PSGR
Krishnammal College for Women
CELEBRATING WOMEN SINCE 1963
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)

2024- 2027 Batch

SEMESTER I

PSGR Krishnammal College For Women

Department of Mathematics

Programme: B.Sc. Mathematics

2024 - 2027 Batch Onwards

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.

Programme&Branch : B.Sc. Mathematics

Scheme of Examinations

(Applicable to students admitted during the academic year 2024-25 Batch and onwards)

Semester	Part	Course Code	Title of the Paper	Course Types	Instruction hours per week	Contact Hours	Tutorial Hours	Duration of Examination (in hours)	Examination Marks			Credits
									CA	ESE	TOTAL	
I	I	TAM2301/HIN2301/ FRE2301	Tamil Paper I/Hindi Paper I / French Paper I	L	6	88	2	3	25	75	100	3
	II	ENG2301	English Paper I	E	6	88	2	3	25	75	100	3
	III	TH23C01	Advanced Calculus with SCILAB	CC	5	73	2	3	25	75	100	4
	III	TH23C02	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	**Non Tamil Students**										
		NME23B1/ NME23A1	Basic Tamil I / Advanced Tamil I	AEC	2	28	2	-	100	-	100	2
		Students with Tamil as Language										
		NME23ES	Introduction to Entrepreneurship	AEC	2	30	-	-	100	-	100	
I - V	VI	24BONL1 24BONL2 24BONL3	Online course I Online course II Online course III	ACC	-	-	-	-	-	-	-	-
		COMISSER	Community Services	-	-	-	-	-	-	-	-	Gr

L – Language

E- English

CC –Core Courses
GE –Generic Elective
AEC – Ability Enhancement Course

CA – Continuous Assessment
ESE – End Semester Examination
ACC - Additional Credit Course

COURSE CODE	COURSE NAME	Category	L	T	P	Credit
TH23C01	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.	Apply and solve physical problems using Laplace Transform	K3
CLO4.	Analyse special functions like Beta and Gamma to evaluate multiple integrals	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

SEMESTER I CORE I

Advanced Calculus with SCILAB

Credits: 4 **Hours:73**
Course Code: TH23C01

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.

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 edition
2.	S. Narayanan and T. K. M Pillay **Unit II & III**	Calculus Volume II	S. Viswanathan, Printers & Publishers, PVT.,LTD	2019 & 1st edition
3.	Dr. M.D. Raisinghania **Unit IV & V**	Advanced Differential Equations	S.Chand and Company	2021 & 20th edition
4.	Er. Hema Ramachandran and	Scilab(A free	S.Chand and	2015 & 1st edition

	Achuthsankar S Nair **(For SciLab experiments)**	Software to Matlab)	Company	

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 edition
2	A.K. Sharma	Advanced Differential Equations	Discovery Publishing Pvt Ltd	2004 & 1st edition
3	Shahriar	Approximately Calculus	First Indian Edition, American Mathematical Society	2012 & 1st edition
4	N.P. Bali	Integral Calculus	Lakshmi Publication Pvt Ltd	2011 & 11th edition
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 fraction

http://cajael.com/eng/control/LaplaceT/LaplaceT-10_Problem_B2_3_OGATA_4ed_L.php

- Laplace Transforms of some functions

http://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. (Mrs.) K. Sumathi, Associate Professor, Department of Mathematics
2. Dr. (Mrs.) S. Aiswarya, Assistant Professor, Department of Mathematics

COURSE CODE	COURSE NAME	Category	L	T	P	Credit
TH23C02	CORE II 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.	Analyse 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

SEMESTER I - CORE II
DIFFERENTIAL EQUATIONS AND VECTOR ANALYSIS WITH SCILAB

Credits:4 **Hours:73**

Subject Code: TH23C02

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.

UNIT II **15hrs**

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

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.

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	10th Edition, 2017
2.	Susan Jane Colley **Unit IV – V**	Vector Calculus	Pearson Education, Inc	4th Edition, 2012
3.	Dr. Hema Ramachandran& Dr. Achuthsankar S.Nair	Scilab (A free Software to Matlab)	S Chand and company	1st Edition, 2015
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 edition
2	M.D Raisinghania	Advanced differential equations	S. Chand& Co New Delhi	2021 & 20th edition
3	George F. Simmons & Steven G. Krantz	Differential Equations Theory, Technique and Practice	Tata McGraw Hill Education Private Ltd	Reprint 2011 & 10th edition
4	Nathaniel Coburn	Vector and Tensor Analysis	The Macmillan Company, New York	2012 & 1st edition
5	Erwin Kreyszig	Advanced Engineering Mathematics	Wiley Plus	2011 & 10th Edition

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 solver
  http://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)

- Lesson36 Gradient

- 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 NAME	Category	L	T	P	Credit
TH24A01	ALLIED - MATHEMATICAL STATISTICS – I WITH R SEMESTER I	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

ALLIED – MATHEMATICAL STATISTICS – I WITH R

Credits : 5 **Hours:88**

Course Code : TH24A01

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 & 8thEdition,

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 Edition
2	A.K.Goon, M.K.Gupta, Das Gupta	Fundamentals of Statistics Vol –I	The World Press, Calcutta	2002 & 8th Edition
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 Edition

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 2024 -2025

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)

Allied offered as Clusters

Batch	Semester	Course Code	Title	Contact hrs/week	CA	ESE	Total	Credit	Offered to
2024-2025	I	TH23A09	Allied - Mathematics for Sciences I	7	25	75	100	5	B.Sc. (Physics)
2024-2025	I	TH23A12	Allied - Mathematics I	7	25	75	100	5	B.Sc. (Chemistry, Botany)

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
TH24A02	ALLIED -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

SEMESTER I

ALLIED - MATHEMATICS FOR MANAGEMENT I

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

Credits :4 **Hours : 73**

Subject Code:TH24A02

UNIT I **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 &

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

Job oriented Course – Machine learning

Course objectives

To understand machine learning algorithms to work on real time data

Course Outline:

Unit 1 : Introduction to Machine Learning (Duration: 10 Hours)

- Introduction to machine learning
- Types of machine learning algorithms: supervised, unsupervised, and reinforcement learning
- Overview of the machine learning workflow
- Introduction to Python programming language and libraries (NumPy, Pandas, Matplotlib)

Project: Predicting House Prices Apply regression techniques to predict house prices based on various features such as size, number of bedrooms, and location.

