PSGR
Krishnammal College for Women
Affiliated to Bharathiar University \ Autonomous \ College of Excellence \ Accredited with A++ Grade \ Ranked 9th in NIRF

B.Sc. Mathematics (Aided & Self Supporting)

SYLLABUS

CHOICE BASED CREDIT SYSTEM (CBCS) &
LEARNING OUTCOME- BASED CURRICULUM FRAMEWORK (LOCF)

2025- 2028 Batch

SEMESTER I

PSGR Krishnammal College For Women

Department of Mathematics

Programme: B.Sc. Mathematics

2025 - 2028 Batch

Programme Educational Objectives

Program Educational Objectives of **B.Sc. Mathematics** Programme is to enable the students to possess the following knowledge and skills

1. **Mathematical knowledge**

   - ❖ The ability to demonstrate an understanding of the foundations of calculus, analysis and linear algebra as well as the ability to think logically and critically.
   - ❖ The ability to explore the new emerging areas of science and engineering like Nonlinear Dynamics, Computational Mathematics and Cryptography.
   - ❖ The ability to abstract general principles from examples.

2. **Problem solving skills**

   - ❖ The ability to formulate, analyses, and solve problems through analytical and computational techniques and apply them to other disciplines when appropriate.
   - ❖ The ability to plan, analyse and investigate industrial and societal problems using simulation tools and scientific computing

3. **Research skills**

   - ❖ The ability to search for, locate, extract, organise, evaluate and use or present information that is relevant to a particular topic.
   - ❖ The ability to carry out interdisciplinary research among the various basic sciences and engineering disciplines

4. **Communication skills**
   - ❖ The ability to Display competence in oral, written, and visual communication with the help of relevant current technology
5. **IT skills**
   - ❖ The ability to acquire necessary computer skills and knowledge to excel in their professional career in related disciplines

6. **Employable skills**

   - ❖ The ability to translate their degree into a viable career path with the using their mathematical and statistical skills
   - ❖ The ability to become leaders in their associated organization with team building and managing capabilities

PSGR Krishnammal College for Women

Department of Mathematics

Programme: B.Sc. Mathematics

Programme Learning Outcomes

B.Sc. Mathematics will enable the students to be successful in

- A career that uses Mathematics in business, industry or government
- Teaching Mathematics at all levels
- Carrying out research in Mathematics or fields related to Mathematics.
- Competitive examinations like GATE, GRE, SET/NET, TNPSC, UPSC etc.

On the successful completion of the Programme, the following are the expected outcomes.

PLO Number	PLO Statement
PLO1.	**Disciplinary Knowledge** - Capability of demonstrating comprehensive knowledge of mathematics and understanding of one or more discipline.
PLO2.	**Communication Skills** -Ability to use mathematics as a precise language of communication in other branches of human knowledge
PLO3.	**Critical thinking and analytical reasoning** - Ability to employ critical thinking, analyze the results and apply them in various problems appearing in different branches of mathematics.
PLO4.	**Information/digital literacy -** Capability to use appropriate software's to mathematical investigations and problem solving
PLO5.	**Self-directed learning:** Ability to work independently and do in-depth study of various notions of mathematics.
PLO6.	**Problem solving:** -. Capability to solve various models such as growth and decay models, radioactive decay model, drug assimilation, LCR circuits and population network flow problems and to provide new solutions using the domain knowledge of mathematics acquired during this programme.
PLO7.	**Lifelong learning:** Ability to think, acquire knowledge and skills through logical reasoning and to inculcate the habit of self-learning.

Bachelor of Science in Mathematics
Choice Based Credit Sysytem(CBCS)
Learning Outcomes Based Curriculum Framework (LOCF)
Scheme and Syllabus of 2025-2028 Batch
Semester I

Semester	Par	Course Code	Title of the Course	Course Types	Instruction hours per week	Contact Hours	Tutorial Hours	Duration of Examination (in hours)	Examination Marks			Credits
									CA	ESE	TOTAL	
I	I	TAM2501/ HIN2501/ FRE2501	Tamil Paper I/ Hindi Paper I / French Paper I	L	6	88	2	3	25	75	100	3
	II	ENG2501	English Paper I	E	6	88	2	3	25	75	100	3
	III	TH25C01	Advanced Calculus with SCILAB	CC	5	73	2	3	25	75	100	4
	III	TH25C02	Differential Equations and Vector Analysis with SCILAB	CC	5	73	2	3	25	75	100	4
	III	TH24A01	Mathematical Statistics – I with R	GE	6	88	2	3	25	75	100	5
	IV	NME25B1 NME25A1	Basic Tamil I Advanced Tamil I	AEC	2	28	2	-	100	-	100	2
		NME23ES	Introduction to Entrepreneurship	AEC	2	30	-	-	100	-	100	
I-II	VI	NM25GAW	General Awareness	AECC	SS	-	-	-	100	-	100	Gr.
I-II	VI	COM25SER	Community Services 30 Hours	GC	-	-	-	-	-	-	-	-
I - V	VI	24BONL1 24BONL2 24BONL3	Online course I Online course II Online course III	ACC	-	-	-	-	-	-	-	-

L – Language
CC –Core Courses
GE –Generic Elective
AEC – Ability Enhancement Course
AECC – Ability Enhancement Compulsory Course

E- English
CA – Continuous Assessment
ESE – End Semester Examination
ACC - Additional Credit Course
GC - General Course
Gr. – Grade

