



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE  
(AUTONOMOUS)  
(Accredited with "A" grade by NAAC)  
(An ISO 9001:2015 Certified Institution)  
SUNDARAKKOTTAI, MANNARGUDI – 614 016.

**DEPARTMENT OF MATHEMATICS**

**Academic Year 2020-2021**

**1.1.3 Courses offered by the institution that focus on employability/ entrepreneurship/  
skilldevelopment during the year.**

S.No.	Semester	Name of the Course	Course Code	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill
1	II	Probability & Statistics	20MA203	Employability
2	I	Algebra and Analytical Geometry 3D	20AMM102	Employability
3	II	Trigonometry & Fourier Series	20AMM203	Employability
4	II	ODE, PDE and Laplace transforms	20AMM204	Employability
5	I	Numerical Analysis	20AMA102	Employability
6	II	Statistics	20AMA203	Employability
7	II	Operations Research	20AMA204	Employability
8	V	Numerical Methods with MATLAB Programming	16SCCMM9	Skill development
9	VI	Graph Theory	16SMBEMM2:1	Employability
10	V	Operations Research	16SMBEMM1:1	Skill development & Employability
11	VI	Astronomy	16SMBEMM3:1	Employability
12	III	Advanced Operations Research	P16MAE4B	Employability
13	IV	Advanced Numerical Analysis	P16MA43	Employability
14	V	Numerical Methods with MATLAB Programming (Practical)	16SCCMM1P	Skill development & Employability
15	IV	Project Work	P16MAPW	Skill development & Employability
16	III	Fuzzy Sets and their applications	P16MAE3B	Skill development & Employability

HEAD OF THE DEPARTMENT i/c  
Department of Mathematics  
S.T.E.T. Women's College (Autonomous)  
Sundarakkottai, Mannargudi - 614 016



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE (AUTONOMOUS),  
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**DEPARTMENT OF MATHEMATICS**  
**B.Sc., MATHEMATICS**

**Semester : II – CC – III : PROBABILITY AND STATISTICS**

**Ins. Hrs. /Week : 4**

**Course Credit: 4**

**Course Code :20MA203**

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**OBJECTIVES :**

- To introduce the idea of random variables, Probability distributions including Discrete and Continuous Probability Distributions.
- To create the idea about correlation and regression.
- To learn the properties of Expectation and Variance.

**UNIT I**

Theory of probability - Definition of probability - Theorems on Probability - Conditional Probability- Independence of events - Some problems.

**UNIT II**

Random variables and Distribution functions - Discrete & Continuous Random variables - Two Dimensional Random Variables.

**UNIT III**

Expectation and its Properties –Variance and its Properties - Covariance.

**UNIT IV**

Discrete Probability Distributions – Binomial and Poisson distributions - Moment generating functions of these distributions - Additive properties of these distributions-Recurrence relations for the moments for the Binomial and Poisson distributions.

**UNIT V**

Correlation & regression – Properties of correlation & regression coefficients -Problems for finding correlation and regression co-efficient.

## **COURSE OUTCOME :**

After the completion of the course the students will be able to

1. Understand the axiomatic formulation of Probability theory.
2. Understand the key concept of discrete and continuous random variables
3. Acquire knowledge of expectation and variance
4. Learn the concept of Regression and correlation
5. Understand the concept of Binomial and Poisson distributions.

## **TEXT BOOK(S) :**

[1] Gupta.S.C & Kapoor.V.K, Fundamentals of Mathematical statistics, Sultan chand sons, New Delhi -2002 edition

Unit - I Chapter 3 : Sec. 3.1 to 3.5,3.9,3.9.1,3.10 to 3.13

Unit - II Chapter 5 : Sec. 5.1 to 5.5

Unit - III Chapter 6 : Sec. 6.1 to 6.6

Unit - IV Chapter 8 : Sec. 8.4 to 8.4.7, Sec. 8.5 to 8.5.8

Unit - V Chapter 10 : Sec. 10.1 to 10.4 Chapter 11 : Sec. 11.1 &11.2

## **REFERENCE BOOK(S) :**

1. Gunabtom, Probability and Statistics Theory and Applications, Springer Verlag, New York.

## **E\_RESOURCES :**

1. <http://www.utstat.toronto.edu/mikevans/jeffrosenthal/book.pdf>

2. <https://www.pdfdrive.com/an-introduction-to-probability-and-statistics-wiley-series-in-probability-and-statistics-d168585572.html>

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SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE (AUTONOMOUS),  
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**DEPARTMENT OF MATHEMATICS**  
**ALLIED MATHEMATICS**  
**ALLIED COURSE – II**  
**(For Physics & Chemistry)**

**Semester : I – AC – II : ALGEBRA AND ANALYTICAL GEOMETRY (3D)**

**Ins. Hrs. /Week : 3**

**Course Credit: 2**

**Course Code :20AMM102**

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**OBJECTIVES :**

- To inculcate the basics concept of Algebra.
- To give depth knowledge of matrices and inculcate habit of problem solving.
- To enable the students to develop their skill in three dimensions.

