

ST. ALOYSIUS COLLEGE (AUTO), JABALPUR  
Reaccredited 'A++' by NAAC with CGPA (3.58/4.0)

College with Potential for Excellence by UGC

DST-FIST supported

Department of Mathematics

## Faculty of Science

Bachelor of Science (B.Sc.)

SUBJECT: Mathematics

B.Sc. V Semester

Paper-Core – Elements of Discrete Mathematics

### Course Outcomes

CO. No.	Course Outcomes	Cognitive Level
CO1	Comprehend Indian Logic and its influence on Modern Logic Analyse and Apply Relations and Lattices to Real World	U, An, Ap
CO2	Correlate Boolean Algebra to Switching Circuit and Generate Applications in Real Life. Analyse and Evaluate a Minimal Boolean Function	U, An, Ap
CO3	Deduce the Practicality of Graph Theory and implement the techniques in Real Life perspective.	U, An, Ap
CO4	Understand and Apply Trees and Matrix Representation of Graphs	U, An, Ap

### Credit and Marking Scheme

Theory	Credits	Marks		Total Marks
		Internal	External	
	6	40	60	100
Total	6	100		

### Evaluation Scheme

Theory	Marks	
	Internal	External
	3 Internal Exams of 20 Marks each during the Semester (Best 2 will be taken)	1 External Exams (At the End of Semester)

*[Signature]*

*Mito*

*[Signature]*

*[Signature]*

*AL*

*[Signature]*

ST. ALOYSIUS COLLEGE (AUTO), JABALPUR

Reaccredited 'A++' by NAAC with CGPA (3.58/4.0)

College with Potential for Excellence by UGC

DST-FIST supported

Department of Mathematics



## Content of the Course Theory

No. of Lectures Hours per Week: 6 Hours. per Week

Total No. of Lectures: 90 Hours.

Maximum Marks: 60

Unit	Topics	No. of Lectures
I	<b>1.1 Indian Logic</b> 1.1.1 Origins 1.1.2 The schools Vaisheshika 1.1.3 Catuskoti 1.1.4 Nyaya 1.1.5 Jain Logic 1.1.6 Buddhist Logic 1.1.7 Navya-Nyaya 1.1.8 Influence of Indian Logic on Modern Logic 1.1.9 Boolean Logic and Indian Thoughts <b>1.2 Relations</b> 1.2.1 Binary, Inverse, Composite and Equivalence relation 1.2.2 Equivalence classes and its properties 1.2.3 Partition of a set 1.2.4 Partial order relation 1.2.5 Partially ordered and totally ordered sets 1.2.6 Hasse diagram <b>1.3 Lattices</b> 1.3.1 Definition and examples 1.3.2 Dual, bounded, distributive and complemented lattices	34
II	<b>2.1 Boolean Algebra</b> 2.1.1 Definition and properties 2.1.2 Switching circuits and its applications 2.1.3 Logic gates and circuits <b>2.2 Boolean Functions</b> 2.2.1 Disjunctive and conjunctive normal forms 2.2.2 Bool's expansion theorem <b>2.3 Minimize the Boolean function using Karnaugh Map</b>	34

*Mr. Gaur*  
*Mita*

*Punita*

*Shital*

*AL*

*Anilang*

ST. ALOYSIUS COLLEGE (AUTO), JABALPUR  
Reaccredited 'A++' by NAAC with CGPA (3.58/4.0)

College with Potential for Excellence by UGC

DST-FIST supported

Department of Mathematics

III	<b>3. Graphs:</b> 3.1 Definition and types of graphs 3.2 Subgraphs 3.3 Walk, path and circuit 3.4 Connected and disconnected graph 3.5 Euler graph 3.6 Hamiltonian path and circuit 3.7 Dijkstra's Algorithm for shortest paths in weighted graph	28
IV	<b>4. Tree:</b> 4.1 Trees and properties 4.2 Rooted, Binary and Spanning tree 4.3 Rank and nullity of a graph 4.4 Kruskal's and Prim's Algorithm 4.5 Cut- set and Its Properties 4.6 Fundamental Circuits and Cut- set 4.7 Planar graphs 4.8 Kuratowski's two graph 4.9 Matrix representation of graph 4.9.1 Incidence 4.9.2 Adjacency 4.9.3 Circuit 4.9.3 Cut – Set 4.9.4 Path	24

