

B.Sc. Statistics

**Manonmaniam Sundaranar University
Tirunelveli**

**Syllabus From the Academic Year
2026-2027**

OUTCOME BASED EDUCATION - CHOICE BASED CREDIT SYSTEM

A. VISION AND MISSION OF THE UNIVERSITY

Vision

"To provide quality education to reach the un-reached"

Mission

- To conduct research, teaching and outreach programmes to improve conditions of human living
- To offer a wide variety of off-campus educational and training programs, including the use of information technology, to individuals and groups
- To develop partnership with industries and government so as to improve the quality of the workplace and to serve as catalyst for economic and cultural development
- To provide quality / inclusive education, especially for the rural and un-reached segments of economically downtrodden students including women, socially oppressed and differently abled.

B. PROGRAMME EDUCATIONAL OUTCOMES (PEO)

In alignment with the Vision and Mission of the University, the following have been defined as the PEO for the graduates.

PEO1: Developing strong positive attitude to learn independently the concepts in the field of study

PEO2: Ensuring confidence among the learners to apply the knowledge and skills gained to solve real life issues

PEO3: Habituating ethical values among the learners to succeed in personal and professional life

C. PROGRAMME OUTCOMES (PO)

Programme Outcomes for the Under Graduate Degree Programmes of the University are articulated as under.

After the successful completion of Undergraduate Programme from the University, the learner should be able to

PO1: Comprehend the knowledge acquired and communicate the same to others

PO2: Analyze and compare the factual data / situation to comprehend and to critically evaluate to find solution to the problem ahead

PO3: Apply theories and philosophies learned in solving the problem in scientific manner

PO4: Think reflectively on the earlier activities and attempt for self-directed lifelong learning process

PO5: Understand multicultural existence and identify the means to prolong moral/ethical values in personal and professional life

PO6: Expose the learner to the digital technology to learn through multiple sources

PO7: Train the learner to be a responsible player in teams and impart leadership qualities in them.

D. PROGRAMME SPECIFIC OUTCOMES (PSO)

After the successful completion of the B.Sc. Statistics programme, the graduates will be able to:

PSO1: Plan sample surveys and analyze the outcomes

PSO2: Handle data sets and describe their inherent properties employing knowledge acquired on statistics software

PSO3: Select and apply appropriate statistical methods for analyzing data

PSO4: Understand, Interpret and explain the relationships among the characteristics in the data

PSO5: Learn the procedures for making optimal inferences in decision making situations

PSO6: Solve mathematical problems applying statistical theory

PSO7: Pursue higher studies, research, entrepreneurship and lifelong learning in Statistics and allied fields with social responsibility.

Course Title	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	Total
Descriptive Statistics	9	8	11	10	8	8	5	59
Probability Theory	9	8	11	10	10	11	5	64
Mathematics for Statistics – I	9	8	11	10	10	11	5	64
Basics of Statistics	9	8	11	10	8	8	5	59
Office Automation	4	10	7	6	5	7	8	47
Matrix and Linear Algebra	5	4	7	8	8	10	9	51
Distribution Theory	5	4	7	8	8	10	9	51
Real Analysis	9	8	11	10	9	10	5	62

Mathematics for Statistics – II	8	7	11	9	8	10	9	62
Programming in C++	8	8	12	10	9	12	6	65
Total	75	73	99	91	83	97	66	584

Each Course has to address a minimum of 4 PSOs

Level of contribution of the Course towards attaining PSOs

0 – No Contribution 1 – Low Level 2 – Medium Level 3 – High Level

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI – 627 012.

B.Sc., Statistics

under CBCS with effect from the academic year 2026-27 and onwards

Eligibility for Admission:

Candidates who have passed the higher secondary examination conducted by Government of Tamil Nadu with Statistics / Mathematics / Business Statistics / Business Mathematics / Computer Science as one of the courses or other equivalent examinations are eligible for admission to the first year of the B.Sc., (Statistics) degree program.

Duration of the Program:

The duration of the program is three academic years comprising of six semesters with two semesters in each academic year. Examinations will be conducted at the end of each semester for the respective courses.

Medium of Instructions and Examinations:

The medium of instructions and examinations for the courses of Part I and Part II shall be in the languages concerned. For the courses of Part III and Part IV, the medium of instructions and examinations shall be in English.

Examination

The regulations for examination, passing minimum in each course and classification of successful candidates and award of ranks are at par with the regulations for other undergraduate science programs of the University.

E. MEASUREMENT OF ATTAINMENT OF COURSE OUTCOME

The Course Outcomes (COs) are measured through the performance of learners by direct and indirect assessment methods for that particular course.

i. Internal Assessment (25 Marks)

Tests – 20 Marks

Seminar / Attention (Participation) in Class – 5 Marks

ii. Semester End Examinations (75 Marks)

Written exams, Practical, Project report, and Comprehensive Viva Voce

Note: In both Internal and Semester End Examinations

Lower Order Thinking (K1, K2, & K3) – 60 % in each part

Higher Order Thinking (K4, K5, & K6) – 40 % in each part

F. Semester End Examination Question Paper Pattern for the Theory Papers

- The Maximum Marks for Semester End Examination is 75 for UG.
- The question paper shall have three Parts with the maximum of 75 marks for three hours with the following break-up.

Part-A

Part-A shall contain **ten** Multiple Choice Questions drawn from all the units on the basis of two questions from each unit. Each question shall carry one mark ($10 \times 1 = 10$ Marks). Answer all the questions.

Part-B

Part-B shall contain **five** either or type questions drawn from all the 5 units. One either or type question from each unit. Each question shall carry 5 marks ($5 \times 5 = 25$ Marks). Answer all the questions.

Part-C

Part-C shall contain **five** either or type questions drawn from all the 5 units. One either or type question from each unit. Each question shall carry 8 marks ($5 \times 8 = 40$ Marks). Answer all the questions.

G. Marks for Practicals

- The Maximum Marks for Practical Examination is 100 for UG.
- External Mark Components 60 Marks - Practical Examination 45 Marks and Record 15 Marks.
- Internal Mark 40 Marks.