The weightage assigned to various components of the CA is as follows

a. Language, English, Core & Allied – 25 Marks

CIA Test	:	5 Marks **(conducted for 45 marks after 50 days – 3 units)**
Model Exam	:	7 Marks **(Conducted for 75 marks after 85 days (Each Unit 15 Marks))**
Seminar/Assignment/Quiz	:	5 Marks
Class Participation	:	5 Marks
Attendance	:	3 Marks (Attendance 76% - 80% - 1 Mark, 81% - 90% - 2 Marks, 91% - 100% - 3 Marks
Total	**:**	**25 Marks**

Introduction to Entrepreneurship

Quiz	:	50 Marks
Assignment	:	25 Marks
Project / Case study	:	25 Marks
Total	**:**	**100 Marks**

Question paper pattern and distribution of marks for CA

Language and English - UG

Section A	5 x 1 (No choice)	:	5 Marks
Section B	4 x 5 (4 out of 6)	:	20 Marks (250 words)
Section C	2 x 10 (2 out of 3)	:	20 Marks (500 words)
	Total	**:**	**45 Marks**

Core and Allied - (First 3 Units)

CA Question from each unit comprising of

One question with a weightage of 2 Marks :2 x 3 = 6

One question with a weightage of 5 Marks (Internal Choice at the same CLO level) :5 x 3=15

One question with a weightage of 8 Marks (Internal Choice at the same CLO level) :8 x 3=24

Total : 45 Marks

Model / End Semester Examination – Question Paper Pattern and Distribution of Marks

Language and English

Section A	10 x 1 (10 out of 12)	:	10 Marks
Section B	5 x 5 (5 out of 7)	:	25 Marks (250 words)
Section C	4 x 10 (4 out of 6)	:	40 Marks (600 - 700 words)
	Total	**:**	**75 Marks**

Core and Allied courses: 5 x 15 = 75 Marks

Questions from each unit comprising of

One question with a weightage of 2 Marks : 2 x 5=10

One question with a weightage of 5 Marks (Internal Choice at the same CLO level): 5 x 5=25

One question with a weightage of 8 Marks (Internal Choice at the same CLO level): 8 x 5=40

Total : 75 Marks

b. Advanced Tamil & Basic Tamil

CIA	: 25 Marks **(conducted for 50 marks after 50 days)**
Model	: 50 marks **(conducted for 75 marks after 50 days)**
Quiz	: 15Marks
Assignment	: 10 Marks
Total	**: 100 Marks**

COURSE CODE	COURSE TITLE	Category	L	T	P	Credit
TH25C01	ADVANCED CALCULUS WITH SCILAB	Theory	73	2	-	4

Preamble

- To provide fundamentals of differentiation and integration and show their significant role in physical, economical and industrial world

Prerequisite

Knowledge of limits, Differential derivatives and related formulas

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1.	Recall the basic concepts of calculus, curvature, evolutes, envelops and asymptotes	K1
CLO2.	Understand and translate integrals of physical problems	K2
CLO3.	Analyze special functions like Beta and Gamma to evaluate multiple integrals	K3
CLO4.	Apply and solve physical problems using Laplace Transform	K4

Mapping with Programme Learning Outcomes

CLOS/PLOS	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1.	S	M	S	S	S	S	S
CLO2.	S	M	S	S	S	S	S
CLO3.	S	M	S	S	S	S	S
CLO4.	S	M	S	S	S	S	S

S- Strong; M-Medium

Syllabus

Advanced Calculus with SCILAB

Credits: 4 **Hours:73**

UNIT I **14 hrs**

Total differentiation – Euler's theorem on homogeneous functions - Curvature – Radius of curvature in Cartesian and polar forms – Evolutes and envelopes – Pedal equations-linear asymptotes.

UNIT II **15 hrs**

Multiple integrals- Definition- Change of order of integration in double integral – change of variables in double & triple integrals - Applications to calculations of areas and volumes – Surface areas – Areas in polar coordinates - Jacobians.

UNIT III **14hrs**

Beta and Gamma integrals – their properties & relation between them - simple problems – Applications of Gamma functions to multiple integrals.

UNIT IV **15 hrs**

Laplace Transform – Introduction - Definition- working rule - Piecewise continuous function- functions of exponential order and class-sufficient condition for the existence-Linearity property –some elementary functions-first shifting theorems- unit step functions-Second shifting theorem-change of scale property-derivatives –multiplication by positive integral powers of t derivatives-Division by t theorems- Laplace transforms of integrals-Initial value and final value theorem-Periodic functions-Evaluation of integrals.

UNIT V **15hrs**

Inverse Laplace transforms - Introduction-Definition - Null function definition-Uniqueness of inverse Laplace transforms-Some elementary functions-Linearity property-method of partial fractions-Heaviside expansions theorems- First translation-Second translation theorem- Change of scale property-Inverse Laplace transforms of derivatives and integrals.

Simple problems using math gpt - https://math-gpt.org/

Origins: Vedas and Śulbasūtras

- Place value system
- Concept of zero
- Origins of geometry

Math is the hidden secret to understanding the world | Roger Antonsen

https://www.dbraulibrary.org.in/RareBooks/History%20of%20Hindu%20Mathematics.pdf

https://www.youtube.com/watch?v=Lq88aDStVs8

https://www.youtube.com/watch?v=gNJNmPJqXJc

Shulba Sutra - The Indian Geometry

Note : IKS topics and AI tool integration are restricted to Assignments only.