**References**

**Text Books:**

1. J. P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications To Computer Science, McGraw Hill Education, 1<sup>st</sup> edition, 2017.
2. Satinder Bal Gupta, C. P. Gandhi: Discrete Structures, Laxmi Publication, 2010.
3. C. L. Liu: Elements of Discrete Mathematics, Mac Graw Hill Education, 4<sup>th</sup> edition, 2017.
4. Narsingh Deo: Graph Theory with Applications to Engineering and Computer Science, Prentice Hall India Learning Private Limited, 1997.
5. मध्यप्रदेश हिंदी ग्रन्थ अकादमी की पुस्तके।

**Reference Books:**

1. Seymour Lipschutz and Mark Lipson: Discrete Mathematics (Schaums Outline),

*Mita*  
*Luete*

*gaur*

*Arulana*

ST. ALOYSIUS COLLEGE (AUTO), JABALPUR  
Reaccredited 'A++' by NAAC with CGPA (3.58/4.0)

College with Potential for Excellence by UGC

DST-FIST supported

Department of Mathematics

Mac Graw Hill Education, 3rd edition, 2017.

2. Edgar G. Goodaire and Michael M. Parmenter.

3. Discrete Mathematics with Graph Theory, Pearson Education Pt. Ltd., Indian Reprint 2003



*Mr. Gan*

Mita

*Punit*

*Shiv*

*AL*

*Adarsh*

ST. ALOYSIUS COLLEGE (AUTO), JABALPUR

Reaccredited 'A++' by NAAC with CGPA (3.58/4.0)

College with Potential for Excellence by UGC

DST-FIST supported

Department of Mathematics

## Faculty of Science

Bachelor of Science (B.Sc.)

**SUBJECT: MATHEMATICS**

B.Sc. V Semester

Paper- Discipline Specific Elective

Numerical Methods and Scientific Computation

### Course Outcomes

CO.No.	Course Outcomes	Cognitive Level
CO1	Understand numerical methods to find the solution of a system of linear equations.	U
CO2	Compute interpolation value for real data.	E
CO3	Find quadrature by using various numerical methods.	E
CO4	Solve system of linear equations by using various numerical techniques.	Ap
CO5	Obtain solutions of ordinary differential equations by using numerical methods.	Ap

### Credit and Marking Scheme

	Credits	Marks		Total Marks
		Internal	External	
Theory	4	40	60	100
Total	4	100		

### Evaluation Scheme

	Marks	
	Internal	External
Theory	3 Internal Exams of 20 Marks (During the Semester) (Best 2 will be taken)	1 External Exams (At the End of Semester)



*Mr. Gaur*

*Mishra*

*Prasanna*

*Arjun*

*Dr.*

*Arjun*



ST. ALOYSIUS COLLEGE (AUTO), JABALPUR  
Reaccredited 'A++' by NAAC with CGPA (3.58/4.0)

College with Potential for Excellence by UGC

DST-FIST supported

Department of Mathematics

## Content of the Course

### Theory

No. of Lectures (in hours per week): 4.5 Hrs. per week

Total No. of Lectures: 60 Hrs.

Maximum Marks: 60

Unit	Topics	No. of Lectures
I	<b>Methods for solving Algebraic and Transcendental Equations:</b> 1.1 Ramanujan 1.2 Bisection 1.3 Regula Falsi 1.4 Secant 1.5 Newton-Raphson	16
II	<b>Interpolation and Numerical Integration:</b> 2.1 Lagrange Interpolation 2.2 Finite difference operators 2.3 interpolation formula using Differences 2.3.1 Gregory-Newton Forward Difference Interpolation 2.3.2 Gregory-Newton Backward Difference Interpolation 2.4 Numerical Integration 2.4.1 Newton-Cote's formulae 2.4.2 Trapezoidal rule 2.4.3 Simpson's 1/3 Rule 2.4.4 Simpson's 3/8 Rule 2.4.5 Gauss Integration	16
III	<b>Methods to Solve System of Linear Equations:</b> 3.1 Direct method for solving system of linear equations 3.1.1 Gauss elimination 3.1.2 LU decomposition 3.1.3 Cholesky decomposition 3.2 Iterative method 3.2.1 Jacobi 3.2.2 Gauss-Seidel	24
IV	<b>Numerical Solution of Ordinary Differential Equations:</b> 4.1 Single step methods 4.1.1 Picard 4.1.2 Taylor's series 4.1.3 Euler 4.1.4 Runge-Kutta	24

*[Signature]*

*[Signature]*

*Mita*

*[Signature]*

*[Signature]*

*[Signature]*

*[Signature]*

ST. ALOYSIUS COLLEGE (AUTO), JABALPUR  
Reaccredited 'A++' by NAAC with CGPA (3.58/4.0)