Unit 2: Supervised Learning (Duration: 10 Hours)

- Linear regression
- Logistic regression
- Decision trees and ensemble methods (Random Forest, Gradient Boosting)
- Support Vector Machines (SVM)
- k-Nearest Neighbors (kNN)

Project: Spam Email Classification Use supervised learning algorithms to classify emails as spam or non-spam based on their content.

Unit 3: Unsupervised Learning (Duration: 10 Hours)

- K-means clustering
- Hierarchical clustering
- Principal Component Analysis (PCA)
- Anomaly detection

Project: Customer Segmentation Apply clustering techniques to segment customers based on their purchasing behavior.

Unit 4 : Model Evaluation and Selection (Duration: 10 Hours)

- Cross-validation
- Evaluation metrics (accuracy, precision, recall, F1-score)
- Hyperparameter tuning
- Model selection techniques

Project: Credit Risk Assessment Evaluate and select the best-performing model for predicting credit risk using different evaluation metrics and hyperparameter tuning.

Unit 5 : Case Studies (Duration: 10 Hours)

- Sentiment analysis on movie reviews
- Image classification using convolutional neural networks (CNNs)
- Recommendation systems
- Time series forecasting

Projects:

1. Sentiment Analysis on Twitter Data
2. Image Classification on CIFAR-10 Dataset
3. Movie Recommendation System
4. Stock Price Prediction using Time Series Data

Final Project: Real-World Machine Learning Application (Duration: 10 Hours)

Work on a real-world machine learning project of your choice, applying the skills and techniques learned throughout the course. This project will give you the opportunity to showcase your understanding and creativity in solving practical problems using machine learning.

TEXT BOOK:

1. Tom M. Mitchell, "Machine Learning", McGraw-Hill, 2010

Question Paper Pattern

CIA Pattern

Section A – 3 x 2 = 6

Section B – 3 x 5 = 15 (either or – same CLO Level)

Section C – 3 x 8 = 24 (either or – same CLO Level)

Total 45

ESE Pattern

Section A – 5 x 2 = 10

Section B – 5 x 5 = 25 (either or – same CLO Level)

Section C – 5 x 8 = 40(either or – same CLO Level)

Total 75

Department of Mathematics
CHOICE BASED CREDIT SYSTEM (CBCS) & LEARNING OUTCOME- BASED CURRICULAR FRAMEWORK (LOCF)
Programme & Branch : B.Sc. Mathematics 2024-27 Batch,

Scheme of Examinations

SEMESTER II

SEMESTER	Part	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	ES	TOTAL	
II	I	TAM2302/ HIN2302/ FRE2302	Tamil Paper II / Hindi Paper II / French Paper II	L	6	88	2	3	25	75	100	3
	II	ENG2302	English Paper II	E	5	73	2	3	25	75	100	3
	III	TH23C03	Calculus of Transforms with SCILAB	CC	6	88	2	3	25	75	100	4
	III	TH24C02	Number Theory And Summation of Series with MAPLE	CC	5	73	2	3	25	75	100	4
	III	TH24A09	Mathematical Statistics – II	GE	6	88	2	3	25	75	100	5
	IV	NM24UHR	Universal Human Values and Human Rights	AECC	2	30	-	-	100	-	100	2
	IV	NM23GAW	General Awarness	AEC	SS				100	-	100	Gr
	IV	*NME23B2/ NME23A2	Basic Tamil II / Advanced Tamil II	AEC	-	-	-	-	100	-	100	Gr
	VI	COM15SER	Community Services 30 hours	GC	-	-	-	-	-	-	-	-
I - V	VI	24BONL1 24BONL2 24BONL3	Online course 1 Online course 2 Online course 3	ACC	-	-	-	-	-	-	-	-

* ***Outside class hours***

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

CA – Continuous Assessment
ESE – End Semester Examination
GAW- General Awareness
ACC-Additional Credit Course
E- English

COURSE CODE TH23C03	CORE III CALCULUS OF TRANSFORMS WITHSCILAB SEMESTER II	Category	L	T	P	Credit
		Theory	88	2	-	4

Preamble

- To understand the practical applications of Integral transforms in solving problems ofsignal processing, differential and integral equations.
- To use SCILAB effectively to solve problems involving Integral transform.

Prerequisite

- Knowledge in differential and integral calculus

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Learn and acquire knowledge of Integral Transforms	K1
CLO2	Understand the concepts of Fourier, Laplace, Hankel and Mellin Transforms and the formation of difference equations	K2
CLO3	Solve difference equations using single step and multistep numerical methods	K3
CLO4	Demonstrate competency to solve differential and integral equations using the Fourier, Laplace, Hankel and Mellin Transforms	K4

Mapping with Programme Learning Outcomes

CLOS/PLOS	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7
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; M – -Medium; L – -Low

Syllabus

SEMESTER II - CORE PAPER III
Calculus of Transforms with SCILAB

Credits: 4 **Hours: 88**
Subject Code: TH24C03

UNIT I **18 Hrs**

Applications of Laplace Transforms: Introduction-Solutions of Ordinary Differential Equations-Partial Differential Equations, Initial and Boundary Value Problems-Solutions of Integral Equations-Solutions of Boundary Value Problems-Evaluations of Definite Integrals - Simple Problems using SCILAB.

UNIT II **18 Hrs**

Fourier Transforms and Their Applications: Introduction-The Fourier Integral Formulas-Definition of the Fourier Transform and Examples-Fourier Transforms of Generalized Functions-Basic Properties of Fourier Transforms-Applications of Fourier Transforms to Ordinary Differential Equations-Solutions of Integral Equations-Solutions of Partial Differential Equations – Fourier sine and cosine transforms with examples-Simple Problems using SCILAB.

UNIT III **17 Hrs**

Hankel Transforms and Their Applications: Introduction-The Hankel Transform and Examples-Operational Properties of the Hankel Transform-Applications of Hankel Transforms to Partial Differential Equations.