Text Books

S. No	Author	Title of the book	Publishers	Year & Edition
1.	S. Narayanan and T. K. M Pillay **Unit I**	Calculus Volume I	S. Viswanathan, Printers & Publishers, PVT.,LTD	2019, 1st Edn.
2.	S. Narayanan and T. K. M Pillay **Unit II & III**	Calculus Volume II	S. Viswanathan, Printers & Publishers, PVT.,LTD	2019, 1st Edn.
3.	Dr. M.D. Raisinghania **Unit IV & V**	Advanced Differential Equations	S.Chand and Company	2021, 20th Edn.
4.	Er. Hema Ramachandran and Achuthsankar S Nair **(For SciLab experiments)**	Scilab (A free Software to Matlab)	S.Chand and Company	2015, 1st Edn.

Unit I	Chapter 8 Chapter10 Chapter11	Section:1.3-1.7 Section:2.1-2.8 Section: 1-4
Unit II	Chapter5 Chapter6	Section: 1-7 Section: 1.1-2.4
Unit III	Chapter 7	Section: 2.1-6
Unit IV	Part IV:– A Chapter 1	 Sections – 1.1 to 1.21
Unit V	Part IV:– A Chapter 2	 Sections – 2.1 to 2.12

ReferenceBooks

S. No	Author	Title of the book	Publishers	Year & Edition
1	Serge Lang	A First Course in Calculus	Springer Publication	2013, 5th Edn.
2	A.K. Sharma	Advanced Differential Equations	Discovery Publishing Pvt Ltd	2004, 1st Edn.

3	Shahriar	Approximately Calculus	First Indian Edition, American Mathematical Society	2012 , 1st Edn.
4	N.P. Bali	Integral Calculus	Lakshmi Publication Pvt Ltd	2011 11th Edn.
5	Johnny Heikell	Scilab for real Dummies	http://www.heikell.fi/downloads/scilabpdf.pdf	

Digital Demonstration using SCILAB

http://cajael.com/eng/control/LaplaceT/LaplaceT-1_Example_2_6_OGATA_4editio.php

- Laplace Transforms with partial fractionhttp://cajael.com/eng/control/LaplaceT/LaplaceT-10_Problem_B2_3_OGATA_4ed_L.php
- Laplace Transforms of some functionshttp://cajael.com/eng/control/LaplaceT/LaplaceT-7_Example_2_17_OGATA_4ed_La.php
- Solving differential equation with SciLab

MOOC learning

https://nptel.ac.in/courses/111/105/111105122/

(6 Lectures by Prof. Harishankar Mahato, IIT, Kharagpur)

- Lecture 10 Improper integrals
- Lecture 11 Improper integrals
- Lecture 13 Beta Gamma functions
- Lecture 14 Beta Gamma functions
- Lecture 22 Triple integrals
- Lecture 23 Triple integrals

Note

Question paper setters to confine to the above text books only.

Pedagogy

Chalk and Talk, Seminar, Group Discussion, online courses.

Course Designers

1. Dr. K. Sumathi, Associate Professor, Department of Mathematics
2. Dr. S. Aiswarya, Assistant Professor, Department of Mathematics

COURSE CODE	COURSE TITLE	Category	L	T	P	Credit
TH25C02	DIFFERENTIAL EQUATIONS AND VECTOR ANALYSIS WITH SCILAB	Theory	73	2	-	4

Preamble

- To learn the basics of differential equations and various techniques of solving differential equations
- To expose the practical applications of differential equations and introduce students to the fundamentals of vector calculus
- To show that differential equations and vector analysis are powerful tools in solving problems of physical, social and managerial sciences.

Prerequisite

- Understanding of the concepts of a function and the relationship between a function and its graph
- Understanding of differential derivatives (ordinary and partial)
- Knowledge of Functions and angles, Vector Algebra

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1.	Recall the fundamental concepts of differential equations and vector Analysis and their role in modern Mathematics.	K1
CLO2.	Understand the efficient use of techniques in solving differential equations and applying vector differential operators	K2
CLO3.	Apply the problem-solving techniques of differential equations and vector analysis in diverse situations of Physics, Engineering, and other mathematical contexts	K3
CL04.	Analyze the use and applications of differential equations and/or vector calculus to some topic related to undergraduate study, employment or other experience.	K4

Mapping with Programme Learning Outcomes

CLOS/PLOS	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1.	S	M	S	S	S	S	S
CLO2.	S	M	S	S	S	S	S
CLO3.	S	M	S	S	S	S	S
CLO4.	S	M	S	S	S	S	S
CLO4.	S	M	S	S	S	S	S

S- Strong; M-Medium

Syllabus

DIFFERENTIAL EQUATIONS AND VECTOR ANALYSIS WITH SCILAB

Credits:4 **Hours:73**

UNIT I **15hrs**

Solution of Differential Equations of the first order and First Degree – Linear Equations with Constant Co-efficient – Application to Geometry and Mechanics. Solving simple problems using SciLab.

Acyuta's expression for instantaneous velocity involving the derivative of ratio of two functions

https://www.youtube.com/watch?v=N2PpRnFqnqY

https://www.youtube.com/watch?v=ifbaAqfqpc4

UNIT II **15hrs**

Homogeneous Linear Equations – Trajectories - Equations of the First Order but not of the First Degree. Solving simple problems using SciLab.