Model Question Paper
DESCRIPTIVE STATISTICS

Time: Three hours

Maximum: 75 marks

Section A ($10 \times 1 = 10$ marks)

Answer all questions

Choose the correct answer

1. Statistics is concerned with: (K2)

a) Presentation of data only	b) Collection of data only
c) Analysis and interpretation of data	d) All of the above
2. Which of the following is a ratio scale data? (K2)

a) Gender	b) Temperature in Celsius
c) Height of students	d) Ranking in a class
3. The graphical representation suitable for cumulative frequency is (K1)

a) Histogram	b) Frequency polygon
c) Ogive curve	d) Line diagram
4. The value that divides the data into two equal parts is called (K1)

a) Mean	b) Median
c) Mode	d) Geometric mean
5. The measure of dispersion that is least affected by extreme values is: (K2)

a) Standard Deviation	b) Quartile Deviation
c) Mean Deviation	d) Range
6. If $r = +1$, the correlation between two variables is (K2)

a) High	b) Perfect positive
c) Perfect negative	d) Moderate
7. In regression analysis, the two regression lines intersect at the point of (K1)

a) Mean values	b) Median values
c) Mode values	d) Origin
8. In a scatter diagram, if points are scattered without any trend, the correlation is: (K1)

a) Perfect positive	b) Perfect negative
c) Zero	d) High
9. For two attributes A and B, if $(AB) = (A)(B)/N$, then the attributes are: (K2)

a) Associated	b) Independent
c) Dependent	d) Consistent
10. Yule's coefficient of association is used in (K2)

a) Theory of attributes	b) Correlation analysis
c) Regression	d) Curve fitting

Section B ($5 \times 5 = 25$ marks)

Answer all questions

11. a) What are the various types of data? Give suitable examples for each type. (K2)
(OR)
b) Distinguish between Population and Sample. Explain different types of data with suitable examples. (K2)
12. a) Define Arithmetic Mean, Geometric Mean and Harmonic Mean. When is each most appropriate? (K2)
(OR)
b) Explain the concepts of Skewness and Kurtosis. How do they differ from measures of central tendency? (K2)

13. a) Compute Mean Deviation and Standard Deviation for the following data: 8, 10, 12, 14, 16, 18. Compare the results. (K3)

(OR)

- b) Explain the concept of Skewness and Kurtosis with suitable diagrams. (K3)

14. a) Fit a parabolic curve of the form $y = a + bx + cx^2$ to the following data using the method of least squares: (K4)

x	1	2	3	4	5
y	2	6	12	20	20

(OR)

- b) Evaluate the advantages and limitations of Spearman's Rank Correlation over Pearson's correlation coefficient. (K4)

15. a) State the principle of least squares. Explain its use in fitting a straight line. (K2)

(OR)

- b) Explain the concept of Association of Attributes and Yule's coefficient of association. (K2)

Section C (5×8 = 40 marks)

Answer all questions

16. a) Describe various methods of diagrammatic and graphic representation of data. Draw a Histogram and Ogive for the following frequency distribution: (K4)

Class	0-10	10-20	20-30	30-40	40-50
f	5	12	18	10	5

(OR)

- b) Discuss the origin and development of Statistics as a discipline. Highlight its importance in modern decision-making with examples. (K4)

17. a) For the following data, calculate Mean, Median, Quartiles and Coefficient of Variation:

22, 24, 26, 28, 30, 32, 35, 38, 40, 45. (K3)

(OR)

- b) Explain Partition Values (Quartiles, Deciles, Percentiles). Compute them for a given frequency distribution and interpret the results. (K3)

18. a) From the following data, compute Pearson's coefficient of correlation and the two regression equations:

X	10	12	15	18	20	25
Y	15	18	22	25	28	35

Also interpret the results. (K4)

(OR)

- b) Prove that the coefficient of correlation is the geometric mean of the regression coefficients. State the properties of regression coefficients. (K4)

(OR)

19. a) Fit a straight line ($y = a + bx$) to the following data using the method of least squares and estimate y when x=6. (K5)

(OR)

- b) Explain the method of fitting the exponential curve $y = ab^x$. State its applications in real life. (K5)

20. a) Compare the Principle of Least Squares with other curve fitting methods. Evaluate its importance in modern data analysis. (K4)

(OR)

- b) Explain the theory of attributes in detail. Discuss the concept of Association and Independence with examples. (K4)

H. Passing Minimum

The candidate shall be declared to have passed the examination if the candidates secure not less than 30 marks out of 75 marks in the semester examination in each theory course and in total (CIA mark + Theory Exam mark) not less than 40 marks.

The candidates shall be declared to have passed the examination if he/she secures not less than 40 marks in total (CIA mark + Practical Exam mark) with minimum of 18 marks out of 45 marks in the Practical Exam conducted by the University. There is no passing minimum for the record notebook. However, submission of the record notebook is necessary.

Candidate who does not obtain the required minimum marks for a pass in a Course/Practical shall be declared Re-Appear (RA) and the candidate has to appear and pass the same at a subsequent appearance.

SCHEME OF EXAMINATION

Sem. (1)	Pt. I/II/ III/ IV/ V (2)	Course No. (3)	Course Category (4)	Course Title (5)	Contact Hrs./week (6)	L Hrs. / week (7)	T Hrs. / week (8)	P Hrs. / week (9)	C Credits (10)
I	I	1	Language	Tamil	6	6	0	0	3
	II	2	Language	English	6	6	0	0	3
	III	3	Core - I	Descriptive Statistics	4	3	1	0	4
	III	4	Core - II	Probability Theory	4	3	1	0	4
	III	5	Elective - I	Mathematics for Statistics-I	4	4	0	0	3
	III	6	Practical-I	Statistics Practical - I	2	0	0	2	2
	IV	7	SEC- I (Skill Enhancement Course)	Basics of Statistics	2	2	0	0	2
	IV	8	Skill Enhancement (Foundation Course)	Office Automation	2	2	0	0	2
	Subtotal				30	26	2	2	23
II	I	9	Language	Tamil	6	6	0	0	3
	II	10	Language	English	6	6	0	0	3
	III	11	Core - III	Matrix and Linear Algebra	4	3	1	0	4
	III	12	Core - IV	Distribution Theory	4	3	1	0	4
	III	13	Elective – II	Real Analysis	4	4	0	0	3
	III	14	Practical - I	Statistics Practical-II	2	0	0	2	2
	IV	15	SEC - II (Skill Enhancement Course)	Mathematics for Statistics-II	2	2	0	0	2
	IV	16	SEC - III (Skill Enhancement Course)	Programming in C++	2	2	0	0	2
	IV	17	Naan Mudhalvan	Overview of English Communication	0	0	0	0	2
	Subtotal				30	26	2	2	25
III	I	18	Language	Tamil	6	6	0	0	3
	II	19	Language	English	6	6	0	0	3
	III	20	Core - V	Estimation Theory	5	3	1	0	5
	III	21	Core - VI	Sampling Techniques	5	3	1	0	5
	III	22	Elective - III	Numerical Methods (Discipline Specific)	4	4	0	0	3
	III	23	Digital Skills for Employability	Advanced Communication & Digital Skills	1	1	0	0	1
	IV	24	SEC- IV (Skill Enhancement Course)	Statistics Practical III	2	0	0	2	2
	IV	25	EVS	Environmental Studies	1	1	0	0	1
	Subtotal				30	24	2	2	23