UNIT IV **17 Hrs**

Mellin Transforms and Their Applications: Introduction-Definition of the Mellin Transform and Examples-Basic Operational Properties of Mellin Transforms-Applications of Mellin Transforms-Application of Mellin Transforms to Summation of Series-Generalized Mellin Transforms.

UNIT V **18 Hrs**

Difference Equations: Introduction-Order of Difference Equation-Degree of Difference Equation-Solution to Difference Equation-Formation of Difference Equations-Linear Difference Equations-Linear Homogeneous Difference Equations with Constant Coefficients-Non-Homogeneous Linear Difference Equations with Constant Coefficients.

Text Books

S. No	Author	Title of the book	Publishers	Year & Edition
1.	Lokenath Debnath and Dambaru Bhatta **Unit I- IV**	Integral Transforms and their Applications	Chapman & Hall/CRC	3rd Edition, 2015
2.	Dr. V.N. Vedamurthy and Dr. N. Ch. S. N. Iyengar **Unit V**	Numerical Methods	Vikas Publishing House Pvt. Ltd.	2015
3	Lecture notes/Lab manual/Tutorials on SciLab			

UNIT I	Chapter 4	4.1 -4.6(Except Page. No. 181 - 188, 196 - 197, 204 - 214, 222 - 230)
UNIT II	Chapter 2	2.1 – 2.5 and 2.10-2.13 (9 - 37, 60 - 73)

UNIT III	Chapter 7	7.1 – 7.4 (315 - 328)
UNIT IV	Chapter 8	8.1-8.4 and 8.6, 8.7 (339 - 353, 358 - 364)
UNIT V	Chapter 10	10.1 to 10.8

Reference Books

S. No	Author	Title of the book	Publishers	Year & Edition
1	B.S. Grewal	Higher Engineering Mathematics	Khanna Publishers, New Delhi.	39th Edition, 2007
2	Veerarajan. T	Engineering Mathematics	Tata McGraw Hill, New Delhi.	3rd Edition, 2004
3	Kreyszig. E	Advanced Engineering Mathematics	John wiley and sons, (Asia) Pvt. Ltd., Singapore.	2006
4	J. K. Goyal and K.P. Gupta	Integral Transform	PragatiPrakashanEducational publishers, Meerut	2015
5	M.K.Venkataraman	Numerical Methods in Science & Engineering	National Publishing Company	1990

Digital Demonstration using SciLab

https://help.scilab.org/docs/6.0.0/en_US/intg.htm

- Evaluation of definite integrals
  https://help.scilab.org/docs/5.5.2/en_US/fft.html
- Fast Fourier transforms
  https://www.bragitoff.com/2016/03/fourier-series-and-scilab/
- Fourier series and scilab
  https://www.bragitoff.com/2016/03/calculating-fourier-series-and-plotting-it-scilab/
- Fourier series and plotting
  https://www.bragitoff.com/2016/03/polynomial-fitting-scilab/
- _polynomial fitting using scilab

MOOC learning

https://nptel.ac.in/courses/111/102/111102129/

(6 Lectures by Prof..Sarthoksircar IIT, Delhi)

- Introduction to Fourier transforms Part I
- Introduction to Fourier transforms Part II
- Applications of Fourier transforms Part I
- Introduction to Laplace Transforms Part I
- Introduction to Laplace Transforms Part II
- Applications of Laplace Transforms Part I

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. (Mrs.) K. Sumathi,
2. Dr.(Mrs) G. Arthi

COURSE CODE TH24C04	CORE IV NUMBER THEORY AND SUMMATION OF SERIES WITH MAPLE SEMESTER II	Category	L	T	P	Credit
		Theory	73	2	-	4

Preamble

- To orient the students to learn about the real and complex number systems and also some of the basic notation of set theory.
- To enable the students to learn about the convergence and divergence of the series and develop problem solving skills.

Prerequisite

Knowledge in basic properties of the real numbers that lead to the formal development of real analysis and various methods in terms of convergence and divergences.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Know the concept of convergence and limits that are applicable to sequences, series, differentiation and integration	K1
CLO2	Determine the convergence or divergence of sequences and series	K2
CLO3	Analyse the precise proofs of results that arise in the context of real analysis	K3
CLO4	Apply convergence tests to infinite series	K4

Mapping with Programme Learning Outcomes

CLOS/PLOS	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7
CLO1	S	S	S	S	S	S	S
CLO2	S	M	S	S	S	S	S
CLO3	S	M	S	S	S	S	S
CLO4	S	S	S	S	S	S	S

Strong; M-Medium; L-Low

Syllabus

SEMESTER II - CORE IV

NUMBER THEORY AND SUMMATION OF SERIES WITH MAPLE

Credits : 4 **Hours: 73**
Subject Code: TH24C04

UNIT I **15 hrs**

The Real and Complex number systems: Introduction – The field axioms – The order axioms – Geometric representation of real numbers – intervals – integers- the unique factorization theorem for integers – rational numbers- irrational numbers – upper bounds, maximum element, least upper bound – the completeness axiom – some properties of supremum – properties of the integers deduced from completeness axiom – the Archimedean property of the real number system – rational number with finite decimal representation – Finite decimal approximation to real numbers -infinite decimal representation of real numbers – Absolute values and the triangular inequality – The Cauchy – Schwarz inequality – Plus and minus infinity and the extended real number system **R*** - Complex numbers – Geometric representation of complex number – The imaginary unit – Absolute value of a complex number – Impossibility of ordering the complex numbers – Complex exponentials – Further properties of complex exponentials – The argument of a complex number – Integral powers and roots of complex numbers – complex logarithms – complex powers – Complex sine and cosines – Infinity and the extended complex plane **C*.**
Introduction- Numbers , fractions and Geometry in the Vedas. Decimal nomenclature of numbers in the vedas.