Derivation of the M¯adhava series for Rsine and Rversine

https://in.video.search.yahoo.com/search/video?fr=mcafee&p=Roots+of+Indian+Science%3A+Part+E+%E2%80%93+Physics+in+Ancient+India&type=E211IN885G0#id=3&vid=f866b419941d31ae2522e50fc51e7fbb&action=view

UNIT III **14 hrs**

Linear Equations of Second Order – Simultaneous Differential Equations. Solving simple problems using SciLab.

UNIT IV **15hrs**

Vector-Valued Functions, Vector Fields: An Introduction, Gradient, Divergence, Curl, and the Del Operator

UNIT V **14hrs**

Line integrals, Surface integrals, Volume integrals using Integral theorems.

AI related tools for Problem solving using math. Gpt

https://math-gpt.org/

Note : IKS topics and AI tool integration are restricted to Assignments only.

Text Books

S. No	Author	Title of the book	Publishers	Year & Edition
1	N.P. Bali **Unit I – III**	Differential Equations	Firewall Media, An imprint of Laxmi Publications Pvt, Ltd, New Delhi	2017, 10th Edn.
2.	Susan Jane Colley **Unit IV – V**	Vector Calculus	Pearson Education, Inc	2012, 4th Edn.
3.	Dr. Hema Ramachandran& Dr. Achuthsankar S.Nair	Scilab (A free Software to Matlab)	S Chand and company	2015, 1st Edn.
4.	Lecture notes/Lab manual/Tutorials on Sci Lab			

Unit I	Chapter 2 Chapter 3 Chapter 4	Page No: (21 -25,40-43,48-54,70-79,86-92,105-108, 116-120,141-148,154-162) Page No:(170-178,185-189,190-195,209-213,222-226,235-240) Page No:(269-279)
Unit II	Chapter 5	Page No:(286-289,297-302,308-313)
	Chapter6 Chapter7	Page No:(314 -329) Page No:(335-339,348-351,353-354)
Unit III	Chapter8 Chapter9	Page No:(356-367,383-390) Page No:(400-404,416-428)
Unit IV	Chapter 3	Sections – 3.3 to 3.5
Unit V	Chapter6 Chapter7	Sections 6.1 to 6.3 Sections – 7.1 to 7.3

Reference Books

S. No	Author	Title of the book	Publishers	Year & Edition
1	N.M Kapur	A text book of Differential equations	Pitambar Publishing Company Educational Publishers, New Delhi - 110005.	2008 , 11th revised Edn
2	M.D Raisinghania	Advanced differential equations	S.Chand& Co New Delhi	2021 , 20th Edn
3	George F. Simmons & Steven G. Krantz	Differential Equations Theory, Technique and Practice	Tata McGraw Hill Education Private Ltd	Reprint 2011 , 10th Edn
4	Nathaniel Coburn	Vector and Tensor Analysis	The Macmillan Company, New York	2012 , 1st Edn
5	Erwin Kreyszig	Advanced Engineering Mathematics	Wiley Plus	2011, 10th Edn

Digital Demonstration using SciLab

https://help.scilab.org/docs/6.0.0/en_US/ode.html

- Evaluation of ordinary differential equations https://help.scilab.org/docs/6.0.0/en_US/odeoptions.html

- setting options for ODE solverhttp://www.tf.uns.ac.rs/~omorr/radovan_omorjan_003_prII/s_examples/Scilab/Gilberto/scilab04.pdf

- Vector operations in SciLab

MOOC learning

https://nptel.ac.in/courses/111/106/111106100/

(2 Lectures by Prof.Srinivasamanam, IIT, Madras)

- Lesson 1 Introduction to Ordinary differential equations
- Lesson 13 Second order ODE with constant co-efficient

https://nptel.ac.in/courses/111/105/111105122/

(4 Lessons by Prof Hari Shankar mahata, IIT Kharagpur)

- Lesson36Gradient
- Lesson 37 Curl and divergence
- Lesson 41Directional derivatives
- Lesson 44 Applications to Mechanics

For Assignments/ Case Studies Only

Introduction to Industry 4.0 - Need – Reasons for Adopting Industry - Definition – Goals and Design Principles - Technologies of Industry 4.0- Skills required for Industry 4.0- Advancements in Industry 4.0 – Impact of Industry 4.0 on Society, Business, Government and People.

Reference

P. Kaliraj and T. Devi,	Higher Education for Industry 4.0 and Transformation to Education 5.0	Taylor and Francis group- CRS press	2021

Note

Question paper setters to confine to the above text books only.

Pedagogy

Chalk and Talk, Seminar, Group Discussion and Numerical Exercises.

Course Designers

1. Dr. K. Sumathi, Associate Professor, Department of Mathematics
2. Dr. R. Sakthikala, Assistant Professor, Department of Mathematics

COURSE CODE	COURSE TITLE	Category	L	T	P	Credit
TH24A01	MATHEMATICAL STATISTICS – I WITH R	Theory	88	2	-	5

Preamble

- To introduce the basic statistical concepts and help the students to know the need for statistics and statistical analysis.
- To describe the types of data and to discuss random variables and their distributions.

Prerequisite

Knowledge of population, sample, events and outcome.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1.	Recall the basic concepts of Set theory and Probability Distributions	K1
CLO2.	Understand and formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.	K2
CLO3.	Apply & evaluate the design, including sampling techniques of a statistical study	K3
CLO4.	Analyze statistical software R to perform statistical computations and display numerical and graphical summaries of data sets	K4

Mapping with Programme Learning Outcomes

CLOS/PLOS	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1.	S	S	S	S	S	S	S
CLO2.	S	S	S	S	S	S	S
CLO3.	S	S	S	S	S	S	S
CLO4.	S	S	S	S	S	S	S

S- Strong

Syllabus

SEMESTER I

MATHEMATICAL STATISTICS – I WITH R

Credits : 5 **Hours:88**

UNIT I **18hrs**

Probability and Distributions: Introduction - Set Theory -The Probability Set Function - Conditional Probability and Independence - Random Variables - Discrete Random Variables - Continuous Random Variables.