College with Potential for Excellence by UGC

DST-FIST supported

Department of Mathematics

4.2 Multistep methods	
4.2.1 Predictor-corrector	
4.2.2 Modified Euler	
4.2.3 Milne-Simpson	

## References

### Text Books:

1. S. S. Sastry: Introductory Methods of Numerical Analysis, Prentice Hall India Learning Private Limited, Fifth edition, 2012.
2. E. Balagurusamy: Numerical Methods, Tata McGraw Hill Publication, 2017.
3. मध्यप्रदेश हिंदी ग्रंथ अकादमी की पुस्तके।

### Reference Books:

1. M.K. Jain, S. R. K. Iyengar, R. K. Jain, Numerical Method for Scientific and Engineering Computation, New Age International (P) Ltd., 1999.
2. Saxena H. C.: Finite Differences and Numerical Analysis, S Chand, 2010.

in qu

Mita

Puniti

guy

AL

Ardana

ST. ALOYSIUS COLLEGE (AUTO), JABALPUR  
Reaccredited 'A++' by NAAC with CGPA (3.58/4.0)

College with Potential for Excellence by UGC

DST-FIST supported

Department of Mathematics

## Faculty of Science

Bachelor of Science (B.Sc.)

SUBJECT: Mathematics

B.Sc. VI Semester

Paper-Core – FUZZY SETS AND THEIR APPLICATIONS

### Course Outcomes

CO. No.	Course Outcomes	Cognitive Level
CO1	Understand the difference between crisp sets and fuzzy sets, Fuzzy membership function, types and operations of fuzzy sets and their properties.	U, An, Ap
CO2	Fuzzy numbers and fuzzy arithmetic.	U, An
CO3	Basic concepts of fuzzy relations, fuzzy graphs and fuzzy logic.	U, An, Ap
CO4	Knowledge of m fuzzy sets and intuitionistic fuzzy sets. Understand Fuzzy relations, Crisp v/s Fuzzy relations.	U, An, Ap

### Credit and Marking Scheme

Theory	Credits	Marks		Total Marks
		Internal	External	
	6	40	60	100
Total	6	100		

### Evaluation Scheme

Theory	Marks	
	Internal	External
	3 Internal Exams of 20 Marks each during the Semester (Best 2 will be taken)	1 External Exams (At the End of Semester)

*Mr. Gur*

*Mita*

*heute*

*gaur*

*AL*

*Ardaug*



ST. ALOYSIUS COLLEGE (AUTO), JABALPUR  
Reaccredited 'A++' by NAAC with CGPA (3.58/4.0)

College with Potential for Excellence by UGC

DST-FIST supported

Department of Mathematics



## Content of the Course

### Theory

No. of Lectures Hours per Week: 6 Hours. per Week

Total No. of Lectures: 90 Hours.

Maximum Marks: 60

Unit	Topics	No. of Lectures
I	Support height nucleus of a fuzzy set, cardinality of a fuzzy set containment of two fuzzy sets, degree of subsethood, Fuzzy set, Membership function, Basic definition and concepts, Types of Fuzzy sets- normal subnormal fuzzy set, normalization $\alpha$ -cut set, strong $\alpha$ -cut, convex fuzzy set, necessary and sufficient condition for convexity of a fuzzy set.	34
II	Operations on fuzzy sets, Union, Intersection, Complement of a fuzzy set, Decomposition of fuzzy sets, Cartesian Product, Algebraic product, Product of a fuzzy set with a crisp number, contract intensification and fuzzification Bounded sum and difference, t-norms, t-conorms, Power of a fuzzy set, Disjunctive sum of two fuzzy sets, examples.	34
III	Properties of fuzzy sets- commutative, associative, distributive, idempotent, identity, involution, De-Morgan's laws, and their proofs, equality of two fuzzy sets, examples.	28
IV	The Zadeh Extension Principle, Fuzzy numbers, Fuzzy arithmetic, Fuzzy relations, Crisp v/s Fuzzy relations, Composite Fuzzy relation, Binary Fuzzy relations, Fuzzy equivalence relation, Fuzzy compatibility relation, Fuzzy relation equation, Similarity relations Fuzzy graphs.	24

## References

### Text Books:

1. G.J. Klir and Yuan, Fuzzy sets and Fuzzy Logic: The compositional rule of inference, Prentice Hall of India, New Delhi, 1995.
2. H.J. Zimmermann, Fuzzy set Theory and its Applications, Allied publishers Ltd, New Delhi 1991.