IV	I	26	Language	Tamil	6	6	0	0	3
	II	27	Language	English	6	6	0	0	3
	III	28	Core - VII	Testing of Statistical Hypothesis	5	4	1	0	5
	III	29	Core - VIII	Actuarial Statistics	5	4	1	0	5
	III	30	Elective - IV	Economic & Official Statistics (Discipline Specific)	3	3	0	0	3
	III	31	SEC - V (Skill Enhancement Course)	Statistics Practical – IV	2	0	0	2	2
	IV	32	NM	Nann Mudhalvan	2	2	0	0	2
	IV	33	VE	Value Education	1	1	0	0	2
Subtotal					30	26	2	2	25
V	III	34	Core - IX	Stochastic Processes	5	4	1	0	4
	III	35	Core - X	Regression Analysis	5	4	1	0	4
	III	36	Core - XI	Statistics Practical - V	5	0	1	4	4
	III	37	Core - XII	Project with Viva voce	5	5	0	0	4
	III	38	Elective - V	Operations Research (Discipline Specific)	4	4	0	0	3
	III	39	Elective - VI	Econometrics / Population Studies	4	4	0	0	3
	IV	40	NM	Nann Mudhalvan	2	2	0	0	2
	IV	41	-	Internship / Industrial Training / Field visit / Knowledge updating	0	0	0	0	2
Subtotal					30	23	3	4	26
VI	III	42	Core - XIII	Design of Experiments	6	4	2	0	4
	III	43	Core - XIV	Demography	6	4	2	0	4
	III	44	Core - XV	Statistics Practical - VI	6	0	2	4	4
	III	45	Elective - VII	Statistical Quality Control	5	4	1	0	3
	III	46	Elective - VIII	Time Series / Index numbers	5	4	1	0	3
	IV	47	NM	Nann Mudhalvan	2	2	0	0	2
	IV	48	Extension activity	Extension Activity	0	0	0	0	1
Subtotal					30	18	8	4	21

Note:

- Statistics Practical – I : Based on the courses Descriptive Statistics and Probability Theory
- Statistics Practical – II : Based on the courses Matrix and Linear Algebra and Distribution Theory
- Statistics Practical – III : Based on the courses Estimation Theory and Sampling Techniques
- Statistics Practical – IV : Based on the courses Testing of Statistical Hypothesis and Actuarial Statistics
- Statistics Practical – V : Based on the courses Stochastic Processes and Regression Analysis
- Statistics Practical – VI : Based on the courses Design of Experiments and Demography

SYLLABUS

SEMESTER – I

1. TAMIL

2. ENGLISH

3. DESCRIPTIVE STATISTICS

Course Code		TITLE OF THE COURSE	L	T	P	C
Core		DESCRIPTIVE STATISTICS	3	1	0	4
Prerequisites		Basic knowledge of Statistics	Syllabus Version		2026-27	

L: Lecture T: Tutorial P: Practical C: Credits

Course Outcomes (COs):

At the end of this course of study, the student will be able to

CO No.	Course Outcome	Cognitive Level
CO1	Explain the origin, scope, limitations, misuses of statistics, population, sample, classification, tabulation, and types of data.	K1, K2
CO2	Represent statistical data using line diagrams, histograms, frequency polygons, frequency curves, and ogive curves; calculate measures of central tendency and dispersion.	K3
CO3	Compute and analyze correlation coefficients, rank correlation, simple linear regression equations, and curve fitting using least squares.	K4
CO4	Apply advanced statistical concepts such as theory of attributes, consistency, independence, association of attributes, and Yule's coefficient for real-world data analysis.	K5, K6
K1: Remember K2: Understand K3: Apply K4: Analyze K5: Evaluate K6: Create		

Course Outline:

Unit - I

Origin, scope, limitations and misuses of Statistics – Collection – Classification - Tabulation of data. Population and Sample - Types of Data – Nominal, ordinal, Interval and ratio. Diagrammatic and graphic representation of data: line diagram, frequency polygon, frequency curve, histogram and Ogive curves.

Unit - II

Measures of central tendency: mean, median, mode, geometric mean and harmonic mean. Partition values: Quartiles, Deciles and Percentiles. Measures of Dispersion: Mean

deviation, Quartile deviation and Standard deviation – Coefficient of variation. Skewness and Kurtosis.

Unit - III

Linear correlation - scatter diagram, Pearson's coefficient of correlation, computation of co-efficient of correlation from a bivariate frequency distribution, Rank correlation - Simple linear regression equations - properties of regression coefficients

Unit - IV

Curve fitting: principle of least squares, fitting of the curves of the form $y = a+bx$, $y = a+bx+cx^2$ and Exponential and Growth curves.

Unit – V

Theory of Attributes: Introduction – Definition-Classes and Class Frequencies-Consistency of data-Independence of attributes-Association of attributes-Yule's coefficient.

BOOKS FOR STUDY:

1. Gupta, S.C. and V.K. Kapoor (2020) Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Goon, A.M., M.K. Gupta and B. Das Gupta (2017) Fundamentals of Statistics- Vol. I. World Press Ltd, Kolkata.
3. Agarwal, B. L. (2013). Basic Statistics, New Age International Private Limited, New Delhi, India

BOOKS FOR REFERENCE:

1. Anderson, T.W. and Sclove, S.L. (1978) Introduction to Statistical Analysis of data, Houghton Mifflin, Boston.
2. Bhat, B.R., Srivenkataramna, T. and Madhava Rao, K.S. (1996) Statistics: A Beginner's Text, Vol. I, New Age International, New Delhi.
3. Croxton, F.E. and Cowden, D.J. (1969) Applied General Statistics, Prentice Hall, New Delhi.
4. Spiegel, M.R. and Stephens, L. (2010) Statistics, Schaum's Outline Series, Mc Graw Hill, New York.
5. Holcomb, Z. C. (2017). Fundamentals of Descriptive Statistics, Routledge, New York.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. <https://nptel.ac.in/courses/111/104/111104120/>
2. https://www.iiserpune.ac.in/~bhasbapat/phy221_files/curvefitting.pdf
3. <https://www.toppr.com/guides/maths/statistics/bar-graphs-and-histogram/>
4. <https://nptel.ac.in/courses/111/104/111104098/>

Mapping of Course Outcomes to Programme Outcomes and Mapping of Course Outcomes to Programme Specific Outcomes

	POs							PSOs						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
CO1	3	2	1	1	1	1	1	2	2	2	2	1	1	1
CO2	2	3	3	2	1	2	1	2	2	3	2	2	2	1
CO3	2	3	3	2	1	2	1	2	2	3	3	2	2	1
CO4	2	3	3	3	2	2	2	3	2	3	3	3	3	2
Total								9	8	11	10	8	8	5

4. PROBABILITY THEORY

Course Code		TITLE OF THE COURSE	L	T	P	C
Core		Probability Theory	3	1	0	4
Prerequisites		Basic knowledge of Probability and distributions	Syllabus Version		2026-27	

L: Lecture T: Tutorial P: Practical C: Credits

Course Outcomes (COs):

At the end of this course of study, the student will be able to

CO No.	Course Outcome	Cognitive Level
CO1	Explain the fundamental concepts of probability, random variables, probability distributions, multiple random variables, expectation, and limit theorems.	K1, K2
CO2	Apply probability theorems, random variable distributions, expectation concepts, and limit theorems to solve statistical and probabilistic problems.	K3
CO3	Analyze probability models, joint and conditional distributions, transformations of random variables, and convergence concepts for interpreting uncertain phenomena.	K4
CO4	Evaluate the appropriateness and effectiveness of probabilistic methods, distribution models, and limit theorems in solving practical and theoretical problems; create probabilistic models for real-life applications.	K5, K6
K1: Remember K2: Understand K3: Apply K4: Analyze K5: Evaluate K6: Create		

Course Outline:

Unit - I

Probability: sample space – Events - algebraic operations on events- definition of probability - independent events – conditional probability - addition and multiplication theorems of probability – Bayes Theorem.