UNIT II **17 hrs**

Expectation of a Random Variable - Some Special Expectations – Important Inequalities. Multivariate Distributions: Distributions of Two Random Variables-

Transformations: Bivariate Random Variables - Conditional Distributions and Expectations - Independent Random Variables - The Correlation Coefficient.

UNIT III **17 hrs**

Some Special Distributions: The Binomial and Related Distributions - The Poisson Distribution- The Normal Distribution - The Bivariate Normal Distribution.

UNIT IV **18hrs**

Consistency and Limiting Distributions: Convergence in Probability- Convergence in Distribution - The Central Limit Theorem- Extensions to Multivariate Distributions.

UNIT V **18 hrs**

Optimal Tests of Hypotheses: Most Powerful Tests - Uniformly Most Powerful Tests - Likelihood Ratio Tests - The Sequential Probability Ratio Test.

Text Book

S. No	Author	Title of the book	Publishers	Year & Edition
1	Robert V. Hogg , Joseph W. McKean and Allen T. Craig	Introduction to Mathematical Statistics	Pearson Education	2019, 8th Edn.

UnitI	**Chapter 1**	1.1 to 1.7
Unit II	**Chapter 2**	1.8 - 1.10 , 2.1 – 2.5
Unit III	**Chapter 3**	3.1-3.2, 3.4, 3.5.1
Unit IV	**Chapter 5**	5.1-5.4
Unit V	**Chapter 8**	8.1- 8.4

Reference Books

S. No	Author	Title of the book	Publishers	Year & Edition
1	B.L.Agarwal	Basic Statistics	New Age International Publishers	2006, 4th Edn.
2	A.K.Goon, M.K.Gupta, Das Gupta	Fundamentals of Statistics Vol –I	The World Press, Calcutta	2002, 8th Edn.
3	Murray R.Spiegel, Larry J.Stephens	Schaum's Outline of Theory and Problems of Statistics	Tata McGraw Hill Publishing Company Ltd, New Delhi	2005, 3rd Edn.

Digital Demonstration using R

http://www.r-tutor.com/elementary-statistics/numerical-measures/mean

- Finding mean

http://www.r-tutor.com/elementary-statistics/numerical-measures/median

- Finding median

http://www.r-tutor.com/elementary-statistics/probability-distributions/binomial-distribution

- Binomial distribution

http://www.r-tutor.com/elementary-statistics/probability-distributions/poisson-distribution

- Poisson distribution

http://www.r-tutor.com/elementary-statistics/hypothesis-testing

- Hypothesis testing

MOOC learning

https://nptel.ac.in/courses/111/106/111106112/

(6 Lectures by Prof..G.Srinnivasan, IIT, Madras)

- Probability
- Rules of probability
- Conditional probability
- Binomial distribution
- Poisson distribution

Note

Question paper setters to confine to the above text books only.

Pedagogy

Chalk and Talk, Seminar, Group Discussion, Numerical Exercises and Demonstration.

Course Designers

1. Dr.K.Sumathi , Associate Professor, Department of Mathematics
2. Dr.D.Sasikala , Assistant Professor, Department of Mathematics

Allied Courses Offered to other Programs

For the Students Admitted During the Year 2025 -2026

Semester I

Batch	Semester	Course Code	Title	Contact hrs/week	CA	ESE	Total	Credit	Offered to
2024-2025	I	TH24A02	Allied– Mathematics for Management I	5	25	75	100	4	BBA, BBA (IB & RM), BBA (BPM)

Generic Electives offered as Clusters

Batch	Semester	Course Code	Title	Contact hrs/week	CA	ESE	Total	Credit	Offered to
2025-2026	I	TH23A19	Mathematics for Sciences I	7	25	75	100	5	B.Sc(.Physics)
2025-2026	I	TH23A18	Mathematics I	7	25	75	100	5	B.Sc.(Chemistry, Botany)

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
TH24A02	MATHEMATICS FOR MANAGEMENT I SEMESTER I	THEORY	73	2	-	4

Preamble

- To inspire the students to get the knowledge in basic mathematical concepts
- Introducing the need for mathematics to recognize appropriate investigate and interpretive procedures in management

Course Learning Outcomes

Upon the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the basics concepts about collection and representation of data and Measures of central tendency.	K1
CLO2	Understand the mathematical results to find solutions in Mathematics of Finance.	K2
CLO3	Apply the fundamental mathematical concepts to solve statistical problems.	K3
CLO4	Analyze and evaluate the accuracy of common statistical methods in excel.	K4

Mapping with Programme Learning Outcomes

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	M	S
CLO2	S	S	M	S	M
CLO3	S	S	S	S	S
CLO4	M	S	S	S	S

S- Strong; M-Medium

Syllabus

MATHEMATICS FOR MANAGEMENT I

(Common to BBA(Aided), BBA (IB & RM), BBA (BPM))

Credits :4 **Hours : 73**

UNIT **14 hrs**

Matrices-Fundamental ideas about Matrices- operational Rules-Matrix Multiplication- Solving a system of linear equation by Cramer's rule and matrix inverse method, Inversion of Square Matrices of 3rd order, rank, simple problems.