UNIT II **15 hrs**

Some Basic Notations of Set theory: Introduction – Notations – Ordered pairs – Cartesian product of two sets – Relations and functions – Further terminology concerning functions – One – to – one functions and inverses – Composite functions – Sequences – Similar sets – Finite and infinite sets – Countable and uncountable sets – Uncountability of the real number system – set algebra – Countable collections of countable sets

UNIT III **15 hrs**

Convergence and divergence of series: Definition of Infinite Series – Elementary results – Series of positive terms - Comparison tests -– Cauchy's condensation test – D'Alembert's ratio test -Cauchy's root test - Raabe's test - Absolute convergence.

UNIT IV **16 hrs**

Theory of Equations: Remainder Theorem - Roots of an Equation - Relations connecting the Roots and Coefficients - Symmetric function of roots **-** Transformations of equations – Reciprocal equations – Removal of terms – Transformations in General - Descarte's rule of signs.

UNIT V **12 hrs**

Rolle's Theorem - Multiple roots – Strum's theorem (statement only) –Strum's functions -Horner's method.

Text Book

S. No	Author	Title of the book	Publishers	Year & Edition
1	Tom. M. Apostol **Unit I & II**	Mathematical Analysis	Narosa Publishing House	2002
2	T.K. Manicavachagom Pillay, T. Natarajan & K.S. Ganapathy **Unit III – V**	Algebra Vol I	S.Viswanathan, Printers & Publishers, PVT., LTD	2017

UNIT I	Chapter 1	Sections 1.1 -1.33
UNIT II	Chapter 2	Sections 2.1 – 2.15
UNIT III	Chapter 2	Sections 8 - 19, 21 - 24
UNIT IV	Chapter 6	Sections 1 to 12, 15 to 19, 21& 24
UNIT V	Chapter6	Sections 25,26, 27, 30

Reference Books

S. No	Author	Title of the book	Publishers	Year & Edition
1.	R.R.Goldberg	Methods of Real Analysis	Oxford University Press	2018
2	Walter Rudin	Principles of Mathematical Analysis	Tata McGraw Hill Publications	2013
3.	P.N. Chatterjee	Algebra	Rajhans Agencies, Meerut	2010
4.	S.Barnard &J.M.Child	Higher Algebra	Enlarged Edition, A.I.T.B.S Publishers & Distributors	2004
5.	Hall & Knights, R Knight	Higher Algebra	Arihant Prakashan, Meerut	2008

https://www.maplesoft.com/applications/view.aspx?sid=3981&view=html

- ❖ Convergence of series
- ❖ Radius of convergence
- ❖ Cauchy‘s root test
- ❖ Ratio test
- ❖ Integral test

https://www.maplesoft.com/support/help/Maple/view.aspx?path=convert/base

- ❖ Conversion of numbers with various bases

MOOC learning

https://www.academia.edu/5241092/VISUALIZING_THE_BEHAVIOR_OF_INFINITE_SERIES_AND_COMPLEX_POWER_SERIES_WITH_THE_GEOGEBRA

https://nptel.ac.in/courses/111/101/111101134/

(6 Lectures by Prof I.K. Rana, IIT Bombay)

- Real Numbers and sequences Part I
- Real Numbers and sequences Part II
- Real Numbers and sequences Part III
- Convergence of sequences Part I
- Convergence of sequences Part II
- Convergence of sequences Part III

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. (Mrs.) K. Sumathi, Associate Professor, Department of Mathematics
2. Dr.(Mrs) S.Aiswarya, Assistant Professor, Department of Mathematics

COURSE CODE TH24A09	MATHEMATICAL STATISTICS –II (Problems in Applied statistics usingR)	Category	L	T	P	Credit
		Theory	88	2	-	5

Preamble

- To introduce statistical techniques of analysis and inference thatare useful in manyareas of scientific research.
- To present descriptive statistics and utilize the probability distributions to performstatistical inference.

Prerequisite

- Critically evaluate the design, including sampling techniques, of a statistical study,
- Effectively use statistical software R to perform statistical computations and displaynumerical and graphical summaries of data sets

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Construct and interpret deviations and proportions for populations,	K1
CLO2	Explain and successfully apply all aspects of parametric testing techniques including single and multi-sample tests for mean and proportion	K2
CLO3	Explain and successfully apply all aspects of appropriate non-parametric tests.	K3
CLO4	Understand, apply and compute maximum likelihood estimation	K4

Mapping with Programme Outcomes

CLOS/PLOS	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7
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; M-Medium; L-Low

ALLIED – MATHEMATICAL STATISTICS - II

(Problems in Applied statistics using R)

Credits : 5 **Hours: 88**

Subject Code :TH24A09

UNIT I **17 Hours**

Linear Regression - Introduction - Simple Linear Regression Model – Problems- Estimating the Regression Parameters-Error Random Variable- Prediction Intervals for Future Responses –problems- Coefficient of Determination- Sample Correlation Coefficient.

UNIT II **18 Hours**

Testing Statistical Hypotheses - Introduction - Hypothesis Tests and Significance Levels-Problems - Tests Concerning the Mean of a Normal Population-Case of Known Variance-Problems - One-Sided Tests - The *t* Test for the Mean of a Normal Population-Case of Unknown Variance -- Hypothesis Tests Concerning Population Proportions-Two-Sided Tests of ***p.*** Hypothesis Tests Concerning Two Populations: Introduction-Testing Equality of Means of Two Normal- Populations: Case of Known Variances-Problems.

UNIT III **18 Hours**

Testing Equality of Means: Unknown Variances and Large Sample Sizes-Problems - Testing Equality of Means: Small-Sample Tests when the Unknown Population Variances Are Equal- Paired-Sample *t* Test -Testing Equality of Population Proportions –Problems.Analysis of Variance - Introduction - One-Factor Analysis of Variance- Remark on the Degrees of Freedom - Two-Factor Analysis of Variance: Introduction and Parameter Estimation- Two-Factor Analysis of Variance: Testing Hypotheses.

UNIT IV **18 Hours**

Chi-Square Goodness-of-Fit Tests- Introduction -- Chi-Squared Goodness-of-Fit Tests - Testing for Independence in Populations Classified According to Two Characteristics.Quality Control - Introduction - The ***X*** Control Chart for Detecting a Shift in the Mean

-Problems - When the Mean and Variance Are Unknown- ***S***Control Charts – Problems -Control Charts for Fraction Defective .

