JYOTI NIVAS COLLEGE AUTONOMOUS
SYLLABUS FOR 2018 BATCH AND THEREAFTER

Programme: B.Sc.   **Semester: I**

MATHEMATICS PAPER I

Course Code: 18IMA1   **No. of Hours: 60**

COURSE OBJECTIVES:

- Capable of inquiring and understanding wide range of concepts in mathematics.

- Able to solve linear system of equations, differential and integral calculus problems

- Able to develop codes using FOSS to solve all mathematical problems

LEARNING OUTCOMES:

- Solve a system of linear equations by row-reducing its augmented form

- Explain the significance of eigenvectors and Eigen values and compute them

- Find the nth derivatives of functions.

- Apply the Leibnitz's theorem for finding nth derivative of product of two functions.

- Relate and integrate geometry into real life contexts as well as into other disciplines

UNIT 1

CHAPTER 1 ALGEBRA I   **15 HRS**

Matrices : Elementary row and column transformations (operations), equivalent matrices. Row- reduced echelon form, Normal form of a matrix , Rank of a matrix, Problems. Homogeneous and Non – Homogeneous systems of *m* linear equations in *n* unknowns consistency criterion – criterion for uniqueness of solutions. Eigen values and Eigen vectors of a square matrix of order 2 and 3, standard properties, Cayley-Hamilton theorem (without proof). Finding A^{-1} , A^{-2} and A^2 , A^3 , A^4

UNIT 2

CHAPTER 1 DIFFERENTIAL CALCULUS I   **20 HRS**

Differential Calculus Successive Differentiation - n^{th} derivatives of the functions: e^{ax}, $(ax + b)^n$, $\log(ax+ b)$, $\sin(ax + b)$, $\cos(ax + b)$, $e^{ax} sin(bx+ c)$, $e^{ax} \cos(bx + c)$ – Problems. Leibnitz theorem (with proof) and its applications.

Partial differentiation –Function of two and three variables - First and higher derivatives - Homogeneous functions – derivatives- Euler's theorem and its extension (with proof) - Total derivative and differential - Differentiation of implicit functions

and composite functions – Problems - Jacobians – Properties of Jacobians problems.

CHAPTER 2 INTEGRAL CALCULUS I   10 HRS

Reduction formulae for $\int \sin^n x \, dx$, $\int \cos^n x \, dx$, $\int \tan^n x \, dx$, $\int \cot^n x \, dx$, $\int \sec^n x \, dx$, $\int \csc^n x \, dx$, $\int \sin^n x \cos^m x \, dx$, definite integrals of the above with appropriate limits.

UNIT 3

CHAPTER 1 ANALYTICAL GEOMETRY OF THREE DIMENSIONS I   10 HRS

Recapitulation: straight lines and planes. Equation of the sphere in general and standard forms - equation of a sphere with given ends of a diameter. Tangent plane for Sphere – Orthogonal Spheres.

CHAPTER 2 ANALYTICAL GEOMETRY OF THREE DIMENSIONS II   5 HRS

Standard equations of right circular cone and right circular cylinder.

(Questions from recapitulation will not be asked)

PRACTICALS:

LIST OF PROBLEMS

1. Introduction to python and commands connected with matrices.

2. Computations with matrices.

3. Row reduced echelon form and normal form.

4. Establishing consistency or otherwise and solving system of linear equations.

5. Introduction to and commands for derivatives and n^{th} derivatives.

6. Commands for plotting functions.

7. n^{th} derivative without Leibnitz rule.

8. n^{th} derivative with Leibnitz rule.

9. Obtaining partial derivative of some standard functions

10. Verification of Euler's theorem, its extension and Jacobian.

11. Commands for reduction formula with or without limits.

12. Implementing vector form of line.

13. Implementing vector form of plane.

REFERENCES:

1. B S Vatssa, *Theory of Matrices*, New Delhi: New Age International Publishers, 2005.

2. Frank Ayres and Elliott Mendelson, *Schaum's Outline of Calculus*, 5th ed. USA: Mc. Graw Hill., 2008.

3. G B Thomas and R L Finney, *Calculus and analytical geometry, Narosa Publishing House, Sixth Edition, Thirteenth reprint, 1998*

4. J Edwards, *An elementary treatise on the differential calculus: with applications and numerous example*, Reprint. Charleston, USA: Biblio Bazaar, 2010.

5. N P Bali, *Differential Calculus*, India: Laxmi Publications (P) Ltd.., 2010.

6. Ram Krishna Ghosh and Kantish Chandra Maity,An Introduction to Analysis, Integral Calculus, New Central Book Agency, Twelfth Edition, 2012

7. S Narayanan & T. K. Manicavachogam Pillay, *Calculus*.: S. Viswanathan Pvt. Ltd., vol. I & II 2016.

8. Thomas's Calculus, Pearson India , Twelfth Edition, 2017