Unit - II

Random variables: Discrete and continuous random variables – distribution function - properties – probability mass function and probability density function – discrete and continuous probability distributions.

Unit - III

Multiple random variables: Joint, marginal and conditional distribution functions - independence of random variables – transformation of random variables and their distribution functions.

Unit - IV

Mathematical expectation: Expectation – properties – Cauchy - Schwartz inequality, conditional expectation and conditional variance. Moment generating function, characteristic function, probability generating function and their properties. Chebyshev's inequality.

Unit - V

Limit Theorems: convergence in probability, weak law of large numbers – Bernoulli's theorem, Khintchine's theorem (statements only) - Central limit theorems with simple problems.

BOOKS FOR STUDY:

1. Bhat B.R. (2019) Modern Probability Theory, New Age International Publishers, New Delhi.
2. Gupta, S.C. and V.K. Kapoor (2020) Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
3. Goon, A.M., M. K. Gupta and B. Das Gupta (2017) Fundamentals of Statistics- Vol. I., World Press, Ltd, Kolkata.

BOOKS FOR REFERENCE:

1. Robert, V. Hogg, Joseph W. McKean and Allen T. Craig (2013) Introduction to Mathematical Statistics (Seventh Edition), Pearson Education, New York.
2. Lipschutz, S. (2008) Probability Theory (Second Edition), Schaum's Outline Series, McGraw Hill, New York.
3. Alexander, M. Mood, Franklin A. Graybill and Duane C. Boes (2017). Introduction to the Theory of Statistics (Third Edition), Mc Graw Hill Education, New Delhi.
4. Bhuyan K.C. (2010), Probability Distribution Theory and Statistical Inference, New Central Book Agency (P) Ltd., New Delhi.
5. Spiegel, M.R. and Ray, M. (1980) Theory and Problems of Probability and Statistics, Schaum's Outline Series, McGraw Hill, New York.
6. Rohatgi, V. K. and A. K. Md. E. Saleh (2009). An Introduction to Probability Theory and Mathematical Statistics (Second Edition). John Wiley & Sons, New York

Related Online MOOCs Contents [SWAYAM, NPTEL, Websites etc.]

1. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=+u3y6UdbIvOJ97LFeSCmHQ==>
P-01. Probability I
2. <https://nptel.ac.in/courses/111101004>
3. <https://nptel.ac.in/courses/111104079>

Mapping of Course Outcomes to Programme Outcomes and Mapping of Course Outcomes to Programme Specific Outcomes

	POs							PSOs						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
CO1	3	2	1	1	1	1	1	2	2	2	2	1	2	1
CO2	2	3	3	2	1	2	1	2	2	3	2	3	3	1
CO3	2	3	3	2	1	2	1	2	2	3	3	3	3	1
CO4	2	3	3	3	2	2	2	3	2	3	3	3	3	2
Total								9	8	11	10	10	11	5

5. MATHEMATICS FOR STATISTICS - I

Course Code		TITLE OF THE COURSE	L	T	P	C
Core		MATHEMATICS FOR STATISTICS	4	0	0	3
Prerequisites		Basic knowledge of Real number system and Calculus	Syllabus Version		2026-27	

Course Outcomes (COs):

At the end of this course of study, the student will be able to

CO No.	Course Outcome	Cognitive Level
CO1	Explain the fundamental concepts of tangents, normals, curvature, multiple integrals, Beta and Gamma functions, and differential equations.	K1, K2
CO2	Apply techniques of differential calculus, multiple integration, Beta and Gamma functions, and differential equations to solve mathematical problems.	K3

CO3	Analyze geometrical properties of curves, curvature, evolutes, involutes, multiple integrals, and differential equations for mathematical interpretation and problem solving.	K4
CO4	Evaluate the suitability and effectiveness of various calculus and differential equation methods in solving theoretical and applied mathematical problems; create mathematical models for real-life applications.	K5, K6
K1: Remember K2: Understand K3: Apply K4: Analyze K5: Evaluate K6: Create		

Course Outline:

Unit – I

Tangent and Normal-Direction of the tangent-Angle of intersection of curves-subtangent and subnormal - Differential coefficient of the length of an arc of $y=f(x)$ - Polar coordinates - Angle between the radius vector and the tangent-Polar subtangent and polar subnormal - Length of arc in polar coordinates.

Unit – II

Method of finding the envelop - Curvature - Circle, radius and centre of curvature - Cartesian formulae - Evolute and Involute - Radius of curvature when the curve is given in polar coordinates.

Unit – III

Multiple integrals - Evaluation of double integrals - Double integral in polar coordinates - Triple integrals - Applications of multiple integrals.

Unit – IV

Infinite integrals - Integrand becoming infinite at certain points in the interval of integration - Beta and Gamma functions - Properties of Beta functions - Relation between Beta and Gamma functions - Evaluation of integrals using Gamma functions.

Unit – V

Differential equations: Standard types of first order and first-degree equations. Variables separable, Homogeneous, Non-homogeneous equations and Linear equation. Equations of first order but of higher degree.

BOOKS FOR STUDY:

1. Narayanan, S. and Manicavachagom Pillay, T.K. (2015) Calculus Vol. I, S.Viswanathan (Printers publishers) Pvt. Ltd., Chennai.
2. Narayanan, S. and Manicavachagom Pillay, T.K. (2014) Calculus Vol. II, S.Viswanathan (Printers publishers) Pvt. Ltd., Chennai.
3. Narayanan, S. and Manicavachagom Pillay, T.K. (2015) Calculus Vol. III, S.Viswanathan (Printers publishers) Pvt. Ltd., Chennai.

BOOKS FOR REFERENCE:

1. P.Duraipandian and S.Udayabaskaran,(1997) Allied Mathematics, Vol. I & II. Muhil Publishers, Chennai
2. S.P.Rajagopalan and R.Sattanathan,(2005) Allied Mathematics.Vol. I & II. Vikas Publications, New Delhi.
3. P.Kandasamy, K.Thilagavathy (2003) Allied Mathematics Vol-I, II S.Chand & company Ltd., New Delhi-55.