**UNIT I**

Binomial and Exponential Series (Proof not needed) Only- Summation and Approximation of the series (related problems Only)

**UNIT II**

Non-Singular, Symmetric, Skew symmetric, Orthogonal, Hermitian, Skew Hermitian and Unitary matrices – Characteristic equation , Eigen values, Eigenvectors– Cayley Hamilton's Theorem (proof not needed) related problems only.

**UNIT III**

Standard equation of a plane – Intercept form – Equation of the Plane Passing through the points – Angle between the planes.

**UNIT IV**

Symmetrical form of straight line – Straight line passing through two points – Angle between the plane – Coplanar lines – Shortest distance between two lines.

**UNIT V**

Equation of a sphere – Equation of a sphere Passing through a circle – Intersection of two spheres is a circle – Tangent plane to the Sphere.

## **COURSE OUTCOME :**

After the completion of the course the students will be able to

1. Learn the binomial theorem and its summation and approximations.
2. Understand the types of matrices and its definitions and compute the eigen value and eigen vectors.
3. Learn the angle between planes, bisector planes, perpendicular distance from a point to a plane and intersection of two lines.
4. Compute the angle between a line and a plane, length of perpendicular from a point to a line.
5. Understand the equation of a plane passing through the circle and tangent of the plane.

## **TEXT BOOK(S) :**

1. T.K.Manicavachagam Pillai, T.Natarajan, K.S.Ganapathy, Algebra, Vol. I, S.Viswanathan Pvt Limited, Chennai, 2007.
2. T.K.Manicavachagam Pillai, T.Natarajan, K.S.Ganapathy, Algebra, Vol. II, S.Viswanathan Pvt Limited, Chennai, 2012.
3. T.K.Manicavachagam Pillai, T.Natarajan, Analytical Geometry(3D), S.Viswanathan Pvt Limited, Chennai, 2008.

UNIT- I Chapter 3 : Sec. 10 and 14 & Chapter 4: Sec. 2,3 of [1]

UNIT- II Chapter 2 : Sec. 1 to 14 and 16.2 to 16.3 of [2]

UNIT-III Chapter 2 : Sec. 1 to 9 of [3]

UNIT- IV Chapter 3 : Sec. 1 to 4, 7, 8 of [3]

UNIT- V Chapter 4 : Sec. 1 to 8 of [3]

## **REFERENCE BOOK(S) :**

1. Sannu Rahi, Algebra, Tata McGraw Hill Publishing Company Limited, New Delhi, 2009.
2. Shanti Narayan, Dr. P.K.Mittal, Analytical Solid Geometry, S.Chand & company Private limited New Delhi, 2016.

## **E\_RESOURCES :**

1. <https://www.google.com/amp/s/dokumen.tips/amp/documents/free-download-here-manickavasagam-pillai-volume-1pdf-free-download-here-algebra.html>
2. [https://www.academia.edu/19646465/Analytical\\_solid\\_geometry\\_Shanti\\_Narayan](https://www.academia.edu/19646465/Analytical_solid_geometry_Shanti_Narayan)

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DEPARTMENT OF MATHEMATICS  
ALLIED MATHEMATICS  
ALLIED COURSE – III  
(For Physics & Chemistry)

Semester : II – AC – III : TRIGONOMETRY AND FOURIER SERIES

Ins. Hrs. /Week : 4

Course Credit: 3

Course Code :20AMM203

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**OBJECTIVES :**

- To inculcate the basic concept of Trigonometry.
- To acquaint the students become familiar in Fourier series and solve the problems.
- To learn the Fourier series expansion of periodic function with the period of  $2\pi$ .

**UNIT I**

Expansion of  $\sin n\theta$ ,  $\cos n\theta$ ,  $\tan n\theta$  ( $n$  being a positive integer) – Expansion of  $\sin^n\theta$ ,  $\cos^n\theta$ , – Expansion of  $\sin \theta$ ,  $\cos \theta$  and  $\tan \theta$  in terms of powers of  $\theta$  (only problems in all the above)

**UNIT II**

Hyperbolic functions– Relation between Hyperbolic and Circular functions –Expansion of Inverse Hyperbolic functions –Separation of real and imaginary parts

**UNIT III**

Logarithm of a complex number – Summation of a series – Difference Method – Angles in Arithmetic Progression method.

**UNIT IV**

Fourier Series Definition – Fourier Series Expansion of Periodic Functions with period  $2\pi$  – Odd and Even Functions.

**UNIT V**

Half range sine and Cosine series Definition and Problems – Change of Interval

## **COURSE OUTCOME :**

After the completion of the course the students will be able to

1. Learn the expansion of  $\sin n\theta$  and  $\cos n\theta$  and its related problems.
2. Understand the hyperbolic functions and its relation between hyperbolic and circular functions.
3. Understand the summation of series and its methods.
4. Understand the concept of fourier series and familiarizes with odd, even fourier series with their periodic functions.
5. Analyse the half range sine and cosine functions and its change of interval.

## **TEXT BOOK(S) :**

1.S.Arumugam, A. Thangapandi Issac and A.Somasundaram, Trignometry and Fourier series, New Gamma Publications, 1999.