### Reference Books:

1. Pundir and Pundir, Fuzzy Sets and their Applications, Pragati Prakashan, Meerut, 2012
2. Timothy J. Ross, Fuzzy Logic with Engineering Applications, John Wiley & Sons, 2010

*Handwritten signature*

*Mila*

*Handwritten signature*

*Handwritten signature*

*Handwritten signature*

*Handwritten signature*

ST. ALOYSIUS COLLEGE (AUTO), JABALPUR  
Reaccredited 'A++' by NAAC with CGPA (3.58/4.0)

College with Potential for Excellence by UGC

DST-FIST supported

Department of Mathematics

Bachelor of Science (B.Sc.)

SUBJECT: Mathematics

B.Sc. VI Semester

Paper- Discipline Specific Elective (DSE-1) ,  
Paper-1

Advanced Numerical Methods and Scientific Computation

### Course Outcomes

CO.No.	Course Outcomes	Cognitive Level
CO1	Understand and evaluate Hermite Interpolation, Piecewise Interpolation	U, E
CO2	Analyze and evaluate Spline Interpolation, Bivariate Interpolation and Lagrange Bivariate Interpolation.	An, E
CO3	Analyze ,evaluate and apply Approximation , Find Least Square approximation	An, E, Ap
CO4	Evaluate, analyze and apply extrapolation methods, Richardson's extrapolation ordinary differential equations and Difference Equations.	E, An, Ap

### Credit and Marking Scheme

	Credits	Marks		Total Marks
		Internal	External	
Theory	4	40	60	100
Total	4	100		

### Evaluation Scheme

	Marks	
	Internal	External
Theory	3 Internal Exams of 20 Marks (During the Semester) (Best 2 will be taken)	1 External Exams (At the End of Semester)



*Handwritten signature*

*Handwritten signature*

*Handwritten signature*

*Handwritten signature*

*Handwritten signature*

*Handwritten signature*

ST. ALOYSIUS COLLEGE (AUTO), JABALPUR  
Reaccredited 'A++' by NAAC with CGPA (3.58/4.0)

College with Potential for Excellence by UGC

DST-FIST supported

Department of Mathematics

## Content of the Course

### Theory

No. of Lectures (in hours per week): 4.5 Hrs. per week

Total No. of Lectures: 60 Hrs.

Maximum Marks: 60

Unit	Topics	No. Of Lectures
I	1. Interpolation : 1.1 Hermite Interpolation 1.2 Piecewise Interpolation 1.2.1 Piecewise Linear Interpolation 1.2.2 Piecewise Quadratic Interpolation 1.2.3 Piecewise Cubic Interpolation 1.2.4 Piecewise Cubic Interpolation using Hermite Type Data	18
II	2.1 Spline interpolation: 2.1.1 Quadratic spline interpolation 2.1.2 Cubic spline interpolation 2.1.3 Natural Spline 2.2 Bivariate interpolation 2.2.1 Lagrange Bivariate interpolation 2.2.2 Newton's Bivariate interpolation for Equispaced Points	18
III	3.1 Approximation : 3.1.1 $L^p$ Norm for Discrete Data and Continuous Data 3.1.2 Euclidean Norm for Discrete Data and Continuous Data 3.1.3 Uniform Norm for Discrete Data and Continuous Data 3.2 Least squares Approximation 3.2.1 Gram-Schmidt Orthogonalizing Process 3.2.2 Legendre Polynomials	22
IV	4.1 Extrapolation methods : 4.1.1 Richardson's Extrapolation 4.2 Ordinary differential equations 4.2.1 Reduction of Higher order Equations to the system of first order Differential Equations 4.2.2 System of Linear first order Differential Equations with Constant Coefficients	22

Mr. Gur

Mila  
hanta

gud

AL

Arslan

ST. ALOYSIUS COLLEGE (AUTO), JABALPUR  
Reaccredited 'A++' by NAAC with CGPA (3.58/4.0)

College with Potential for Excellence by UGC

DST-FIST supported

Department of Mathematics

	4.3 Difference Equations.	
--	---------------------------	--

## References

### Text Books:

1. Numerical Method for scientific and Engineering computation by M.K. Jain , S.R.K. Iyenger , R.K. Jain south Edition (2003) , New Age .
2. मध्यप्रदेश हिंदी ग्रंथ अकादमी की पुस्तके।

### Reference Books:

1. Saxena H.C.: Finite Differences and Numerical Analysis, S Chand, 2010.
2. S.S. Sastry: Introductory Methods of Numerical Analysis, Prentice Hall India Learning Private Limited, Fifth edition, 2012.



