Deccan Education Society's

FERGUSSON COLLEGE, PUNE

(AUTONOMOUS)

SYLLABUS UNDER AUTONOMY

SECOND YEAR B.Sc.(COMPUTER SCIENCE)

MATHEMATICS
SEMESTER –III

w.e.f. Academic Year 2017-2018

Deccan Education Society's
Fergusson College (Autonomous), Pune
Faculty of Science
S.Y. B.Sc. (Computer Science)

Syllabus of Mathematics

SEMESTER – III				
Subject	**Paper Code**	**Paper Title**	**Number of Lectures**	**Credits**
Mathematics	MTC2301	Applied Algebra	48	3
	MTC2302	Numerical Techniques	48	3
	MTC2303	Mathematics Practical	10 sessions	2

SEMESTER – IV				
Subject	**Paper Code**	**Paper Title**	**Number of Lectures**	**Credits**
Mathematics	MTC2401	Computational Geometry	48	3
	MTC2402	Operations Research	48	3
	MTC2403	Mathematics Practical	10 sessions	2

Paper Code: MTC2301

Course objectives:

- To develop problem solving abilities using a computer.
- To build the necessary skill set and analytical abilities for developing computer based solutions using mathematical concepts.
- To imbibe quality software development practices using Logical operations.

PAPER CODE:MTC2301 **PAPER –I: Applied Algebra** **[Credits - 3: No. of Lectures 48]**		
	Title and Contents	**No. of Lectures**
Unit –I	**General Vector Spaces** 1.1 Real vector spaces. 1.2 Subspaces. 1.3 Linear independence. 1.4 Basis and dimensions. 1.5 Row space, Column space and null space. 1.6 Rank and Nullity.	**16**
Unit –II	**Linear Transformations** 2.1 General linear transformations. 2.2 Kernel and range. (Rank nullity theorem without proof) 2.3 Inverse linear transformation. 2.4 Matrix of general linear transformation	**16**
Unit – III	**Eigen Values and Eigen vectors** 3.1 Eigen Values and Eigen vectors (Definition only) 3.2 Diagonalization (without proof) 3.3 Application of Eigen values (Quadratic form)	**06**
Unit - IV	**Inner Product Spaces** 4.1 Definition and elementary results 4.2 Length, distance and angle in Inner product space 4.3 Cauchy Schwarz Inequality 4.4 Orthonormal bases 4.5 Gram-Schmidt process 4.6 Orthogonal matrix and its equivalent conditions	[14] **10**
Text Book:		

(1) S. Lang, Introduction to Linear Algebra, Second Ed. Springer-Verlag, New Yark, (1986).

Reference Books:

(1) M. Artin, Algebra, Prentice Hall of India , New Delhi, (1994).

(2) K. Hoffmann and R. Kunze Linear Algebra, Second Ed. Prentice Hall of India New Delhi, (1998).

(3) G. Strang, Linear Algebra and its Applications. Third Ed. Harcourt Brace Jovanovich, Orlando, (1988).

(4) A. Ramchandra Rao and P. Bhimasankaran, Linear Algebra, Tata McGraw Hill, New Delhi (1994).

(5) Elementary Linear Algebra (Applications Version) by Howard Anton, Chris Rorres. (Seventh Edition) John Wiley & Sons, Inc

(6) Discrete Mathematical Structures (Sixth edition), Kolman, Busby and Ross.

Paper Code: MTC2302

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PAPER CODE:MTC2302
PAPER –II: Numerical Techniques
[Credits - 3: No. of Lectures 48]

	Title and Contents	No. of Lectures
Unit –I	**Errors** 1.1 Accuracy of Numbers 1.2 Errors	**02**
Unit –II	**Algebraic and Transcendental Equations** 2.1 Location of Roots 2.1.1 Descartes Rule of sign 2.1.2 Sturm's Function 2.2 Bisection Method 2.3 False Position Method 2.4 Newton-Raphson Method	**05**
Unit –III	**Calculus of Finite Differences** 3.1 Differences 3.1.1 Forward Differences 3.1.2 Backward Differences 3.1.3 Central Differences 3.1.4 Operators(E, E^{-1}, μ ,D) 3.1.5 Properties of Operators 3.1.6 Relation between Operators 3.2 Fundamental Theorem on Differences of polynomial 3.3 Estimation of Error by Difference Table 3.4 Technique to determine missing Terms by using shift Operators	**10**
Unit –IV	**Interpolation with Equal Intervals** 4.1 Newton Gregory Formula for Forward Interpolation 4.2 Newton Gregory Formula for Backward Interpolation	**09**