2. S. Narayanan and T.K.Manicavachagom Pillay, S. Viswanathan, Calculus Volume III - Private limited, 2014.

UNIT- I Chapter 1: Sec. 1.2 to 1.4 of [1]

UNIT- II Chapter 2 : Sec. 2.1 and 2.2 of [1]

UNIT-III Chapter 3 & Chapter 4 : Sec. 4.1 to 4.3of [1]

UNIT- IV Chapter 6 : Sec. 1 to 3 of [2]

UNIT- V Chapter 6: Sec. 4 to 6 of [2]

## **REFERENCE BOOK(S):**

1. K.S.Rawat, Trigonometry, Sarup and Sons, New Delhi, 2005.

2. S.K.Jain, Fourier Series and Fourier Transforms, Sarup and Sons, New Delhi, 2001.

## **E\_RESOURCES :**

1.[https://www.google.com/url?sa=t&source=web&rct=j&url=http://www.uobabylon.edu.iq/eprints/publication\\_7\\_16606\\_477.pdf&ved=2ahUKEwiEm\\_xwKbtAhX8xzgGHYcXBkEQFjAFegQICAB&usg=AOvVaw1E\\_Pm2tIK4fJsAiuQJmwr2](https://www.google.com/url?sa=t&source=web&rct=j&url=http://www.uobabylon.edu.iq/eprints/publication_7_16606_477.pdf&ved=2ahUKEwiEm_xwKbtAhX8xzgGHYcXBkEQFjAFegQICAB&usg=AOvVaw1E_Pm2tIK4fJsAiuQJmwr2)

2.<https://www.google.com/url?sa=t&source=web&rct=j&url=http://www.iitg.ac.in/physics/fac/charu/courses/ph405/FourierTransform.pdf&ved=2ahUKEwinktHFsaXtAhXQfX0KHaaaAtAQFjAMegQIDxAB&usg=AOvVaw066vJTVNV2fz-BAT4YWaDb>

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DEPARTMENT OF MATHEMATICS  
ALLIED MATHEMATICS  
ALLIED COURSE – IV  
(For Physics & Chemistry)

Semester : II – AC – IV : ODE, PDE AND LAPLACE TRANSFORMS

Ins. Hrs. /Week : 3

Course Credit: 2

Course Code : 20AMM204

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**OBJECTIVES :**

- To learn the basic concepts of ODE and PDE.
- To train the students in PDE and Laplace Transforms.
- To learn the linear equation with constant coefficient.

**UNIT I**

Ordinary Differential Equation of first order but of higher degree –Equations solvable for x, solvable for dy/dx, Clairaut's form (simple cases only)

**UNIT II**

Linear equations with constant coefficients – Finding Particular integrals in the cases of  $e^{kx}$ ,  $\sin(kx)$ ,  $\cos(kx)$  (where k is a constant),  $x^k$  where k is a positive integer, and  $e^{kx}f(x)$  where f(x) is any function of x(only problems in all the above – No proof needed for any formula).

**UNIT III**

Formation of Partial differential equations by eliminating constants and by elimination of arbitrary functions – Definition of general, particular & complete solutions – Singular integral (geometrical meaning not required) – Solutions of first order equations in the standard forms -  $f(p, q) = 0$ ,  $f(x, p, q) = 0$ ,  $f(y, p, q) = 0$ ,  $f(z, p, q) = 0$ ,  $f_1(x, p) = f_2(y, q)$ ,  $z = xp + yq + f(p, q)$  - Lagrange's Equations and simple problems.

**UNIT IV**

Laplace Transform – Definition –  $L(e^{at})$ ,  $L(\cos at)$ ,  $L(\sin at)$ ,  $L(t^n)$ , where n is a positive integer. Basic theorems & formula only -  $L[e^{-st}\cos bt]$ ,  $L[e^{-st}\sin bt]$ ,  $L[e^{-st}f(t)]$ –  $L[f(t)]$ ,  $L[f'(t)]$ ,  $L[f''(t)]$ .

## UNIT V

Inverse Laplace Transforms related to the above standard forms – Solving Second Order ODE with constant coefficients using Laplace Transforms.

### COURSE OUTCOME :

After the completion of the course the students will be able to

1. Learn the order and degree of the ODE's.
2. Identify some specific methods and solve them.
3. Understand the formation of PDE by eliminating constants and arbitrary functions.
4. Learn the Laplace Transforms and its related problems.
5. Understand the Inverse Laplace Transforms and solving second order ODE with constant coefficients.

### TEXT BOOK(S) :

1.S. Narayanan, T.K. Manicavachagam Pillai, Calculus Volume- III, S.Viswanathan Pvt. Limited,2014.

UNIT – I Chapter – 1 :Sec. : 5,6

UNIT – II Chapter – 2 :Sec. :1 to 4

UNIT – III Chapter – 4 : Sec. : 1, 2, 3, 5[5.1 to 5.4], 6

UNIT – IV Chapter – 5 : Sec. : 1, 2, 4, 5

UNIT – V Chapter – 5 :Sec. : 6 to 11

### REFERENCE BOOK(S) :

1. M.L.Khanna, Differential Equation, Jaiprakashnath & Meerut, 1994.
2. K.S.Rauat, Differential Equation, Sarup and Sons, New Delhi, 2003.