UNIT V **17 Hours**

Vital Statistics-Definition-Utility of vital statistics-Measures of population and Vitalstatistics-Introduction-Measures of population - Measures of vital statistics - Mortality Rates
–Fertility Rates.

Text Books

S. No	Author	Title of the book	Publishers	Year & Edition
1.	Sheldon M Ross	Introductory Statistics Unit – I to IV	Elsevier	3rd Edition, 2010
2.	Veer Bala Rastogi	Biostatistics Unit – V	Medtech	3rd Edition, 2015

UNIT I	Chapter 12	Sections: 12.1 - 12.3,12.7,12.8, 12.9
UNIT II	Chapter 9 Chapter 10	Sections: 9.1-9.5 Sections: 10.1-10.2
UNIT III	Chapter 10 Chapter 11	Sections: 10.3-10.6 Sections: 11.1-11.5
UNIT IV	Chapter 13	Sections: 13.1-13.4, 15.1-15.3
UNIT V	Chapter 20 Chapter 21	Sections: 20.2., 20.2.1., 20.2.2 Sections: 21.1-21.5

Reference Books:

S. No	Author	Title of the book	Publishers	
1.	Fundamentals of Mathematical Statistics	S.C.Gupta and V.K.Kapur	Sultan Chand & sons, New Delhi.	11th Edition, 2014
2.	E.L.Lehmann Joseph P.Romano	Testing Statistical Hypotheses	Springer Private Ltd,	3rd Edition, 2009
3.	Murray R.Spiegel Larry J.Stephens	Theory and problems of Statistics	Tata McGraw Hill Publishing Company Ltd	3rd Edition, 2008

Digital Demonstration with R and MOOC learning

https://nptel.ac.in/courses/111/104/111104120/(6 lessons by Prof. Shalalb, IIT Kanpur)

- Lesson 03 Calculation of Data vectors
- Lesson 04 Built in commands and Data Handling
- Lesson 10 Bar Diagram
- Lesson 11 Subdivided Bar diagram and Pie diagram
- Lesson 21 Co-efficient of variation and Boxplot
- Lesson 30 Rank correlation

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.(Mrs). C.R.Parvathy,
2. Mrs. S.Lakshmi,

COURSE CODE TH24A18	Mathematics- Elementary to Advanced	Category	L	T	P	Credit
		Theory	118	2	-	5

Preamble

- To enable the basic mathematics to the students
- To enable the students to find the practical applications to the real world problems.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Identify the basic concepts in Theory of equations	K1
CLO2	Develop the ability to apply differential equations to significant applied or theoretical problems.	K2
CLO3	Solve problems in Matrices	K3
CLO4	Analyze the how physical phenomena are modeled by differential equations and dynamical systems	K4

COS/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; M-Medium; L-Low

Syllabus

SEMESTER - II
B.Sc(Physics & Chemistry)

UNIT – I: (24Hrs)

Theory of Equations: Relation between roots & coefficients – Transformations of Equations – Diminishing, Increasing & multiplying the roots by a constant Forming equations with the given roots – Rolle‘s Theorem, Descarte‘s rule of Signs(statement only) – simple problems.

UNIT – II: (24Hrs)

Matrices : Singular matrices – Inverse of a non-singular matrix using adjoint method - Rank of a Matrix – Consistency - Characteristic equation, Eigen values, Eigen vectors – Cayley Hamilton‘s Theorem (proof not needed) –Simple applications only.

Unit III: (23 hrs)

Variables - Constants and functions - Limits of algebraic functions - Simple differentiation of algebraic function - Meaning of derivative - Evaluation of first and second order derivatives for algebraic - Exponential - Logarithmic functions.

UNIT – IV: **(23 hrs)**

Differentiation: Maxima & Minima – Concavity, Convexity – Points of inflexion – Rolle's Theorem and Mean Value Theorem- Expansions of Functions-Partial differentiation

Unit V: **(24 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- Singular Points- Tracing of Curves.

Text Book

1	T.K. Manickavasagam Pillai, T. Natarajan and K.S. Ganapathy	Algebra Volume I	Divya subramanian for Ananda Book depot, Reprint Volume I (2022), Unit I
2	T.K. Manickavasagam Pillai, T. Natarajan and K.S. Ganapathy	Algebra Volume II	Divya subramanian for Ananda Book depot, Pvt. Ltd. – Reprint Volume I (2022), Unit II
3	S.Narayanan, T.K Manicavachagam Pillay	Calculus Volume I	Divya subramanian for Ananda Book depot, Pvt. Ltd. – Reprint Volume I (2022), Unit III, IV, & V

Pedagogy

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

Course Designers:

1. Dr.(Mrs).K.Sumathi, Associate Professor, Department of Mathematics
2. Dr.C.R.Parvathy, Associate Professor, Department of Mathematics

Bachelor of Science in Mathematics
Choice Based Credit Sysytem(CBCS)
Learning Outcomes Based Curriculum Framework (LOCF)
Scheme and Syllabus of 2024-2027 Batch
Semester III

Semester	Part	Course Code	Title of the Course	Course Type	Instruction hours per week	Contact Hours	Tutorial Hours	Duration of Examination (in hours)	Examination Marks			Credits
									CA	ESE	TOTAL	
III	I	TAM2303/ HIN2303/ FRE2303	Tamil Paper III/ Hindi Paper III / French Paper III	L	6	88	2	3	25	75	100	3
	II	ENG2403	English Paper III	E	5	73	2	3	25	75	100	3
	III	TH24C05	Analytical Geometry with GeoGebra	CC	3	43	2	3	25	75	100	3
		TH24C06	Statics with GNU - FISICA lab	CC	4	58	2	3	25	75	100	4
		PS23A03/ PL24A01	Physics Paper I/ Paper I – Fundamentals of Botany	GE	4	58	2	3	20	55	75	4
		PS23AP1/ PL23AP1	Physics practical/ BotanyPractical	GE	2	30	--	--	--	--	--	--
III		CS23SBGP	Gen- AI	SEC	3	44	1	—	100	--	100	3
	IV	NM23DTG	Design Thinking	AEC	2	30	-	-	100	-	100	2
I-III	VI	COM15SER	Community Services 30 Hours	GC	-	-	-	-	-	-	-	-
I - V	VI	24BONL1 24BONL2 24BONL3	Online course I Online course II Online course III	ACC	-	-	-	-	-	-	-	-