	4.3 Central Difference Formulae 4.3.1 Gauss Forward Difference Formula 4.3.2 Gauss Backward Difference Formula	
Unit –V	**Interpolation with Unequal Intervals** 5.1 Newtons Divided Difference Formula 5.2 Lagrange's Interpolation Formula 5.3 Error in Lagrange's Interpolation Formula	**07**
Unit –VI	**Numerical Integration** 6.1 General Quadrature Formula 6.2 Trapezoidal Rule 6.3 Simpson's one-Third Rule 6.4 Simpson's Three-Eighth Rule 6.5 Euler-Maclaurin's Formula	**08**
Unit-VII	**Numerical Solution of Ordinary Differential Equations** 7.1 Euler's Method 7.2 Euler's Modified Method 7.3 Runge -Kutta Method (2^{nd} order and 4^{th} order) 7.4 Milne's Predictor-Corrector Method	**07**

Text Books:

1. S.S. Sastry : Introductory Methods of Numerical Analysis, 3rd edition, Prentice Hall of India, 1999.

Reference Books:-

1. H.C. Saxena: Finite differences and Numerical Analysis, S. Chand and Company.
2. K.E. Atkinson :An Introduction to Numerical Analysis, Wiley Publications.

PAPER CODE:MTC2303
PAPER –IV: Mathematics Practical
[No. of Sessions 10]

Sr. No	Title of Experiment/ Practical
1	**Using scilab** i. Use of ' deff ' command for one and two variables functions. ii. Draw 2-D and 3-D graph for some standard functions. e.g. x^2 , sin (x), exp(x), x^3+y^3etc .
2	**Using scilab** i. Solution for system of linear equations.
3	**Scilab programming** : i. Regula – Falsi Method. Newton-Raphson Method.
4	**Using scilab** . i. Eigen values and Eigenvectors. ii. Diagonalization.
5	**Scilab programming** : i. Newton's forward interpolation formula. ii. Newton's backward interpolation formula
6	**Scilab programming** : i. Lagrange's interpolation for unequal interval. ii. Newton's divided difference formula.
7	**Scilab programming** : i. Numerical Integration by Trapezoidal method. ii. Numerical Integration by Simpson's $(1/3)^{rd}$ rule. iii. Numerical Integration by Simpson's $(3/8)^{th}$ rule.
8	**Scilab programming** : i. Euler's Method ii. Runge -Kutta Method
9	**Written practical** : Gram-Schmidt Process.
10	**Written practical** : Eigen Values and Eigen Vectors

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SECOND YEAR B.Sc.(COMPUTER SCIENCE)

MATHEMATICS

SEMESTER –IV

w.e.f. Academic Year 2017-2018

Paper code: MTC2401

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PAPER CODE:MTC2401 **PAPER –I: COMPUTATIONAL GEOMETRY** **[Credits – 3: No. of Lectures 48]**		
	Title and Contents	**No. of Lectures**
Unit –I	**Two dimensional transformations** 1.1 Introduction. 1.2 Representation of points. 1.3 Transformations and matrices. 1.4 Transformation of points. 1.5 Transformation of straight lines. 1.6 Midpoint transformation. 1.7 Transformation of parallel lines. 1.8 Transformation of intersecting lines. 1.9 Transformation: rotations, reflections, scaling, shearing. 1.10 Combined transformations. 1.11 Transformation of a unit square. 1.12 Solid body transformations. 1.13 Transformation and homogeneous coordinates. Translation. 1.14 Rotation about an arbitrary point. 1.15 Reflection through an arbitrary line. 1.16 Projection – a geometric interpretation of homogeneous coordinates. 1.17 Overall Scaling. 1.18 Point at infinity.	**16**
Unit -II	**Three dimensional transformations** 2.1 Introduction. 2.2Three dimensional – Scaling, shearing, rotation, reflection, translation. 2.3 Multiple transformations. 2.4 Rotation about – an axis parallel to coordinate axes, an arbitrary axis in space.	**16**