### E\_RESOURCES :

1.[https://www.researchgate.net/publication/267487772\\_Differential\\_Equations\\_and\\_Their\\_Applications](https://www.researchgate.net/publication/267487772_Differential_Equations_and_Their_Applications)

2.[https://www.google.com/url?sa=t&source=web&rct=j&url=http://www.personal.psu.edu/wxs27/250/NotesLaplace.pdf&ved=2ahUKEwjXmraOw6btAhX0zzgGHeHeD8MQFjABegQIEhAB&usg=AOvVaw1mHmdFf0ghr6\\_ToFjy7Bzq](https://www.google.com/url?sa=t&source=web&rct=j&url=http://www.personal.psu.edu/wxs27/250/NotesLaplace.pdf&ved=2ahUKEwjXmraOw6btAhX0zzgGHeHeD8MQFjABegQIEhAB&usg=AOvVaw1mHmdFf0ghr6_ToFjy7Bzq)

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**DEPARTMENT OF MATHEMATICS**  
**ALLIED MATHEMATICS**  
**ALLIED COURSE – II**  
**(For CS & BCA)**

**Semester : I – AC – II : NUMERICAL ANALYSIS**

**Ins. Hrs. /Week : 3**

**Course Credit: 2**

**Course Code : 20AMA102**

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**OBJECTIVES :**

- To introduce the basic concept of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation.
- To acquaint the student with an understanding of numerical techniques of differentiation and integration.

**UNIT – I**

The Solution of Algebraic and Transcendental Equations – Bisection method – Iteration method – Newton Raphson method

**UNIT – II**

Interpolation – Finite differences – Newton's forward and backward Interpolation – Lagrange's Interpolation formula

**UNIT –III**

Numerical Differentiation – Numerical Integration: Trapezoidal Rule – Simpson's 1/3 Rule

**UNIT – IV**

Gauss Elimination Method – Gauss Jacobi Method –Gauss Seidal method

**UNIT – V**

Numerical Solution of Ordinary Differential Equations – Solution by Taylor's Series – Euler's method – Runge Kutta second and fourth order method.

## **COURSE OUTCOME :**

After the completion of the course the students will be able to

1. Understand the numerical techniques to find the roots of linear and non-linear equations.
2. Understand the difference operators and use of interpolation.
3. Understand numerical differentiation and integration.
4. Understand the methods of solutions of linear equations.
5. Understand the concept of numerical solutions of ordinary differential equations.

## **TEXT BOOK(S) :**

1.S. S. Sastry, Introductory Methods of Numerical Analysis, 4<sup>th</sup>Edition, Prentice Hall of India, New Delhi.

Unit I	Chapter 2:	Sec. 2.2,2.4, 2.5
Unit II	Chapter 3:	Sec. 3.3(3.3.1&3.3.2), 3.6, 3.9.1
Unit III	Chapter 5:	Sec. 5.2.1 , Sec. 5.4(5.4.1 &5.4.2)
Unit IV	Chapter 6:	Sec. 6.3.2, 6.4
Unit V	Chapter 7:	Sec. 7.2, 7.4, 7.5

## **REFERENCE BOOK(S):**

- 1.M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Private Limited,2001.
- 2.David Kincaid, Ward Cheney, Numerical Analysis, Books/cole Publishing company, California.

## **E\_RESOURCES :**

1. <http://www.math.iitb.ac.in/~baskar/book.pdf>
2. <http://spartan.ac.brocku.ca/~jvrbik/MATH2P20/notes.pdf>

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**DEPARTMENT OF MATHEMATICS**  
**ALLIED MATHEMATICS**  
**ALLIED COURSE – III**  
**(For CS & BCA)**

**Semester : II – AC – III : STATISTICS**

**Ins. Hrs. /Week : 3**

**Course Credit: 3**

**Course Code :20AMA203**

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**OBJECTIVES :**

- To train the students to workout statistical problems.
- To analyse the data graphically using frequency distributions.
- To analyse the data using measure of central tendency.

**UNIT I**

Introduction -Origin and development of statistics-scope-limitations- Frequency distribution - graphical representation.

**UNIT II**

Measures of central tendency: Arithmetic Mean – Geometric Mean – Harmonic Mean - Median - Mode

**UNIT III**

Measures of dispersion: range-Quartile deviation-Mean deviation- Standard deviation- Coefficient of dispersion

**UNIT IV**

Correlation and Regression–Properties of Simple Correlation and regression coefficients – Simple Problems only.

**UNIT V**

Binomial distribution: Moments- Recurrence relations for the Moments-Moment generating functions-simple problems-Additive property.

## **COURSE OUTCOME :**

After the completion of the course the students will be able to

1. Understand the basic concept of statistics.
2. Acquire knowledge of measures of central tendency.
3. Understand the concept of measures of dispersion.
4. Understand the concept of correlation and regression.
5. Gain Knowledge about binomial distribution and its properties.