Mapping of Course Outcomes to Programme Outcomes and Mapping of Course Outcomes to Programme Specific Outcomes

	POs							PSOs						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
CO1	3	2	1	1	1	1	1	2	2	2	2	1	2	1
CO2	2	3	3	2	1	2	1	2	2	3	2	3	3	1
CO3	2	3	3	2	1	2	1	2	2	3	3	3	3	1
CO4	2	3	3	3	2	2	2	3	2	3	3	3	3	2
Total								9	8	11	10	10	11	5

6. STATISTICS PRACTICAL – I

7. BASICS OF STATISTICS

Course Code		TITLE OF THE COURSE	L	T	P	C
Core		BASICS OF STATISTICS	2	0	0	2
Prerequisites		Knowledge of data basic Statistical tool	Syllabus Version		2026-27	

L: Lecture T: Tutorial P: Practical C: Credits

Course Outcomes (COs):

At the end of this course of study, the student will be able to

CO No.	Course Outcome	Cognitive Level
CO1	Explain the basic concepts of Statistics including data collection, classification, tabulation, graphical presentation, measures of central tendency, dispersion, correlation, regression, skewness, and kurtosis.	K1, K2
CO2	Apply statistical techniques such as frequency distribution, graphical representation, measures of central tendency,	K3

	dispersion, correlation, regression, and skewness to solve statistical problems.	
CO3	Analyze statistical data using measures of dispersion, correlation coefficients, regression analysis, skewness, and kurtosis for interpretation and decision-making.	K4
CO4	Evaluate the suitability and effectiveness of statistical methods and models in summarizing, analyzing, and interpreting quantitative data; create statistical solutions for real-life applications.	K5, K6
K1: Remember K2: Understand K3: Apply K4: Analyze K5: Evaluate K6: Create		

Course Outline:

UNIT - I

Nature and scope of Statistics - characteristics and limitation of Statistics - statistical investigation - preparation of questionnaire - Population and Sample - collection of data - primary and secondary data.

UNIT - II

Processing and presentation of data - Classification of data - tabulation of data - Formation of frequency tables - Diagrammatic presentation of statistical data - bar diagrams - pie diagrams and pictograms - simple problems - Graphical presentation of statistical data - Histogram, frequency curves - simple problems.

UNIT – III

Measures of Central tendency: Arithmetic Mean, Median, Mode. Measures of Dispersion: Range, Inter-Quartile Range, Standard Deviation and Coefficient of Variation.

UNIT IV

Simple Correlation- Scatter diagram - Properties of coefficient of correlation- Kendall's coefficient of correlation -Partial and Multiple correlation coefficients. Regression -regression coefficients and their properties-regression equations- Simple problems.

UNIT V

Concept of Skewness and Kurtosis - Karl Pearson's and Bowley's coefficients of Skewness- moments- coefficients of Skewness and Kurtosis - simple problems.

BOOKS FOR STUDY:

1. Goon, A.M., Gupta, M.K. and Dasgupta, B. (2017): Fundamentals of Statistics, Volume-I, World Press Ltd, Calcutta.
2. Gupta, S.C. and V.K. Kapoor. (2020): Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi.

BOOKS FOR REFERENCE:

1. Robert, V. Hogg, Joseph W. McKean and Allen T. Craig (2013) Introduction to Mathematical Statistics (Seventh Edition), Pearson Education, New York.

2. Spiegel, M.R., Schiller, J. and Srinivasan, R.A. (2012): Probability and Statistics, Schaum's Outline Series (Fourth Edition). McGraw- Hill Publishing Company, New Delhi.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. <https://nptel.ac.in/courses/111/104/111104120>.
2. https://www.iiserpune.ac.in/~bhasapat/phy221_files/curvefitting.pdf.
3. <https://www.toppr.com/guides/maths/statistics/bar-graphs-and-histogram>.
4. <https://nptel.ac.in/courses/111/104/111104098>.

Mapping of Course Outcomes to Programme Outcomes and Mapping of Course Outcomes to Programme Specific Outcomes

	POs							PSOs						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
CO1	3	2	1	1	1	1	1	2	2	2	2	1	1	1
CO2	2	3	3	2	1	2	1	2	2	3	2	2	2	1
CO3	2	3	3	2	1	2	1	2	2	3	3	2	2	1
CO4	2	3	3	3	2	2	2	3	2	3	3	3	3	2
Total								9	8	11	10	8	8	5

8. OFFICE AUTOMATION

Course Code		TITLE OF THE COURSE	L	T	P	C
Core		OFFICE AUTOMATION	2	0	0	2
Prerequisites		Basics of Computers	Syllabus Version		2026-27	

L: Lecture T: Tutorial P: Practical C: Credits

Course Outcomes (COs):

At the end of this course of study, the student will be able to

CO No.	Course Outcome	Cognitive Level
CO1	Explain the fundamental concepts of computers, generations of computers, software, programming languages, input/output devices, and MS Office applications.	K1, K2
CO2	Apply the features of MS Word, MS Excel, and MS PowerPoint for document preparation, data processing, graphical representation, and presentation design.	K3
CO3	Analyze computer applications, software utilities, spreadsheet functions, and presentation tools for efficient information management and problem solving.	K4

CO4	Evaluate the suitability and effectiveness of computer software and MS Office applications in handling academic, business, and professional tasks; create professional documents, spreadsheets, charts, and multimedia presentations for real-life and organizational applications.	K5, K6
K1: Remember K2: Understand K3: Apply K4: Analyze K5: Evaluate K6: Create		

Course Outline:

UNIT - I

Introduction to Computer: Introduction - Types of computers - Characteristics of Computers. Generations of Computers: First Generation - Second Generation - Third Generation - Fourth Generation - Fifth Generation.

UNIT - II

Computer Software: Introduction - Operating System - Utilities - Compiler and Interpreters – Programming Languages: High level language - Types of High-Level Language. Input Devices: Output Devices.

UNIT - III

MS-Office: Text Manipulations - Usage of Numbering, Bullets, Footer and Headers - Usage of Spell check, Find & Replace - Text Formatting - Picture insertion and alignment - Creation of documents, using templates - Formatting a Table - Mail Merge Concepts.

UNIT - IV

MS-EXCEL: Cell Editing - Usage of Formulae and Built-in Functions - File Manipulations - Data Sorting (both number and alphabets) - Creating Graphs

UNIT - V

MS-POWER POINT: Inserting Clip arts and Pictures - Frame movements of Clip arts and Pictures - Insertion of new slides - Preparation of Organization Charts - Presentation using Wizards - Usage of design templates, Case Studies: Designing Advertisement and Document creation with special features like header, footer, tables, etc -PowerPoint presentation on various concepts.

BOOKS FOR STUDY:

1. Alexis Leon and Mathews Leon, "Fundamentals of Computer Science and Communication Engineering", Leon Tech world, 1998.
2. Joyce Cox and Team, "Step by Step 2007 Microsoft Office System", PHI Learning Private limited, New Delhi, 2009.