UNIT II **14 hrs**

Mathematics of Finance- Simple and Compound Interest, Depreciation, Annuities, Sinking Fund.

UNIT III **14 hrs**

Meaning and scope, statistical survey, collection of data, classification and tabulation, diagrams and graphs. Introduction to statistical software and learning graphs and diagrams using Excel.

UNIT IV **16 hrs**

Measure of central tendency, arithmetic mean, median and mode, geometric and harmonic mean. Measures of dispersion: Range, Quartile deviation, mean deviation, standard deviation, coefficient of variation. Correlation – rank correlation. Simple problems related to above mentioned concepts using Excel.

UNIT V **15 hrs**

Analysis of Time Series**:** Components of Time Series-Secular Trend-Moving Average Method-Method of Least Squares. Index numbers: Weighted and unweighted indices, cost of living index.

Text Books

S. No	Author	Title of the book	Publishers	Year & Edition
1.	P.R. Vittal	Business Mathematics and Statistics	Margham Publishers	2002
	UNIT II: Chapters : 8,9,10			
2.	P.A. Navnitham	Business Mathematics And Statistics	Jai Publishers	2003
	UNIT I : Vol I Chapter -4 sections :1,2,3,4,5,6,7,9,10 **UNIT III** : Vol II Chapter-1, 2, 3, 5, 6 **UNIT IV** : Vol II Chapter-7, 8. Ch-12: (pg 503-521) **UNIT V** : Vol II Chapter-14 (pg no:579-601) Chapter- 10 (444- 471)			

Reference Books

S. No	Author	Title of the book	Publishers	Year & Edition
1.	S P Gupta	Statistical Methods	Sultan Chand & Sons publishers	2004, I Edn.

MOOC learning

https://nptel.ac.in/courses/111/104/111104120/
Prof Shalabh, Department of Mathematics, IIT Kanpur
Lecture 14 Airthmetic mean
Lecture 15 Median
Lecture 16 Quartiles
Lecture 17 Mode Geometric mean
Lecture 20 Mean and standard deviation
Lecture 21 coefficient of variation
https://nptel.ac.in/courses/111/106/111106112/
Prof G. Srinivasan,Department of Mathematics, IIT Madras
Lecture 1: Introduction to probability and statistics
Lecture 2: Types of data
Lecture 4: Data and diagram

Note

Question paper setters to confine to the above text books only

Pedagogy

Chalk and Talk, Seminar, Group Discussion, Numerical Exercises and Demonstration.

Course Designers

1. Ms.S.Lakshmi, Assistant Professor, Department of Mathematics
2. Dr.J.Rejula Mercy, Assistant Professor, Department of Mathematics

COURSE CODE	COURSE TITLE	Category	L	T	P	Credit
TH24A18	MATHEMATICS I	Theory	103	2	-	5

Preamble

- To introduce the fundamentals concepts of vector calculus, matrices, Laplace transforms and tensors which acts as a tool for understanding basic theories in theoretical physics

Prerequisite

- Knowledge in basic concepts of calculus and matrices

Course Learning Outcomes

On the successful completion of the course, students will be able to

Mapping with Programme Learning Outcomes

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the knowledge of calculus, vectors, vector calculus and these basic mathematical structures which are essential in solving problems in various branches of Physics as well as in engineering.	K1
CLO2	Understanding mathematical tools like calculus,integration,series solution approach,special function and prepare the student to solve problems which model physical phenomena.	K2
CLO3	Apply problem-solving skills that are required to solve different types of Physics related problems with well-defined solutions.	K3
CLO4 -	Analyze and tackle open-ended problems that belong to the disciplinary area boundaries using mathematical equation risen out of it. -	K4

CLOs/PLOS	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	S	S	S	S	S	S
CLO2	S	S	S	S	S	S
CLO3	S	S	S	S	S	S
CLO4	S	S	S	S	S	S

S- Strong

Syllabus

MATHEMATICS - I

Credits:5 **Hours:103**

UNIT I **21hrs**

Vector Calculus: Scalar and vector point functions - Differentiation of vectors - Differential vector Operators - Directional derivative: Gradient, Divergence and curl - MAPLE Applications Stepwise Solutions of Vector Calculus.

UNIT II **20 Hrs**

Integration for vectors: Line, Surface and Volume integrals - Theorems of Gauss, Green's and Stoke's (Statement only) - Verification of Simple problems - MAPLE Applications - Stoke's problem.

UNIT III **21Hrs**

Laplace Transforms: Definition–Laplace Transform of $e^{at}, cosat, sinat, coshat, sinhat, t^n, n$ a positive integer – L $[f'(t)]$, L $[f''(t)]$,....., L[f^n(t)] – Laplace transform of $e^{at}cosbt, e^{at}sinbt$ and $e^a t^n$. Inverse Laplace transforms of standard functions. Solving differential equations of second order with constant coefficients using Laplace transform.

UNIT IV **20 Hrs**

Matrices: Eigen values and Eigen vectors - Cayley Hamilton theorem (without proof) – Verification – Using this theorem finding the inverse of a matrix – Partition of matrices – Diagonalisation of matrices - Power of matrices.

UNIT V **21 Hrs**

Tensor Analysis : Definition of Tensors – Contravariant - Covariant and mixed tensors -Addition and subtraction of Tensors-Summation Convention-Symmetry and Axisymmetric Tensor - Contraction and direct product – Quotient Rule – MAPLE Application – Tensor Calculus with differential Geometry.