## **TEXT BOOK(S) :**

1. Gupta.S.C & Kapoor, V.K, Fundamentals of Mathematical Statistics, Sultan Chand & sons, NewDelhi-2002.

Unit I Chapter 1 : Sec. 1.1 to 1.4

Chapter 2 : Sec. 2.1 to 2.3

Unit II Chapter 2 : Sec. 2.4 to 2.9

Unit III Chapter 2 : Sec. 2.13 to 2.14

Unit IV Chapter10 : Sec. 10.1 to 10.4 & Chapter 11: Sec. 11.1, 11.2 (11.2.1 to 11.2.3)

Unit V Chapter 8 : Sec. 8.4 (8.4.1, 8.4.2, 8.4.6,8.4.7 only )

## **REFERENCE BOOK(S) :**

1.Gupta.S.P , Statistical Methods, Sultan Chand & sons, NewDelhi-1994.

2.Kapil Sharma, Statistical Methods, ABO Publishers, Jaipur, India.

## **E\_RESOURCES :**

1. <https://www.math.arizona.edu/~jwatkins/statbook.pdf>

2. <http://www.cimt.org.uk/cmmss/S1/Text.pdf>

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DEPARTMENT OF MATHEMATICS  
ALLIED MATHEMATICS  
ALLIED COURSE – IV  
(For CS & BCA)

Semester : II – AC – IV : OPERATIONS RESEARCH

Ins. Hrs. /Week : 3

Course Credit: 3

Course Code : 20AMA204

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**OBJECTIVES :**

- To train the students to solve Assignment problems, Transportation problems.
- To train the students in Network problems.
- To impart knowledge in concepts and tools of Operations Research.

**UNIT I**

Operations Research: Introduction - Basics of OR – OR & decision making – Role of OR - Linear programming formulations & graphical solution of two variables – Canonical & standard forms of LPP.

**UNIT II**

Simplex Method: Simplex Method for  $<$ ,  $=$ ,  $>$  constraints –Big M-method.

**UNIT III**

Transportation Problem: Transportation algorithm –Degeneracy algorithm – Degeneracy in Transportation Problem, Unbalanced Transportation problem-Assignment algorithm – Unbalanced Assignment problem.

**UNIT IV**

Sequencing Problem: Processing of n jobs through two machines – Processing of n jobs through 3 machines – Processing of two jobs through n machines.

**UNIT V**

Networks: Network – Fulkerson's rule - Measure of activity – PERT computation – CPM computation - Resource scheduling.

## **COURSE OUTCOME :**

After the completion of the course the students will be able to

1. Understand the advantages and limitations of operation research
2. Understand the LPP and to know methods of solving problems
3. Understand the concepts of transportation and assignment problems
4. Learn about the sequencing problems
5. Assimilate the concept of Network scheduling by CPM and PERT

## **TEXT BOOK(S) :**

1. S.Kalavathy, Operations Research, Fourth Edition, Vikas Publishing House Pvt. Ltd.

UNIT I Chapter 1,Chapter 2 : Sec. 2.1, 2.2 &Chapter 3

UNIT II Chapter 4 & Chapter 5 : Sec. 5.1, 5.2

UNIT III Chapter 8 : Sec. 8.1 to 8.5 & Chapter 9: Sec. 9.3 to 9.5

UNIT IV Chapter 14 : Sec. 14.1 to 14.3, 14.5

UNIT V Chapter 15 : Sec. 15.1 to 15.8

## **REFERENCE BOOK(S) :**

1. P. K Gupta and Manmohan, Operations Research,Sultan Chand and sons Educational publishers, New Delhi.

2. Hamdy A. Taha, Operations Research, 7<sup>th</sup>Edn., Prentice Hall of India Private Limited, New Delhi, 2005.

## **E\_RESOURCES :**

1.[http://ebooks.lpude.in/commerce/bcom/term\\_5/DCOM303\\_DMGT504\\_OPERATION\\_RESEARCH.pdf](http://ebooks.lpude.in/commerce/bcom/term_5/DCOM303_DMGT504_OPERATION_RESEARCH.pdf)

2.<http://www.ggu.ac.in/download/class-note14/operation%20research07.04.14.pdf>

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## **CORE COURSE IX**

### **NUMERICAL METHODS WITH MATLAB PROGRAMMING**

#### **Objectives:**

1. To introduce the exciting world of programming to the students through numerical methods.
2. To introduce the techniques of MATLAB programming.
3. To solve numerical problems using MATLAB programming.

#### **UNIT I**

MATLAB Environment : Getting Started – Solving Problems in MATLAB – Saving you works – Predefined MATLAB Functions – Using Predefined Functions – Manipulating Matrices – Computational Limitations-Special Values and Functions.

#### **UNIT II**

Plotting : Introduction Two Dimensional Plots – Three Dimensional Plotting – Editing Plots from the Menu Bar – Creating Plots from the Workshop Window – Programming in MATLAB : introduction – Problems with Two Variables – Input/Functions – Statement level Control Structures.

