha

**Suggested Theory distribution:**

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

| Distribution of Theory for course delivery and evaluation | | | | | |
|---|---|---|---|---|---|
| Remember | Understand | Apply | Analyze | Evaluate | Create |
| 20% | 20% | 30% | 15% | 10% | 5% |

**Instructional Method:**

a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

c. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

**Web site:**

a. http://en.wikipedia.org/wiki/Math

b. http://numericalmethods.eng.usf.edu