TextBooks

S. No	Author	Title of the book	Publishers	Year & Edition
1	P.Kandasamy & K.Thilagavathy	Allied Mathematics Volume II (For Unit I &II)	S.Chand & company LTD –	2004,First Edn.
2	T.K. Manicavachagam Pillai and S. Narayanan	Ancillary Mathematics (For Unit III & IV) Volume - I	S.Viswanathan (Printers and Publishers) Pvt. Ltd.	Vol. I - 2009 ,Vol. II - 2008

		&Volume - II		
3	A.W.Joshi	Matrices and Tensors in Physics(For unit V)	New Age International Publishers	2010, Revised Edn.
4	http://www.maplesoft.com/applications/			

Reference Books

S. No	Author	Title of the book	Publishers	Year & Edition
1	P.Durai Pandian and Kayalal Pachaiyappa	Vector Analysis	S Chand Publications	2014 ,Revised Edn.
2	Shanthinarayan and P.K Mital	Vector Calculus	S Chand publications	2016 , Fourth Edn.
3	P.C .Mathews	Vector Calculus	Springer Verlang London Ltd.	1998, Seventh Edn.
4	B. D. Gupta	Mathematical Physics	Vikas Publications	1993, Fourth Edn.

Unit I&II : Chapters 1 to3
Unit III : Chapter 7 (Volume II)
Unit IV : Chapter 3 (Volume I) 6.2, 14.0 to17
Unit V : Part II, Chapters 15, 16,17

E – Content

1. Gradient, Divergence and curl–

i) https://www.youtube.com/watch?v=TYOYID9gJxM

ii) https://www.youtube.com/watch?v=v3ZC4Mo1fS0

2. Stoke's Problem–

i) https://www.youtube.com/watch?v=3NvLlzM_ImE

ii) https://www.youtube.com/watch?v=fWZCIUUrkuA

3. Inverse Laplace transforms of standard functions–

i) https://www.youtube.com/watch?v=Y8GXpS31CGI

4. Diagonalisation of matrices - Power of matrices–

i) https://www.youtube.com/watch?v=eEo7K8jPS9Y

ii) https://www.youtube.com/watch?v=LTb9V84hG9w

5. Tensor Calculus with differential Geometry

i) https://www.youtube.com/watch?v=noimvi5OTis

Pedagogy:

Chalk and Talk, Seminar, Group Discussion, Numerical Exercises and Demonstration

CourseDesigners:

1. Dr.C. R. Parvathy, Associate Professor and Head, Department of Mathematics
2. Ms. A. Karpagam, Associate Professor, Department of Mathematics

COURSE CODE	COURSE TITLE	Category	L	T	P	Credits
TH24A19	MATHEMATICS FOR SCIENCES I	Theory	103	2	-	5

Preamble

- To inspire the students to use appropriate and relevant, fundamental and applied mathematical knowledge.
- To explore how Chemistry and Mathematics interact with other disciplines with industry and with wider society.

Prerequisite

- Knowledge in Calculus and Set theory.

Course Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the important quantities associated with vector fields such as divergence, curl and scalar potential and concepts in matrices, set theory and equivalence relations	K1
CLO2	Understanding the various concepts of line integrals and Laplace transform of one variable through problems.	K2
CLO3	Applying fundamental theorem of line integrals, Green's theorem, Stoke's theorem and Divergence theorem to evaluate integrals	K3
CLO4	Demonstrate knowledge of basic concepts such as Abelian groups, normal subgroups, quotient groups , cyclic groups , permutation groups and group actions	K4

Mapping with Programme Outcomes

CLOs/ PLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	S	S	S	M	S	S
CLO2	S	M	S	S	S	S
CLO3	S	S	S	M	S	S
CLO4	S	S	M	S	S	S

S- Strong; M-Medium

Syllabus

MATHEMATICS FOR SCIENCES I

Credits: 5 **Hours: 103**

UNIT I **21Hrs**

Vector Calculus: Scalar and Vector point functions - Differentiation of vectors - Differential Operators - Directional derivative: Gradient - Divergence and curl - MAPLE Applications - Stepwise Solutions of Vector Calculus.

UNIT II **20Hrs**

Integration for vectors Line, surface and volume integrals - Theorems of Gauss, Green's and Stoke's(statements only) *Verification with MAPLE Applications* – Stoke's problem.

UNIT III **21Hrs**

Laplace Transforms:Definition–Laplace Transform of e^{at}, cosat, sinat, coshat, , t^n, n is a positive integer– L [f'(t)], L[f''(t)] ,....., L[f^n(t)] – Laplace transform of e^{at}cosbt ,e^{at}sinbt and $e^{at}t^n$–Inverse Laplace Transforms of standard functions- Solving differential equations of second order with constant coefficients using Laplace transform.

UNIT IV **20Hrs**

Matrices:Eigen values and eigen vectors-Cayley Hamilton theorem(with out proof) Verification – Finding the inverse of a matrix (Using Cayley Hamilton theorem).

UNIT V **21 Hrs**

Review of Set theory and equivalence relations – Group – Properties - Order of an element – Subgroups - Cyclic groups – Theorems – Permutation group - Symmetric group S_n.