#### **UNIT III**

Numerical Techniques : Introduction – Curve Fitting: Linear and Polynomial Regression – Using the Interactive Fitting Tools – Numerical Integration – Numerical Differentiation.

#### **UNIT IV**

Curve Fitting – Linear and parabolic curves by the method of least squares principle-Solving algebraic and transcendental equations-Bisection method, false position method and Newton Raphson method – Solving simultaneous algebraic equation – Guass – seidal method – Guass elimination method.

#### **UNIT V**

Interpolation – Newton’s forward and backward difference formulae – Lagrange’s interpolation formulae – Numerical integration using Trapezoidal and Simpson’s one – third rules – solution of ODE’s = Euler method and Runge – Kutta fourth order method.

#### **Books for Study**

1. Delores M.Etter, David C.Kuncicky, Holly Moore. Introduction to MATLAB, Published by Dorling Kindersley (india) Pvt. Ltd., licenses of Pearson Education in South Asia.
2. M.K.Venkatraman, Numerical methods in Science and Engineering, National Publisher Company, Fifth Edition, 2001 (For Units IV and V).  
Unit 1 : Chapter 2 & 3  
Unit 2 : Chapter 4 & 5  
Unit 3 : Chapter 8.  
Unit 4 : Chapter 2 section 1.7-1.8, Chapter 3, section 2, 4 and 5, Chapter 4, section 2, 6 of (2).  
Unit 5 : Chapter 6, sec 3, 4. Chapter 8, sec 4, Chapter 9, sec 8, 10, Chapter 11, sec 10, 16.

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## MAJOR BASED ELECTIVE II (A)

### GRAPH THEORY

#### Objectives

1. To introduce the notion of graph theory and its applications.
2. To learn the techniques of combinatorics in Graph Theory.

#### UNIT I

Introduction - The Konigsberg Bridge Problem - Graphs and subgraphs: Definition and Examples - Degrees - Subgraphs - Isomorphism. –independent sets and coverings.

#### UNIT II

Matrices - Operations on Graphs - Walks, Trails and Paths – Connectedness and Components - Eulerian Graphs.

#### UNIT III

Hamiltonian Graphs (Omit Chavatal Theorem) - Characterization of Trees - Centre of a Tree.

#### UNIT IV

Planarity: Introduction - Definition and Properties - Characterization of Planar Graphs.

#### UNIT V

Directed Graphs: Introduction - Definitions and Basic Properties – Some Applications: Connector Problem - Kruskal's algorithm - Shortest Path Problem – Dijkstra's algorithm.

#### Textbook

1. S. Arumugam and S. Ramachandran, Invitation to Graph Theory, SciTech Publications (India) Pvt. Ltd., Chennai, 2006.

UNIT-I Chapter-1 Sec 1.0, 1.1 and Chapter -2 Sec 2.0, 2.1, 2.2, 2.3, 2.4.2.6

UNIT-II Chapter-2 Sec 2.8,2.9 ,Chapter-4 Sec 4.1,4.2 and Chapter-5 Sec 5.0,5.1

UNI-III Chapter-5 Sec 5.2, Chapter-6 Sec 6.0, 6.1, 6.2.

UNIT-IV Chapter-8 Sec 8.0, 8.1, 8.2.

UNIT-V Chapter-10 Sec 10.0, 10.1 Chapter-11 Sec 11.0, 11.1, 11.2

#### References

1. Narsingh Deo, Graph Theory with applications to Engineering and Computer Science, Prentice Hall of India, 2004.
2. Gary Chartrand and Ping Zhang, Introduction to Graph Theory, Tata McGraw-Hill Edition, 2004.

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**MAJOR BASED ELECTIVE I (A)**  
**OPERATIONS RESEARCH**

**Objectives:**

1. To introduce the various techniques of Operations Research.
2. To make the students solve real life problems in Business and Management

**UNIT I**

Linear programming problem - Mathematical formulation – Illustrations on Mathematical formulation on Linear Programming Problems – Graphical solution method - some exceptional cases - Canonical and standard forms of Linear Programming Problem - Simplex method.

**UNIT II**

Use of Artificial Variables (Big M method - Two phase method) – Duality in Linear Programming - General primal-dual pair - Formulating a Dual problem - Primal-dual pair in matrix form -Dual simplex method.

**UNIT III**

Transportation problem - LP formulation of the TP - Solution of a TP - Finding an initial basic feasible solution (NWCM - LCM -VAM) – Degeneracy in TP - Transportation Algorithm (MODI Method) - Assignment problem - Solution methods of assignment problem – special cases in assignment problem.

**UNIT IV**

Queuing theory - Queuing system - Classification of Queuing models - Poisson Queuing systems Model I (M/M/1)( $\infty$ /FIFO) only - Games and Strategies – Two person zero sum - Some basic terms - the maximin-minimax principle -Games without saddle points-Mixed strategies - graphic solution  $2 \times n$  and  $m \times 2$  games.

**UNIT V**

PERT and CPM – Basic components – logical sequencing - Rules of network construction- Critical path analysis - Probability considerations in PERT.

**Book for Study:**

Kanti Swarup, P.K. Gupta and ManMohan, Operations Research, 13<sup>th</sup> edition, Sultan Chand and Sons, 2007.