BOOKS FOR REFERENCE:

1. B.Ram and Sanjay Kumar, "Computer Fundamentals", 5th Edition, New Age International Publishers, 2014.
2. Anita Goel, "Computer Fundamentals", 1st Edition, Pearson Education India, 2010.
3. Peter Weverka, "MS Office 2013 All-in-One for Dummies", 1st Edition, Wiley Publications, 2013.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. <https://www.msuniv.ac.in/images/econtent/6.Computer%20%20Fundamentals%20and%20Office%20Automation.pdf>
2. <https://www.wileyindia.com/computer-basics-with-office-automation.html>
3. <https://support.microsoft.com/en-us/office/create-a-cross-reference-300b208c-e45a-487a-880ba02767d9774b>
4. <https://www.informit.com/articles/article.aspx?p=170392>

Mapping of Course Outcomes to Programme Outcomes and Mapping of Course Outcomes to Programme Specific Outcomes

	POs							PSOs						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
CO1	3	1	1	1	1	3	1	1	2	1	1	1	1	2
CO2	2	2	3	2	1	3	1	1	3	2	1	1	2	2
CO3	2	3	2	2	1	3	1	1	3	2	2	1	2	2
CO4	2	3	2	3	2	3	2	1	2	2	2	2	2	2
Total								4	10	7	6	5	7	8

SEMESTER – II**9. TAMIL****10. ENGLISH****11. MATRIX AND LINEAR ALGEBRA**

Course Code		TITLE OF THE COURSE	L	T	P	C
Core		MATRIX AND LINEAR ALGEBRA	3	1	0	4
Prerequisites		Knowledge of Algebra, vector and Arithmetic Operation	Syllabus Version		2026-27	

L: Lecture T: Tutorial P: Practical C: Credits

Course Outcomes (COs):

At the end of this course of study, the student will be able to

CO No.	Course Outcome	Cognitive Level
CO1	Explain the fundamental concepts of matrices, matrix operations, vector spaces, rank, linear dependence, characteristic roots, and Cayley-Hamilton theorem.	K1, K2
CO2	Apply matrix operations, inverse techniques, elementary transformations, rank methods, and characteristic equations to solve algebraic problems.	K3
CO3	Analyze vector spaces, linear dependence, matrix rank, characteristic roots, and matrix transformations for mathematical interpretation and problem solving.	K4
CO4	Evaluate the properties and applications of matrices, vector spaces, and characteristic roots in solving theoretical and practical linear algebra problems; create mathematical models and solutions using matrices, vector spaces, eigenvalues, eigenvectors, and matrix polynomial techniques.	K5, K6
K1: Remember K2: Understand K3: Apply K4: Analyze K5: Evaluate K6: Create		

Course Outline:

UNIT - I

Matrices-Transpose-Conjugate transpose- Reversal law for the transpose and conjugate transpose. Adjoint of a matrix, Inverse of a matrix, Singular and Non -Singular matrices.

UNIT - II

Reversal law for the inverse of product of two matrices. Commutativity of inverse and transpose of matrix, Commutativity of inverse and conjugate transpose of matrix, Orthogonal and Unitary Matrices, Product of unitary matrices, Partitioning of matrices.

UNIT - III

Rank of a matrix, Echelon form, Rank of transpose, Elementary transformations, Elementary matrices, Invariance of rank through elementary transformations, Reduction to Normal form, Equivalent matrices.

UNIT - IV

Vector space – Linear Dependence - Basis of a vector space –Sub-space - Properties of Linearly Independent and Dependent systems, Row and Column spaces, Equality of Row and Column ranks, Rank of Sum and Product of matrices

UNIT - V

Matrix polynomials, Characteristic roots and vectors, Relation between characteristic roots and characteristic vectors, Algebraic and Geometric multiplicity, Nature of characteristic roots in case of special matrices, Cayley- Hamilton theorem.

BOOKS FOR STUDY:

1. Vasishtha, A.R. (2014) Matrices, Krishna Prakashan, Meerut.
2. Shanthi Narayan. and Mittal, P.K. (2000) A Text Book of Matrices, S.Chand & Co, New Delhi.

BOOKS FOR REFERENCE:

1. Narayanan and T. K. Manickavachagam Pillai – Ancillary Mathematics, Vol. II, S. Viswanathan Pvt. Ltd, Chennai.
2. Gentle, J.E. (2007) Matrix Algebra Theory, Computations, and Applications in Statistics, Springer, New York.
3. Richard Bronson. (2011) Matrix Operations, Schaum's Outline Series, McGraw Hill, New York.
4. Searle, S. R. (2006) Matrix Algebra useful for Statistics, Wiley Interscience, New York.
5. M.L. Khanna (2009), Matrices, Jai Prakash Nath & Co.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. e-books, tutorials on MOOC/SWAYAM courses on the subject
2. <https://samples.jbpub.com/9781556229114/chapter7.pdf>
3. <https://www.vedantu.com/maths/matrix-rank>
4. <https://textbooks.math.gatech.edu/ila/characteristic-polynomial.html>
5. <https://www.aitude.com/explain-echelon-form-of-a-matrix/>

Mapping of Course Outcomes to Programme Outcomes and Mapping of Course Outcomes to Programme Specific Outcomes

	POs							PSOs						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
CO1	3	2	2	1	1	1	1	1	1	2	1	1	3	1
CO2	2	3	3	2	1	2	1	1	1	1	2	2	2	3
CO3	2	3	3	2	1	2	1	1	1	1	3	2	2	3
CO4	2	3	3	3	2	2	2	2	1	3	2	3	3	2
Total								5	4	7	8	8	10	9

12. DISTRIBUTIONS THEORY

Course Code		TITLE OF THE COURSE	L	T	P	C
Core		DISTRIBUTIONS THEORY	3	1	0	4

Prerequisites	Knowledge of Probability Theory and Distributions	Syllabus Version	2026-27
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L: Lecture T: Tutorial P: Practical C: Credits

Course Outcomes (COs):

At the end of this course of study, the student will be able to

CO No.	Course Outcome	Cognitive Level
CO1	Explain the fundamental concepts of probability distributions, transformations of random variables, discrete and continuous distributions, and sampling distributions.	K1, K2
CO2	Apply methods of transformations, probability distributions, generating functions, and sampling distributions to solve statistical and probabilistic problems.	K3
CO3	Analyze the properties and behavior of discrete, continuous, and sampling distributions using moments, generating functions, and characteristic functions.	K4
CO4	Evaluate the suitability and effectiveness of various probability and sampling distributions in modeling and interpreting statistical phenomena; create probabilistic and statistical models for real-life applications.	K5, K6
K1: Remember K2: Understand K3: Apply K4: Analyze K5: Evaluate K6: Create		

Course Outline:

Unit - I

Distributions of functions of one-dimensional and two-dimensional random variables – Distribution function method, Transformations and Moment generating function method.

Unit - II

Discrete distributions: Bernoulli, Binomial, Poisson, Geometric and Negative binomial distributions - Multinomial distribution. Moments – probability generating function, moment generating function, characteristic function and properties.

Unit - III

Continuous distributions: Uniform, Normal, Cauchy and Lognormal distributions - concepts, moments, moment generating function, characteristic function and properties.

Unit - IV

Exponential, Gamma, Beta (first and second kinds) concepts, moments, moment generating function, characteristic function and properties.

Unit - V

Sampling distributions: *Chi-square*, *t* and *F* distributions- concepts, moments, moment generating function, characteristic function and properties.

