JYOTI NIVAS COLLEGE AUTONOMOUS
SYLLABUS FOR 2018 BATCH AND THEREAFTER

Programme: B.Sc. **Semester: VI**

MATHEMATICS PAPER VII

Course Code: 18VIMA7 **No. of Hours: 45**

COURSE OBJECTIVES:

- Able to work independently and do in-depth study of various notions of mathematics.
- Seek to understand advances in various branches of mathematics.
- Able to explain the development of mathematics in its applications in other fields of sciences, economics and commerce
- Able to understand the algebraic concepts of mathematics.
- Able to solve problems using differential equations and Linear Programming

LEARNING OUTCOMES:

- List the examples of vector spaces and subspaces.
- Determine a basis and the dimension of a finite-dimensional space.
- Discuss spanning sets and the linear independence for vectors in R^n
- Understand the concepts of range space and null space and verify Rank nullity theorem.
- Given a linear transformation and bases, find a matrix representation for the linear transformation
- Interpret a matrix as a linear transformation from R^n to R^m
- Apply Fourier series to evaluate integral functions.
- Understand, formulate and solve the physical problems involving functions of several variables in Partial differential equations.
- Formulate and solve Linear Programming Problems and apply the concept in solving problems in microeconomics and company management such as planning, production either to maximize the income or minimize the cost of a production scheme.

UNIT 1

CHAPTER 1 LINEAR ALGEBRA **15 HRS**

Vector space – Examples – Properties – Subspaces – criterion for a subset to be a subspace – linear span of a set - linear combination – linear independent and dependent subsets – Basis and dimensions– Standard properties – Examples illustrating concepts and results.

Linear transformations – properties – matrix of a linear transformation – change of basis – range and kernel – rank and nullity – Rank – Nullity theorem

UNIT 2

CHAPTER 1 ANALYSIS **8 HRS**

Fourier Series: Trigonometric Fourier series of functions with period 2π and period $2L$ – Half range Cosine and sine series.

UNIT 3

CHAPTER 1 DIFFERENTIAL EQUATIONS III **12 HRS**

Partial Differential Equations : Simultaneous equations of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ Formation of partial differential equation .Equations of First Order Lagrange's linear equation – Standard types of first order non-linear partial differential equation (by known substitution) Classification of 2^{nd} order partial differential equations. Solution of second order linear partial differential equations in two variables with constant coefficients by finding complementary function and particular integral.

UNIT 4

CHAPTER 1 LINEAR PROGRAMMING **10 HRS**

Linear inequalities and their graphs. Statement of linear programming problems in standard forms – solution of linear programming problems by graphical methods and simplex method - maximization problems in three variables

PRACTICALS:

LIST OF PROBLEMS

1. i. Vector space, subspace – illustrative examples.
   ii. Expressing a vector as a linear combination of given set of vectors.
2. Verify linear dependence and independence of vectors
   Basis and Dimension – illustrative examples.
3. Verify whether a given transformation is linear or not.
4. Finding matrix of a linear transformation.
5. Problems on rank and nullity.

6. To plot periodic functions with period 2π and 2L.
7. Solutions to the problems on different types of Partial differential equations.
8. Solving second order linear partial differential equations in two variables with constant coefficient.
9. Solving some more second order linear partial differential equations in two variables with constant coefficient.
10. Solution to the given set of equations through graphical method.

REFERENCES:

1. B Spain, *Vector Analysis* , ELBS, 1994.
2. D E Bournes and, P C Kendall, *Vector Analysis,* ELBS, 1996.
3. Frank Ayres, *Schaum's outline of theory and problems of Differential Equations*, 1st ed. USA: McGraw-Hill, 1972.
4. G Strang, MIT open courseware (http://ocw.mit.edu/courses).
5. GF Simmons, *Differential equation with Applications and historical notes,* 2nd ed.: McGraw-Hill Publishing Company, Oct 1991.
6. Ian Sneddon, *Elements of Partial Differential Equations*, 3rd ed.: Mc. Graw Hill., 1980.
7. S Narayanan & T K Manicavachagam Pillay, *Differential Equations*.: S V Publishers Private Ltd., 1981.

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