L – Language
E- English
CC –Core Courses
CA – Continuous Assessment
GE –Generic Elective
ESE – End Semester Examination
AEC – Ability Enhancement Course
SEC - Skill Enhancement Course
GC – General Course

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

Design Thinking

Quiz : 50Marks

Assignment : 25 Marks

Project / Case study : 25Marks

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

Evaluation pattern for Gen-AI

Quiz : 50 Marks (5 quizzes with each 10 marks)
Case study : 25 Marks

COURSE CODE	COURSE TITLE	Category	L	T	P	Credit
TH24C05	ANALYTICAL GEOMETRY WITH GEOGEBRA	Core	43	2	-	3

Preamble

- To provide a comprehensive and clear description of geometrical objects.
- To introduce equations for various shapes used in physics and engineering

Prerequisite

Knowledge in Basic vector algebra, trigonometric functions and identities

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall and classify geometric shapes using correct mathematical language. Draw and label figures based on verbal descriptions.	K1
CLO2	Understanding various equations of Planes, Straight Line, Sphere, Cone, and Cylinder.	K2
CLO3	Applying theorems involving vertical angles, complementary angles, supplementary angles, transversals, internal angle measure in triangles, circles and tangent lines to circles and applying geometric concepts to solve problems.	K3
CLO4	Analysetransform from polar co-ordinate system to rectangular co-ordinate system and vice versa.	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	S	S	S	S	S	S
CLO4	S	S	S	S	S	S	S

S- Strong; M-Medium

Syllabus

ANALYTICAL GEOMETRY WITH GEOGEBRA

Credits:3 **Hours: 43**

UNIT I **8 hrs**

Polar Coordinates: Introduction - Definition of Polar Coordinates - Relation between Cartesian Coordinates and Polar Coordinates – Polar Equation of a Straight Line -Polar Equation of a Straight Line in Normal form – Circle – Polar equation of a Conic – Simple Problems using GeoGebra

UNIT II **8hrs**

Planes: Introduction – General Equation of a plane - General Equation of a plane passing through a given point -Equation of a plane in intercept form - Equation of a plane in Normal form– Angle between two planes – Perpendicular distance from a point on a plane – Plane passing through three given points - To find the Ratio in which the plane joining the points (x_1, y_1, z_1) and (x_2, y_2, z_2) is Divided by the Plane $ax + by + cz + d = 0$ - Plane Passing through the intersection of two given planes – Equation of the planes which bisect the angle between two given planes – Condition for the Homogenous Equation of the Second Degree to Represent a pair of Planes- Illustrative examples – Simple Problems using GeoGebra

UNIT III **9hrs**

Straight Line: Introduction – Equation of a Straight Line in Symmetrical Form- Equation of a Straight Line Passing Through the Two Given Points - Equation of a Straight Line Determined by a pair of planes in Symmetrical Form – Angle between a Plane and a Line – Condition for a line to be parallel to a Plane – Condition for a line to lie on the plane - To find the Length of the Perpendicular from a Given Point on a Line– Coplanar Lines–Skew Lines–Equation of Two Non-intersecting Lines Intersection of Three Planes – Conditions for Three Given Planes to form a Triangular Prism – Illustrative Examples – Simple Problems using Geogebra

UNIT IV **9hrs**

Sphere: Definition of Sphere – The Equation of a Sphere with centre at (a,b,c) and radius r– Equation of a sphere on the Line Joining the points (x_1,y_1,z_1) and (x_2,y_2,z_2) as Diameter– Length of the Tangent from $P(x_1,y_1,z_1)$ the Sphere$x^2+y^2+z^2+2ux+2vy+2wz+d=0$-EquationoftheTangentPlane at (x_1,y_1,z_1) to the Sphere $x^2+y^2+z^2+2ux+2vy+2wz+d=0$ - Section of a Sphere by a Plane – Equation of a Circle – Intersection of Two Spheres – Equation of a Sphere Passing through a Given Circle – Condition for Orthogonality of Two Spheres–Radical Plane–Coaxal System–Illustrative Examples.

AI Tools for solving simple problems Using Math GPT

https://math-gpt.org

UNIT V **9 hrs**

Cone: Definition of Cone – Equation of a Cone with a given Vertex and a given guiding curve– Equation of a cone with its vertex at the origin – Condition for the General Equation of the Second Degree to Represent a Cone – Right Circular Cone – Tangent Plane – Reciprocal Cone.

Cylinder: Definition – Equation of a Cylinder with a Given Generator and a given guiding curve – Enveloping Cylinder – Right Circular Cylinder – Illustrative – Simple Problems using GeoGebra.

Overview of important mathematical texts and the contributions of leading Indian mathematicians

https://archive.org/details/in.ernet.dli.2015.282348/page/n143/mode/2up

Text Books

S.No	Author	Title of the Book	Publisher	Year & Edition
1.	P.R. VITAL	Analytical Geometry 2D and 3d (All Five Units)	Pearson Publication	2013,1st Edn.
2.	Department of Mathematics	Lab Manual on GEOGEBRA		
3.	GeoGebra Manual – The Offical Manual of Geogebera https://research.shu.ac.uk/geogebra/GIS_Guides/Official%20GeoGebra%20Manual.pdf(2011)			

Unit I: Chapter 9

Unit II: Chapter 12

Unit III: Chapter 13

Unit IV: Chapter 14

Unit V: Chapter 15 &16

Reference Books

S.No	Author	Title of the Book	Publisher	Year & Edition
1	V.V. Koney	Linear Algebra, Vector Algebra and Analytical Geometry	TPU Press	2009, Standard Edn.
2	P.Duraipandian, Laxmi Duraipandian&D.Muhilan	Analytical Geometry – Three Dimensional	Emerald Publishers	2010, FirstEdn.
3	D.Chatterjee	Analytical Geometry-Two and Three Dimensions	Narosa Publishing House	2011, Standard Edn.
4	George.F.Simmons	Calculus with Analytical Geometry	Mc. Graw-Hill Publisher	Second Edn