Unit 1: Chapter 2 Sec 2.1 to 2.4, Chapter 3 Sec 3.1 to 3.5, Chapter 4 Sec 4.1 , 4.3

Unit 2: Chapter 4 Sec 4.4, Chapter 5 Sec 5.1 to 5.4, 5.9

Unit 3: Chapter 10 Sec 10.1, 10.2, 10.8, 10.9, 10.12, 10.13, Chapter 11 Sec 11.1 to 11.4

Unit 4: Chapter 21 Sec 21.1, 21.2, 21.7 to 21.9, Chapter 17 Sec 17.1 to 17.6

Unit 5: Chapter 25 Sec 25.1 to 25.4, 25.6, 25.7

**Book for Reference:**

1. Sundaresan.V, Ganapathy Subramanian. K.S. and Ganesan.K, Resource Management Techniques, A.R. Publications, 2002.
2. Taha H.A., Operations Research: An introduction, 7th edition, Pearson Prentice Hall, 2002.

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## MAJOR BASED ELECTIVE III (A)

### ASTRONOMY

#### Objectives:

1. To introduce the exciting world of astronomy to the students.
2. To help the students to study spherical trigonometry in the field of astronomy.
3. To understand the movements of the celestial objects.

#### UNIT I

Relevant properties of sphere and formulae in spherical trigonometry (no proof, no problems) - Celestial sphere and diurnal motion -Celestial coordinates-sidereal time.

#### UNIT II

Morning and evening stars -circumpolar stars- diagram of the celestial sphere -zones of earth -perpetual day-dip of horizon-twilight.

#### UNIT III

Refraction - laws of refraction -tangent formula-Cassini's formula - horizontal refraction- geocentric parallax -horizontal parallax.

#### UNIT IV

Kepler's laws - verification of 1<sup>st</sup> and 2<sup>nd</sup> laws in the case of earth - Anomalies -Kepler's equation - Seasons -causes -kinds of years.

#### UNIT V

Moon-sidereal and synodic months - elongation - phase of moon - eclipses-umbra and penumbra - lunar and solar eclipses - ecliptic limits - maximum and minimum number of eclipses near a node and in a year - Saros.

#### Book for Study:

1. Kumaravel, S. and Susheela Kumaravel, *Astronomy*, 8th Edition, SKV Publications, 2004.

Unit 1: Sec: 39-79

Unit 2: Sec: 80-90,106-116

Unit3: Sec: 117-144

Unit 4: Sec: 146-162,173-178

Unit 5: Sec: 229-241,256-275

#### Book for Reference:

1. G V Ramachandran, Text Book of Astronomy, Mission Press, Palayamkottai, 1965.

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## **ELECTIVE IV (2)**

### **ADVANCED OPERATIONS RESEARCH**

#### **Objectives:**

1. To enlighten the students in the field of operations research.
2. To help the students to apply OR techniques in business and management problems.

#### **Unit I**

Integer Programming.

#### **Unit II**

Dynamic (Multistage) programming.

#### **Unit III**

Decision Theory and Games.

#### **Unit IV**

Inventory Models.

#### **Unit V**

Non-linear Programming algorithms.

#### **TEXT BOOK**

Hamdy A. Taha, Operations Research, Macmillan Publishing Company, 4th Edition.

Unit I Chapter 8 § 8.1 – 8.5

Unit II Chapter 9 § 9.1 – 9.5

Unit III Chapter 11 § 11.1 – 11.4

Unit IV Chapter 13 § 13.1 – 13.4

Unit V Chapter 19 § 19.1, 19.2

#### **REFERENCES**

1. Non Linear Programming, O.L. Mangasarian, McGraw Hill, New York .
2. Non Linear Programming, Theory and Algorithms, Mokther S. Bazaraa and C.M. Shetty, Willy, New York .
3. Operations Research-An Introduction, Prem Kumar Gupta and D.S. Hira, S. Chand

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**CORE COURSE XIV**  
**ADVANCED NUMERICAL ANALYSIS**

**Objectives.**

1. To know the theory behind various numerical methods.
2. To apply these methods to solve mathematical problems.

**Unit I**

Transcendental and polynomial equations: Rate of convergence – Secant Method, Regula Falsi Method, Newton Raphson Method, Muller Method and Chebyshev Method. Polynomial equations: Descartes' Rule of Signs - Iterative Methods: Birge-Vieta method, Bairstow's method Direct Method: Graeffe's root squaring method.

**Unit II**

System of Linear Algebraic equations and Eigen Value Problems: Error Analysis of Direct methods – Operational count of Gauss elimination, Vector norm, Matrix norm, Error Estimate. Iteration methods - Jacobi iteration method, Gauss Seidel Iteration method, Successive Over Relaxation method - Convergence analysis of iterative methods, Optimal Relaxation parameter for the SOR method. Finding eigen values and eigen vectors – Jacobi method for symmetric matrices and Power methods only.