BOOKS FOR STUDY:

1. Goon, A. M., M.K. Gupta, and B. Dasgupta (2002) Fundamentals of Statistics, Vol. I, (Third Edition), World Press Ltd, Kolkata.
2. Alexander, M. Mood, Franklin A. Graybill and Duane C. Boes (2017). Introduction to the Theory of Statistics (Third Edition), Mc Graw Hill Education, New Delhi.

BOOKS FOR REFERENCE:

1. Bhuyan K.C. (2010), Probability Distribution Theory and Statistical Inference, New Central Book Agency (P) Ltd., New Delhi.
2. Gupta, S. C., and V. K. Kapoor (2020) Fundamentals of Mathematical Statistics, (Twelfth Edition). Sultan Chand & Sons, New Delhi.
3. Robert, V. Hogg, Joseph W. McKean and Allen T. Craig (2013) Introduction to Mathematical Statistics (Seventh Edition), Pearson Education, New York.
4. Rohatgi, V. K. and A. K. Md. E. Saleh (2009). An Introduction to Probability Theory and Mathematical Statistics (Second Edition). John Wiley & Sons, New York.

Related Online MOOCs Contents [SWAYAM, NPTEL, Websites etc.]

1. https://swayam.gov.in/nd2_cec20_ma01/preview
2. <https://nptel.ac.in/courses/111/104/111104032/>

Mapping of Course Outcomes to Programme Outcomes and Mapping of Course Outcomes to Programme Specific Outcomes

	POs							PSOs						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
CO1	3	2	1	1	1	1	1	2	2	2	2	1	2	1
CO2	2	3	3	2	1	2	1	2	2	3	2	3	3	1
CO3	2	3	3	2	1	2	1	2	2	3	3	2	2	1
CO4	2	3	3	3	2	2	2	3	2	3	3	3	3	2
Total								9	8	11	10	9	10	5

13. REAL ANALYSIS

Course Code		TITLE OF THE COURSE	L	T	P	C
Core		REAL ANALYSIS	4	0	0	3
Prerequisites		Knowledge of multivariate calculus and linear algebra and basic set theory	Syllabus Version		2026-27	

L: Lecture T: Tutorial P: Practical C: Credits

Course Outcomes (COs):

At the end of this course of study, the student will be able to

CO No.	Course Outcome	Cognitive Level
CO1	Explain the fundamental concepts of sequences, series, limits, continuity, differentiability, and integrability of real functions.	K1, K2
CO2	Apply techniques of limit evaluation, convergence tests, continuity, differentiation, and integration to solve mathematical problems.	K3
CO3	Analyze sequences, series, and functions for convergence, differentiability, integrability, and apply theorems to interpret results.	K4
CO4	Evaluate the suitability and effectiveness of real analysis methods in solving theoretical and applied problems; create solutions using sequences, series, and function analysis.	K5, K6
K1: Remember K2: Understand K3: Apply K4: Analyze K5: Evaluate K6: Create		

Course Outline:

Unit - I

Operations on sets, Functions, Real valued functions, Equivalence, Countability, Real Numbers, Cantor set, Least Upper Bounds, Greatest Lower Bound.

Unit - II

Definition of Sequence, Subsequence, Limit of a sequence, Convergent and Divergent sequences, Oscillating sequence, Bounded and Monotone sequences, Operations on convergent sequences, Limit Infimum, Limit Supremum, Cauchy sequences, Summability of sequences.

Unit - III

Definition of Series, Convergent and Divergent series, series with nonnegative terms, alternating series, conditional convergence, absolute convergences and test for absolute convergence

Unit - IV

Limit of a function on the real line, Increasing and Decreasing functions, Continuous function, Operations on continuous functions, Composition of continuous functions, Derivatives, Derivative and continuity, Rolle's Theorem, Mean value theorem, Taylor's theorem

Unit - V

Concept of Riemann Integral, Refinement of partition, Upper and Lower sums, Upper integral and Lower Integral Riemann integrability, Necessary and Sufficient condition for Riemann integrable, Properties of Riemann integrals, Fundamental theorem.

BOOKS FOR STUDY:

1. Goldberg. R R (1976): Methods of Real Analysis, Oxford & IBH.
2. Ranjit Singh and Arora, First course in Real Analysis, Sultan Chand, 1974.
3. Narayanan and Manickavasagam pillai, Ancillary Mathematics, 2009.

BOOKS FOR REFERENCE:

1. Shanthinarayan, (2012): Real Analysis, S. Chand & Co, New Delhi
2. Walter Rudin (2017), Principles of Mathematical Analysis, 3rd Edition, McGraw-Hill

Related Online MOOCs Contents [SWAYAM, NPTEL, Websites etc.]

1. <https://tutorial.math.lamar.edu/classes/calci/thelimit.aspx>
2. <https://www.mathsisfun.com/calculus/derivatives-introduction.html>
3. <https://www.math.ucdavis.edu/~hunter/m125b/ch1.pdf>
4. <https://math.hmc.edu/calculus/hmc-mathematics-calculus-online-tutorials/single-variable-calculus/taylors-theorem/>
5. <http://www.ms.uky.edu/~droyster/courses/fall06/PDFs/Chapter06.pdf>

Mapping of Course Outcomes to Programme Outcomes and Mapping of Course Outcomes to Programme Specific Outcomes

	POs							PSOs						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
CO1	3	2	1	1	1	1	1	2	2	2	2	1	2	1
CO2	2	3	3	2	1	2	1	2	2	3	2	3	3	1
CO3	2	3	3	2	1	2	1	2	2	3	3	2	2	1
CO4	2	3	3	3	2	2	2	3	2	3	3	3	3	2
Total								9	8	11	10	9	10	5

14. STATISTICS PRACTICAL – II**15. MATHEMATICS FOR STATISTICS - II**

Course Code		TITLE OF THE COURSE	L	T	P	C
Core		MATHEMATICS FOR STATISTICS-II	2	0	0	1
Prerequisites		Basic knowledge of theory of equations and Calculus	Syllabus Version		2026-27	

L: Lecture T: Tutorial P: Practical C: Credits

Course Outcomes (COs):

At the end of this course of study, the student will be able to

CO No.	Course Outcome	Cognitive Level
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CO1	Explain the fundamental concepts of theory of equations, differentiation, maxima and minima, differential equations, Laplace transforms, and integration techniques.	K1, K2
CO2	Apply methods of differentiation, integration, Laplace transforms, and differential equations to solve mathematical problems and applications.	K3
CO3	Analyze algebraic equations, maxima and minima problems, differential equations, and integration techniques for mathematical interpretation and problem solving.	K4
CO4	Evaluate the suitability and effectiveness of analytical methods, transformation techniques, and integration procedures in solving theoretical and applied mathematical problems; create mathematical models for advanced applications.	K5, K6
K1: Remember K2: Understand K3: Apply K4: Analyze K5: Evaluate K6: Create		

Course Outline:

Unit - I

Theory of Equations: Nature of roots, Formulation of equation whose roots are given. Relation between coefficients and roots - Transformation of equations.

Unit - II

Successive differentiation – Trigonometrical transformations - Leibnitz's Formulas, n th derivative of standard functions - simple problems. Partial differentiation – Successive partial differentiation.