[16]

	2.5Reflection through – coordinate planes, planes parallel to co-ordinate planes, arbitrary planes. 2.6 Affine and perspective transformations. 2.7 Orthographic projections 2.8 Axonometric projections. 2.9 Oblique projections. 2.10 Single point perspective transformations. 2.11 Vanishing points.	
Unit -III	**Plane Curves:** 3.1 Introduction. 3.2 Curve representation. 3.3 Non – parametric curves. 3.4 Parametric curves. 3.5 Parametric representation of a circle and generation of circle. 3.6 Parametric representation of an ellipse and generation of ellipse. 3.7 Parametric representation of a parabola and generation of parabolic Segment. 3.8 Parametric representation of a hyperbola and generation of hyperbolic segment.	**10** [10]
Unit –IV	**Space curves:** 4.1 Bezier Curves – Introduction, definition, properties (without proof), Curve fitting (up to n = 3), equation of the curve in matrix form (up to n = 3), 1^{st} and 2^{nd} Derivative.	**06**

Text books:

1. D. F. Rogers, j. a. Adams, Mathematical elements for Computer Graphics, McGraw Hill Edition.

Reference books:

1.Schaum Series, Computer Graphics.
2.M. E. Mortenson, Computer Graphics Handbook, Industrial Pres Inc.

Paper code: MTC2402

Course objectives:

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PAPER CODE:MTC 2402 PAPER –II: OPERATIONS RESEARCH [Credits -3: No. of Lectures 48]		
	Title and Contents	**No. of Lectures**
UNIT-I	**Modeling with Linear Programming** 1.1 Two-Variable LP Model 1.2 Graphical LP Solution 1.3 Linear Programming Applications 1.3.1 Production Planning and Inventory Control	**06**
UNIT-II	**The Simplex Method** 2.1 LP Model in Equation Form 2.2 Transition from Graphical to Algebraic Solution 2.3 The Simplex Method 2.4 Artificial Starting Solution 2.4.1 Big M-Method 2.5 Special Cases in Simplex Method	**12**
UNIT-III	**Duality** 3.1 Definition of the dual problem 3.2 Primal dual relationship	**06**
UNIT -IV	**Transportation Model and Its Variants** 4.1 Definition of the Transportation problem 4.2 The Transportation Algorithm 4.3 The Assignment Model	**13**

UNIT-V	**Decision Analysis and Games** 5.1 Optimal solution of two person zero sum games 5.2 Solution of mixed strategy games	**11**

Text books:

1. Operations Research by Hira and Gupta

Reference Books:-

1.Operations Research by S. D. Sharma
2.Operations Research by R. Panneerselvam, Prentice Hall of India.
3.Principles of Operations Research by H. M. Wagner, Prentice Hall of India.
5.Operation Research by J.K. Sharma
6.Operation Research (An Introduction) Ninth Edition, by Hamdy A. Taha.

PAPER CODE:MTC2403
MATHEMATICS PRACTICAL
[Credits -2: No. of Sessions 10]

Sr. No	Title of Experiment/ Practical
1	**C –programming** i. Sorting a set of points with respect to a line. ii. Sorting a set of points with respect to a rectangle.
2	**C- programming** i. Find a pair of points with least mutual mutual distance from the given set ii. Find a pair of points with farthest mutual distance from the given set
3	**Written practical :** Solution of L. P. P. by simplex method Verification by TORA
4	**Written practical** : 2 -D transformations
5	**Written practical** : Transportation and assignment problem Verification by TORA
6	**Written practical**: 3 -D transformations.
7	**C - programming** i. Generation of uniformly n- points on standard Circle. ii. Generation of uniformly n- points on standard Ellipse.
8	**C -programming** i. Sorting a set of points with respect to a polygon. ii. Sorting a set of points with respect to a rectangular block.
9	**Written practical** :Bezier's curve
10	**Scilab programming** : Plotting of Bezier's curve