**Unit III**

Interpolation and Approximation:- Hermite Interpolations, Piecewise and Spline Interpolation – piecewise linear interpolation, piecewise quadratic interpolation, piecewise cubic interpolation, spline interpolation-cubic Spline interpolation. Bivariate Interpolation- Lagrange Bivariate interpolation. Least square approximation.

**Unit IV**

Differentiation and Integration: Numerical Differentiation – Optimum choice of Step length – Extrapolation methods – Partial Differentiation. Numerical Integration: Methods based on undetermined coefficients - Gauss Legendre Integration method and Lobatto Integration Methods only.

**Unit V**

Ordinary differential equations – Singlestep Methods: Local truncation error or Discretization Error, Order of a method, Taylor Series method, Runge-Kutta methods: Explicit Runge-Kutta methods– Minimization of Local Truncation Error, System of Equations, Implicit Runge-Kutta methods. Stability analysis of single step methods (RK methods only).

**TEXT BOOKS**

M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International (p) Limited Publishers, New Delhi, Sixth Edition 2012.

Unit I Chapter 2 § 2.5 (Pages 41-52), 2.9 ( Pages 83-99)

Unit II Chapter 3 § 3.3( Pages 134-140), 3.4( Pages 146-164), 3.5(Pages 170-173), 3.7 ( Pages 179-185) and 3.11 (Pages 196-198)

Unit III Chapter 4 § 4.5 - 4.7 & 4.9 (Pages 284-290)

Unit IV Chapter 5 § 5.2 - 5.5(Pages 320-345) and 5.8(pages 361 – 365 and 380-386)

Unit V Chapter 6 §6.4(Pages 434-459) and 6.5(Pages 468-475)

**REFERENCES**

1. Kendall E. Atkinson, An Introduction to Numerical Analysis, II Edn., John Wiley & Sons, 1988.
2. M.K. Jain, Numerical Solution of Differential Equations, II Edn., New Age International Pvt Ltd., 1983.
3. Samuel. D. Conte, Carl. De Boor, Elementary Numerical Analysis, Mc Graw-Hill International Edn., 1983.

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## **CORE PRACTICAL I**

### **NUMERICAL METHODS WITH MATLAB PROGRAMMING (P)**

#### **Objectives:**

1. To introduce the exciting world of programming to the students through numerical methods.
2. To introduce the techniques of MATLAB programming.
3. To solve numerical problems using MATLAB programming.

#### **LIST OF PRACTICALS**

1. Linear Interpolation
2. Linear Regression
3. Curve Fitting
4. Trapezoidal rule of integration
5. Simpson's 1/3 rule of integration
6. Newton – Raphson method of solving equations
7. Gauss – elimination method of solving simultaneous equations
8. Gauss – Seidal method of solving simultaneous equations
9. R-K fourth order method of solving differential equations
10. Lagrange's method of interpolation.

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## **ELECTIVE I (3)**

### **FUZZY SETS AND THEIR APPLICATIONS**

#### **Objectives:**

1. To introduce the concept of fuzzy theory and study its application in real problems
2. To study the uncertainty environment through the fuzzy sets that incorporates imprecision and subjectivity into the model formulation and solution process.

#### **UNIT I From Classical Sets To Fuzzy Sets, Fuzzy Sets Verses Crisp Sets:**

Fuzzy sets: Basic types – Fuzzy sets: Basic Concepts –Additional Properties of a – cuts- Extension Principle for fuzzy sets .

#### **UNIT II Operations On Fuzzy Sets:**

Types of operations– Fuzzy complements- Fuzzy Intersections:t-Norms – Fuzzy Unions:t-Conorms - Combinations of Operations.

#### **UNIT III Fuzzy Arithmetic:**

Fuzzy numbers - Linguistic variables -Arithmetic operations on intervals –Arithmetic operations on Fuzzy numbers .

#### **UNIT IV Fuzzy Relations:**

Binary Fuzzy Relations – Binary Relations on a Single Set – Fuzzy Equivalence Relations – Fuzzy Compatibility Relations –Fuzzy Ordering Relations – Fuzzy Morphisms.

#### **UNIT V Fuzzy Decision Making:**

Individual decision making – Multiperson Decision Making-Ranking methods – Fuzzy Linear programming.

#### **TEXT BOOK**

George J. Klir and Bo Yuan, Fuzzy sets and Fuzzy Logic Theory and Applications, Prentice Hall of India, (2005).

**UNIT I** Chapter 1 Sections 1.3, 1.4, Chapter :2 Sections 2.1 and 2.3

**UNIT II** Chapter 3 Sections 3.1, 3.2, 3.3, 3.4, 3.5.

**UNIT III** Chapter 4 Sections 4.1,4.2, 4.3, 4.4.

**UNIT IV** Chapter 5 Sections 5.3 ,5.4, 5.5, 5.6, 5.7, 5.8.

**UNIT V** Chapter 15 Sections 15.2,15.3, 15.6, 15.7

#### **REFERENCES**

1. H.J. Zimmermann, Fuzzy Set Theory and its Applications, Allied Publishers Limited (1991).
2. M. Ganesh, Introduction to Fuzzy sets and Fuzzy logic, Prentice Hall of India, New Delhi (2006).

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