Unit - III

Maxima and Minima for one variable – Applications – Concavity, Convexity and points of inflexion - Maxima and Minima for two variables – working rule.

Unit – IV

Linear differential equations of second order with constant coefficients - $(aD^2+bD+c)y = X$, various forms of X : $e^{\alpha x}$, $\cos ax$, $\sin ax$, x^n . Methods of solving homogeneous linear differential equations of second order. Laplace transform and its inverse – solving ordinary differential equation with constant coefficients using Laplace transform.

Unit - V

Integration- Reverse process of differentiation – Methods of integration - Integrals of functions containing linear functions of x - Integrals of functions involving $a^2 \pm x^2$ - Integration of rational algebraic functions - $1/(ax^2+bx+c)$, $(px+q)/(ax^2+bx+c)$. Integration of irrational functions - $1/(ax^2+bx+c)^{1/2}$, $(px+q)/(ax^2+bx+c)^{1/2}$, $(px+q)\sqrt{(ax^2+bx+c)}$ - Integration by parts.

BOOKS FOR STUDY:

1. Narayanan, S., Hanumantha Rao and T.K. Manicavachagom Pillay (2008) Ancillary Mathematics, Volume I, S. Viswanathan Pvt. Ltd, Chennai.

- Narayanan, S. and T.K. Manicavachagom Pillay (2015) Calculus Vol. I, II and III, S. Viswanathan Pvt. Ltd, Chennai.

BOOKS FOR REFERENCE:

- P.Kandasamy, K.Thilagavathy (2003) Allied Mathematics Vol-I, II S.Chand & company Ltd., New Delhi-55.
- P.Duraipandian and S.Udayabaskaran,(1997) Allied Mathematics, Vol. I & II. Muhil Publishers, Chennai
- S.P.Rajagopalan and R.Sattanathan,(2005) Allied Mathematics.Vol. I & II. Vikas Publications, New Delhi.

Related Online MOOCs Contents [SWAYAM, NPTEL, Websites etc.]

- <https://www.youtube.com/watch?v=-OITic9HeUQ>
- https://mathinsight.org/integration_applications
- <https://ocw.mit.edu/ans7870/resources/Strang/Edited/Calculus/Calculus.pdf>
- https://www.sac.edu/FacultyStaff/HomePages/MajidKashi/PDF/MATH_150/Bus_Calculus.pdf

Mapping of Course Outcomes to Programme Outcomes and Mapping of Course Outcomes to Programme Specific Outcomes

	POs							PSOs						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
CO1	3	2	2	1	1	1	1	1	1	2	1	1	3	1
CO2	2	3	3	2	1	2	1	2	2	3	2	2	2	3
CO3	2	3	3	2	1	2	1	2	2	3	3	2	2	3
CO4	2	3	3	3	2	2	2	3	2	3	3	3	3	2
Total								8	7	11	9	8	10	9

16. PROGRAMMING IN C++

Course Code		TITLE OF THE COURSE	L	T	P	C
Core		PROGRAMMING IN C++	2	0	0	2
Prerequisites		Basic knowledge Office Automation	Syllabus Version		2026-27	

L: Lecture T: Tutorial P: Practical C: Credits

Course Outcomes (COs):

At the end of this course of study, the student will be able to

CO No.	Course Outcome	Cognitive Level
CO1	Explain the fundamental concepts of object-oriented programming, classes, objects, inheritance, polymorphism, templates, exception handling, and file handling in C++.	K1, K2
CO2	Apply C++ programming concepts such as functions, classes, operator overloading, inheritance, pointers, and file operations to develop programs for computational problems.	K3
CO3	Analyze object-oriented design principles, inheritance structures, polymorphism, dynamic memory allocation, and exception handling techniques for efficient program development.	K4
CO4	Evaluate the suitability and effectiveness of object-oriented programming techniques and C++ features in solving real-world software development problems; create efficient C++ applications using OOP concepts, templates, file processing, and exception handling.	K5, K6
K1: Remember K2: Understand K3: Apply K4: Analyze K5: Evaluate K6: Create		

Course Outline:

Unit – I

Introduction to C++ - key concepts of Object-Oriented Programming –Advantages – Object Oriented Languages –I/O in C++ - C++ Declarations. Control Structures: - Decision Making and Statements: If ...else, jump, goto, vbreak, continue, Switch case statements - Loops in C++: for, while, do - functions in C++ - inline functions – Function Overloading.

Unit - II

Classes and Objects: Declaring Objects – Defining Member Functions – Static Member variables and functions – array of objects –friend functions – Overloading member functions – Bit fields and classes – Constructor and destructor with static members.

Unit – III

Operator Overloading: Overloading unary, binary operators – Overloading Friend functions – type conversion – Inheritance: Types of Inheritance – Single, Multilevel, Multiple, Hierarchal, Hybrid, Multi path inheritance – Virtual base Classes – Abstract Classes.

Unit – IV

Pointers – Declaration – Pointer to Class, Object – this pointer – Pointers to derived classes and Base classes – Arrays – Characteristics – array of classes – Memory models – new and delete operators – dynamic object – Binding, Polymorphism and Virtual Functions.

Unit – V

Files – File stream classes – file modes – Sequential Read / Write operations – Binary and ASCII Files – Random Access Operation – Templates – Exception Handling - String – Declaring and Initializing string objects – String Attributes – Miscellaneous functions.

BOOKS FOR STUDY:

1. Narayanan,S., Hanumantha Rao and T.K. Manicavachagom Pillay (2008) Ancillary Mathematics, Volume I, S. Viswanathan Pvt. Ltd, Chennai.
2. Narayanan, S. and T.K. Manicavachagom Pillay (2015) Calculus Vol. I, II and III, S. Viswanathan Pvt. Ltd, Chennai.

BOOKS FOR REFERENCE:

1. E. Balagurusamy, “Object-Oriented Programming with C++”, TMH 2013, 7th Edition.
2. The C++ programming language, Bjarne Stroustrup, Pearson publications.
3. Object Oriented Programming in C++ by N.Barkakati, PHI.
4. Herbert Schildt (2003), “C++: The Complete Reference”, Tata McGraw publication.

Related Online MOOCs Contents [SWAYAM, NPTEL, Websites etc.]

1. https://onlinecourses.nptel.ac.in/noc20_cs07/preview
2. https://onlinecourses.nptel.ac.in/noc20_cs91/preview
3. https://onlinecourses.nptel.ac.in/noc22_cs103/preview
4. https://onlinecourses.nptel.ac.in/noc23_cs121/preview

Mapping of Course Outcomes to Programme Outcomes and Mapping of Course Outcomes to Programme Specific Outcomes

	POs							PSOs						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
CO1	3	2	2	1	1	2	1	1	2	3	2	2	3	2
CO2	2	3	3	2	1	3	1	2	2	3	2	2	3	1
CO3	2	3	3	2	1	3	1	2	2	3	3	2	3	1
CO4	2	3	3	3	2	3	2	3	2	3	3	3	3	2
Total								8	8	12	10	9	12	6