5	Shanti Narayan	Analytical Solid Geometry	S.Chand& Company Ltd	2009 &,5thEdn.

MOOC learning

Tangent, Normal :https://nptel.ac.in/courses/111/104/111104095/

Pedagogy:

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

E- Content

1) **Relation between Cartesian Coordinates and Polar Coordinates : https://www.youtube.com/watch?v=Oh2D-efOhcA&ab**

2) **Equation of a plane in Normal form:https://www.youtube.com/watch?v=2sZKZHyaQJ8&ab**
https://www.youtube.com/watch?v=AEZq5uLhbIU&ab

3) **Equation of a Straight Line in Symmetrical Form:https://www.youtube.com/watch?v=AlAReyCFskU&ab**

4) **The Equation of a Sphere with centre at (a, b, c) and radius r: https://www.youtube.com/watch?v=WhYX0T_UqBQ&ab**

5) **Equation of a Cone with a given Vertex and a given guiding curve: https://www.youtube.com/watch?v=XQi6ul9-nJo&ab**

Course Designers:

1. Ms. M. MohanaPriya, Assistant Professor, Department of Mathematics
2. Ms. S. Narmatha, Assistant Professor, Department of Mathematics

COURSE CODE	COURSE TITLE	Category	L	T	P	Credit
TH24C06	STATICS WITH GNU-FISICA LAB	Theory	58	2	-	4

Preamble

- To promote conceptual understanding and problem solving skills, the course contains many interactive elements.

Prerequisite

- Knowledge in forces acting at a point, rigid body, vector algebra and centre of gravity.

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 principles and concepts of statics to develop real concepts	K1
CLO2	Understand the relation between constraints imposed by supportive forces and develop the ability to describe position, forces and moments. Select suitable reference coordinate axes, construct free body diagrams.	K2
CLO3	Apply knowledge of mathematics, physical sciences and an ability to recognize, formulate and solve engineering problems.	K3
CLO4	Analyse the properties (components, resultants and moments) of a forceandforcesystemsin2D&3D.Solve the properties (centroid, centre of gravity and moment of inertia)of areas, lines and volumes and apply the see properties in equilibrium problems. Gain ability to Apply the results from physical models to create real target systems	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; M-Medium

Syllabus

STATICS with GNU – FISICA Lab

Credits:4 **Hours:58**

UNIT I **11 Hrs.**

Forces acting at a point**:** Resultant and components–Parallelogram of forces–Triangle of forces – Polygon of forces – Lami's Theorem – An extended form of the parallelogram law of forces – Resolution of a force– Components of a force along two given directions – Theorem on Resolved parts – Resultant of any number of forces and coplanar forces acting at a point : Graphical and Analytical method – Condition of Equilibrium of any number of forces acting upon a particle- *Simple Problems using GNU -fisicaLab.*

UNIT II **12 Hrs.**

Parallel Forces and Moments**:** Introduction – The resultant of two like, unlike and unequal parallel forces acting ona rigid body–Moment of a force–Physical significance and Geometrical representation of a moment – Varigon's theorem of moments– Generalized theorem of moments. Couples**:** Definition – Equilibrium and Equivalence of two couples – couples in parallel planes – Representation of a couple by a vector - Resultant of a Couple and a Force- *Simple Problems using GNU -fisicaLab.*

UNITIII **11 Hrs.**

Equilibrium of Three Forces Acting on a Rigid body:Rigid body subjected to any three forces – Three coplanar forces – Procedure to be followed in solving any statistical problem – Two Trigonometrical theorems. Coplanar forces: Introduction–Reduction of any number of coplanar forces– Condition and Alternative condition for a system of forces to reduce to a single force or to a couple – Change of the base point – Equation to the line of action of the resultant - *Simple Problems using GNU–fisica Lab.*

UNIT IV **12 Hrs.**

Friction**:** Introduction – Statical, Dynamical and limiting friction – coefficient of friction – Angle of friction– Cone of friction - Equilibrium of a particle on a rough inclined plane – Equilibrium of a body on a rough inclined plane under a force parallel to the plane – Equilibrium of a body on a rough inclined plane under any forces. Centre of gravity**:** Centre of Like Parallel Forces – Centre of mass or Centre of Inertia – Distinction between Centre of gravity and Centre of mass – The Centre of gravity of a body – Determination of uniqueness of the Centre of gravity in simple cases–Centre of gravity by integration- *Simple Problems using GNU –fisicaLab.*

UNIT V **12 Hrs**

Stability of equilibrium**:** Stable, Unstable and Neutral equilibrium – Nature of equilibrium of a rigid body supported at one fixed point – conditions of stability for a body with one degree of freedom. Equilibrium of strings**:** Equation of the common catenary – Tension at any point–Geometricalpropertiesofthecommoncatenary–

AI tools for solving simple problems. - https://math-gpt.org

Geometry in Ancient and Medieval India.

https://archive.org/details/geometry-in-ancient-and-medieval-india-t.-a.-sarasvati-amma/page/98/mode/2up

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

TextBooks

S. No	Author	Title of the book	Publishers	Year & Edition
1.	Dr.M.K.Venkataraman	A Text Book of Statics	Agasthiar Publications	2014, Eleventh Edn.
2	https://www.gnu.org/software/fisicalab/manual/en/fisicalab.pdf			

ReferenceBooks

S. No	Author	Title of the book	Publishers	Year & Edition
1.	K.ViswanathaNaik&M.S.Kasi	Statics	Emerald Publishers	1992, First Edn
2.	N.P. Bali	Statics	Golden Mathematics Series,Laxmi publications	1992 & Fully RevisiedEdn.