*Ms. Gur*

*Mila*

*hant*

*shri*

*Al*

*Adana*



ST. ALOYSIUS COLLEGE (AUTO), JABALPUR  
Reaccredited 'A++' by NAAC with CGPA (3.58/4.0)

College with Potential for Excellence by UGC

DST-FIST supported

Department of Mathematics

## Faculty of Science

Bachelor of Science (B.Sc.)

**SUBJECT: MATHEMATICS**

B.Sc. VI Semester

Paper- Discipline Specific Elective (DSE)- 2

Integral Transform

### Course Outcomes


CO.No.	Course Outcomes	Cognitive Level
CO1	Understanding about Laplace transform and its properties.	U
CO2	Solve ordinary differential equations using Laplace transform.	Ap
CO3	Familiarise with Fourier transform of functions. Relation between Laplace and Fourier transform. Apply the concept of the course in real life problems.	U, Ap
CO4	Explain Parseval's identity and applications of Fourier transform to boundary value problems.	AP

### Credit and Marking Scheme

	Credits	Marks		Total Marks
		Internal	External	
Theory	4	40	60	100
Total	4	100		

### Evaluation Scheme

	Marks	
	Internal	External
Theory	3 Internal Exams of 20 Marks (During the Semester) (Best 2 will be taken)	1 External Exams (At the End of Semester)

  
*Handwritten signatures:*  
Mila  
Puniti  
AL  
Arana



ST. ALOYSIUS COLLEGE (AUTO), JABALPUR

Reaccredited 'A++' by NAAC with CGPA (3.58/4.0)

College with Potential for Excellence by UGC

DST-FIST supported

Department of Mathematics

## Content of the Course

### Theory

No. of Lectures (in hours per week): 4.5 Hrs. per week

Total No. of Lectures: 60 Hrs.

Maximum Marks: 60

Unit	Topics	No. of Lectures
I	Laplace Transform: 1.1 Linearity property 1.2 Existence theorem 1.3 Shifting theorem 1.4 Change of scale property 1.5 Laplace transform of derivatives and integrals 1.6 Differentiation and integration of the Laplace transforms 1.7 Multiplication and division by 't' 1.8 Periodic function	25
II	Inverse Laplace Transform: 2.1 Linearity property 2.2 Shifting theorem 2.3 Change of scale property 2.4 Inverse Laplace transforms of derivatives and integrals 2.5 Multiplication and division by powers of p 2.6 Convolution theorem 2.7 Heaviside expansion theorem	25
III	Application of Laplace Transform: 3.1 Solution of ordinary differential equation with constant coefficients 3.2 Solution of ordinary differential equation with variable coefficients	15
IV	Fourier Transform: 4.1 Linearity property 4.2 Shifting theorem 4.3 Change of scale property 4.4 Modulation 4.5 Convolution theorem 4.6 Fourier transform of derivatives 4.7 Relations between Fourier transform and Laplace transform 4.8 Parseval's identity for Fourier transform 4.9 Solution of differential equation using Fourier transform	15

*Mr. Gur*

*Mita*

*Pooja*

*Arjun*

*AL*

*Arjun*

ST. ALOYSIUS COLLEGE (AUTO), JABALPUR  
Reaccredited 'A++' by NAAC with CGPA (3.58/4.0)

College with Potential for Excellence by UGC

DST-FIST supported

Department of Mathematics

## References

### Text Books:

1 Lokenath Debnath, Dambaru Bhatta: Integral Transforms and Their Applications, Chapman and Hall/CRC; 3<sup>rd</sup> edition, 2014.

- 2 Sreenadh S. Ranganatham S. Prasad M. V. S. S. N. & Babu, Ramesh V. : Fourier Series and Integral Transforms. S. Chand Publishing, 2014.
- 3 A. N. Srivastava: Integral Transforms and Fourier Series. Narosa Publications, 2012.
- 4 मध्यप्रदेश हिंदी ग्रंथ अकादमी की पुस्तके।

### Reference Books:

- 1 I. N. Sneddon: The use of integral transform. McGraw Hill, 1972.
- 2 Murray R. Spiegel. Laplace transform, Schaum's Series, McGraw Hill Education, 1<sup>st</sup> edition, 1965.

*Mr.* *Mr.* *Mita*  
*Pant* *Mr.* *Ac*  
*Halana*