Text Books

S. No	Author	Title of the book	Publishers	Year & Edition
1	P.Kandasamy & K.Thilagavathy	Allied Mathematics Volume II (For Unit I,II)	S.Chand & company Ltd.	2004, 1st Edn.
2	T.K.Manicavachagam Pillai & S. Narayanan	Ancillary Mathematics (For Unit III & IV) Vol. I & Vol. II	S.Viswanathan (Printers and Publishers) Pvt. Ltd.	Vol-I -2008 Vol- II - 2009
3	P.Kandasamy & K.Thilagavathy	Allied Mathematics Volume II (For Unit V)	S Chand & Company Ltd.	2004, 1st Edn.
4	http://www.maplesoft.com/applications/			

Unit I&II	:	Chapters 1 to 3
Unit III	:	Chapter 7 Volume II
Unit IV	:	Chapter 3 Volume I
Unit V	:	Group Theory Chapters 1 to 4 (Volume II)

Reference Books

S. No	Author	Title of the book	Publishers	Year & Edition
1	P.Durai Pandian and Kayalal Pachaiyappa	Vector Analysis	S Chand Publications	2014 , 1st Edn.
2	Shanthinarayan P.K. Mital	Vector Calculus	S Chand publications	2016 , 4th Edn.
3	P.C. Mathews	Vector Calculus	Springer Verlang London Ltd.	1998 , 7th Edn.
4	G. Balaji	Transforms and Partial differential equations	G. Balaji publishers, Revised edition	2011, Revised Edn.

Note

Question paper setters to confine to the above text books only.

E- Content

1) **Scalar and Vector point functions:**
https://www.youtube.com/watch?v=uanWfSQ6cq8&ab

2) **Line, surface and volume integrals:**
https://www.youtube.com/watch?v=NyG0vRn5FfU&ab

3) **Inverse Laplace Transforms of standard functions:**
https://www.youtube.com/watch?v=Y8GXpS31CGI&ab

4) **Eigen values and eigen vectors:**
https://www.youtube.com/watch?v=PFDu9oVAE-g&ab

5) **Review of Set theory and equivalence relations:**
https://www.youtube.com/watch?v=IZzEiuY-c2M&ab

Pedagogy

Chalk and Talk, Seminar, Group Discussion, Demonstration and Numerical Exercises.

CourseDesigners:

1. Dr.K.Sumathi, Associate Professor and Head, Department of Mathematics
2. Ms. Sharmilaa, K, Associate Professor, Department of Mathematics

Job oriented Course – Cryptography

Course objectives

To understand basics of cryptography to work on real time data

Course Outline:

UNIT I : **7 hrs**

Introduction to the concepts of Security: Introduction, The need for security, Security approaches, Principles of security, Types of attacks.

UNIT II : **8 hrs**

Cryptographical Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, stenography, key range and key size, possible types of attacks.

UNIT III : **7 hrs**

Block Cipher Principles : Stream Ciphers and Block Ciphers, Motivation for the Feistel Cipher Structure, The Feistel Cipher. **The Data Encryption Standard:** DES Encryption, DES Decryption.

UNIT IV : **8 hrs**

A Des Example: Results, The Avalanche Effect. **The Strength of Des:** The Use of 56-Bit Keys, The Nature of the DES Algorithm, Timing Attacks. **Differential and Linear Cryptanalysis:** Differential Cryptanalysis, Linear Cryptanalysis. **Block Cipher Design Principles:** DES Design Criteria Number of Rounds, Design of Function F, Key Schedule Algorithm.

UNIT V : **30 hrs**

Capstone Project from Industry

Data Science in the Real World

Duration : 60 Hrs

UNIT I : **12 hrs**

Introduction to real-world applications of data science across industries like healthcare, e-commerce, finance, and social media. Share case studies and current trends to inspire students.

UNIT II : **12 hrs**

Data Wrangling and Cleaning - how to handle messy data: dealing with missing values, removing duplicates, fixing incorrect formats, and identifying outliers.

UNIT III : **12 hrs**

Introduction to Machine Learning -an overview of machine learning concepts such as supervised and unsupervised learning, classification vs regression, and the stages of building a model (data → model → evaluation).

UNIT IV: **12 hrs**

Data Visualization Principles -best practices for creating effective visualizations. Discuss how to choose the right chart, the basics of dashboarding, and how to tell stories with data.

UNIT V : **12 hrs**

Introduction to Python for Data -basic Python syntax, using Jupyter notebooks, and important libraries like NumPy and Pandas.

Ethics, Privacy, and Bias in Data -responsible data usage, AI bias, data privacy (GDPR basics), and the social impact of algorithms.

***Capstone Hands on: Clean, Visualize and Model**

1. Getting Started with Python -Students will write basic Python code, work with lists, loops, functions, and learn how to import CSV files and explore data using print statements.

2. Data Cleaning with Pandas -Practice cleaning real-world datasets using Pandas. Students will use functions like dropna(), fillna(), filtering rows, changing data types, and handling duplicates.

3. Exploratory Data Analysis (EDA) -Learn to generate descriptive statistics, identify trends, and visualize relationships using histograms, box plots, and correlation heatmaps.

4. Data Visualization with Matplotlib and Seaborn -Students will build different types of charts — bar, pie, line, scatter plots, and heatmaps — and learn how to customize visual aesthetics.

5. Basic Machine Learning with Scikit-learn - (Guide students through building a simple machine learning model (like Linear Regression or K-Nearest Neighbors). They will split data into training/testing sets, fit the model, and evaluate its accuracy.

6. Capstone Mini Project - In small groups, students will choose a dataset, clean and analyze it, visualize findings, and (optionally) apply a basic ML model. They'll wrap it up by presenting their insights to the class.

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