# 22BEAS201 MATHEMATICAL METHODS

Hours Per Week :

L	Т	Р	С
1	2	2	3

PREREQUISITE KNOWLEDGE: Basics of interpolation and statistics.

#### COURSE DESCRIPTION AND OBJECTIVES:

Source: http://clipart-library com/mathematics.html

The course aims at making the students to understand the concepts of limits and continuities of functions, differentiability, conjugacy, periodicity and the methods to expand the given function into series form under Fourier's technique, half-range series and series for discontinuous functions. Further this course enables the students to get better understanding over the method of interpolation of functions by finite differences, Newton's forward and backward formulae, interpolation with unevenly spaced points by Newton's divided difference formula and Lagrange's interpolation formula. Moreover, the objectives of this course are extended to enable the students to understand the concept of testing hypothesis for small sample and large sample data by means of single mean, two means, single proportion and two proportions and it clarifies the technique of one tailed and two tailed paired tests as well.

#### **MODULE-1**

#### UNIT-1

#### FUNCTIONS OF COMPLEX VARIABLE:

Limit and Continuity, Differentiability, Analytic functions, Cauchy-Riemann equations in Cartesian form only (without proof), Harmonic functions, Conjugate harmonic functions, Construction of conjugate harmonic function, Milne-Thomson method.

#### UNIT-2

#### FOURIER SERIES:

Periodic Functions, Fourier series, Dirichlet's conditions, Fourier series for discontinuous functions, Fourier series for even and odd functions, Half-range series, functions having arbitrary period.

### **PRACTICES:**

- Finding singular points of a function.
- Examine analytic and harmonic nature of a complex function.
- Construction of analytical function.
- Discuss the harmonic conjugate.
- Approximating a function as a Fourier series. •
- Approximating a function as a half-range series.

#### **MODULE -2**

#### UNIT-1

#### **INTERPOLATION:**

Introduction, Finite differences, Various difference operators and their relations, Interpolation with equally spaced points: Newton's forward and backward formulae, Interpolation with unevenly spaced points: Newton's divided difference formula, Lagrange's interpolation formula.

4L+8T+8P=20 Hours

4L+8T+8P=20 Hours

4L+8T+8P=20 Hours

#### 04L+08T+8P=20 Hours

#### SKILLS:

- ✓ Differentiability of functions.
- ✓ Justifying continuity and discontinuity of functions.
- ✓ Applying Fourier series technique to expand the required functions into series form.
- ✓ Analyze the data for the homogeneity through their means and proportions under large samples.
- Test of hypothesis for the data set and test of goodness of fit with curve fitting.

## TEST OF HYPOTHESIS:

UNIT-2

Correlation: Pearson's Coefficient of correlation, Spearman's rank correlation.

Regression: lines of regression of X on Y and Y on X.

**Hypothesis testing:** Null hypothesis, Errors, Level of significance, Confidence Limits, t-test and Z test for single mean.

#### PRACTICES

- Finding missing values of a function.
- Predict the function based on the data given.
- Develop an interpolating polynomial from the given data.
- Estimating coefficient of correlation.
- Study the correlation between marks of any of your subject with mathematics.
- Study the regression between marks of any of your subject with mathematics.
- Estimating regression coefficients and find the lines of regression.
- Take a sample and define Null and alternate hypotheses.
- Test a large/ small sample for acceptance or rejection.

### COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply Fourier's technique to approximate the functions into series.	Apply	1	1, 2, 4, 9, 10, 12
2	Apply the method of interpolation to evenly and unevenly spaced data.	Apply	2	1, 2, 4, 9, 10, 12
3	Apply test the hypothesis technique to make re- liable decisions.	Apply	2	1, 2, 4, 9, 10, 12
4	Evaluate the nature of singularity of a function and test the analyticity.	Evaluate	1	1, 2, 4, 9, 10, 12

#### **TEXT BOOKS:**

- 1. Bali, N. P., Sai Prasad, K. L., "A Textbook of Engineering Mathematics I, II, III", Universal Science Press, New Delhi, 2018.
- 2. Grewal, B. S., "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2018.

### **REFERENCE BOOKS:**

- 1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, John Wiley and Sons, Inc, 2020.
- 2. Ramana, B. V., "Higher Engineering Mathematics", TMH Publishers, 2017.
- 3. H. K. Dass, , and Er. Rajanish Verma, "Higher Engineering Mathematics", S. Chand and Co., Third revised edition, 2015.
- 4. A. Singaravelu, "Probability and Statistics", 22nd edition, Meenakshi Agency, 2015.