UNITI : Chapter 2: Sections 1 to16
UNITII : Chapter 3: Sections 1 to13
Chapter 4: Sections 1 to10
UNITIII : Chapter 5: Sections 1 to5 Chapter 6: Sections 1 to9
UNITIV : Chapter 7: Sections 1 to12
Chapter 8: Sections 1 to 6 &18
UNITV : Chapter 10: Sections 1 to3
Chapter 11: Sections 1 to6

MOOC Courses

- https://nptel.ac.in/courses/122/102/122102004/#

(6 Lectures by Prof. R. K. Mittal, IIT Delhi)

- Lecture 1 Preliminary concepts
- Lecture 2 Vector Analysis
- Lecture 3 Analysis of forces
- Lecture 4 Analysis of Equilibrium
- Lecture 13 Moments and product of Inertia
- Lecture 16 Stability of Equilibrium

E – Content

1. Resolution of a force i)https://www.youtube.com/watch?v=Nc8ZthC65xs
ii)https://www.youtube.com/watch?v=2-R0erl1cVw

2. Equilibrium of any number of forces acting upon a particle-

i) https://www.youtube.com/watch?v=fWK3JZfpR-Y

3. Moment of a force –i)https://www.youtube.com/watch?v=iy5CeOa7JWw

ii)https://www.khanacademy.org/science/physics/torque- angular-momentum/torque-tutorial/v/moments

4. Resultant of a Couple and a Force-

i) https://www.youtube.com/watch?v=oueKO5-dJOc

ii) https://www.rpi.edu/dept/core-eng/WWW/IEA/f15/lectures/Lecture11.pdf

5. Varigon's theorem of moments–

i) https://www.youtube.com/watch?v=JJX3-af_JOw

6. Coplanar forces – i)https://www.youtube.com/watch?v=UlKGy-SPmrU

ii)https://www.youtube.com/watch?v=S_iG8VlaIXE

7. Angle of friction – i)https://www.youtube.com/watch?v=SK0FNS9seqA

ii)https://www.youtube.com/watch?v=qyS54OwpiI4

8. Centre of gravity – i)https://www.youtube.com/watch?v=-OTix-fhEUE

9. Equilibrium of strings– i)https://www.youtube.com/watch?v=A4Db16NcHiI

ii)**https://www.youtube.com/watch?v=-lIUiE5WY3o**

Pedagogy:

Chalk and talk, seminar, group discussion, numerical exercises and quiz.

CourseDesigners:

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

Course Code	Course Name	Category	L	T	P	Credit
CS23SBGP	**Gen-AI**	Theory	44	1	-	3

Preamble

The objective of this course is to understand the breadth and depth of Generative Artificial Intelligence (Gen AI) and to impart knowledge on its ethical implications, practical applications, and emerging trends.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the fundamental concepts and ethical considerations of Generative AI.	**K2**
CLO2	Apply AI principles in practical settings using basic AI tools and platforms	**K3**
CLO3	Develop advanced skills in specialized AI applications such as text analysis, natural language processing, and image recognition.	**K3**
CLO4	Explore emerging trends in AI, integrating advanced AI tools into diverse professional practices.	**K4**

Mapping with Programme Learning Outcomes

CLOs	PO1	PO2	PO3	PO4	PO5
CLO 1	S	S	S	S	M
CLO2	S	S	S	S	S
CLO3	S	S	M	S	S
CLO4	S	M	S	M	S

S- Strong; M-Medium; L-Low.

Syllabus

Gen-AI - CS23SBGP (44 Hrs)

Unit I*: Introduction to Gen AI* ***(9 hours)***

Understanding Gen AI: Definition and scope of Gen AI - Overview of its applications in various fields - Introduction to essential skills needed for Gen AI. Ethical Considerations: Discussion on ethical guidelines and responsible use of AI - Understanding the impact of AI on society and individuals.

Hands-on Activity: Exploring AI Tools

- Working with appropriate content creation Gen-AI tools to engage with Chat GPT to explore various subjects, simulate interviews, or create imaginative written content.
- Working with appropriate writing and rephrasing Gen-AI tools to drafting essays on designated topics and refining the content with improved clarity, coherence, and correctness.

Unit II*: Basic AI Concepts* ***(8 hours)***

Introduction to AI: Basic concepts and terminology of artificial intelligence - Examples of AI in everyday life - Real-world examples of AI applications in different domains. Machine Learning Basics: Understanding the principles of machine learning - Overview of supervised and unsupervised learning.

Hands-on Activity: Simple AI Projects

- Working with appropriate educational content creation Gen-AI tools to generate quizzes and flashcards based on classroom material.
- Working with appropriate language learning Gen-AI tools to practice and enhance language skills through interactive exercises and games across multiple languages.

Unit III: AI in Practice **(9 hours)**

Text Analysis and Natural Language Processing (NLP): Introduction to NLP concepts and techniques - Hands-on exercises analyzing text data and extracting insights. Image Recognition and Processing: Basics of image recognition algorithms and techniques - AI Tools for Text and Image Processing

Hands-on Activity: Text and Image Projects

- Working with appropriate image processing Gen-AI tools to experiment with AI-generated images.
- Working with appropriate object recognition Gen-AI tools to identify various objects such as text, images, products, plants, animals, artworks, barcodes, and QR codes.

Unit IV: ***AI for Productivity and Creativity*** ***(9 hours)***

AI-enhanced Productivity and creativity Tools: Overview of productivity and creativity tools enhanced with AI capabilities - Tips for integrating AI into daily tasks and workflows. AI and Jobs: Exploring how AI impacts jobs and industries - Discussion on opportunities and challenges - Exploration of AI-powered creative tools and applications.

Hands-on Activity: Productivity and Creativity

- Working with appropriate content creation Gen-AI tools togenerate interactive videos / blog posts / art / drawing / music and storytelling experience.
- Working with appropriate resume generation Gen-AI tools to create professional resumes efficiently.

Unit V: ***Future of Gen AI and Final Project*** ***(9 hours)***

Emerging Trends in Gen AI - Applications of Generative AI - Ethical andSocietal Impact of Gen AI -Future Directions and Challenges - Case Studies in Generative AI.

Hands-on Activity: Trends in Gen AI

- Working with appropriate speech generation Gen-AI tools to customize synthetic speech for virtual assistance across different applications.
- Working with appropriate data analysis Gen-AI tools to perform data analysis, visualization, and predictive modeling tasks.
- Working with appropriate Gen-AI design tools to simplify the creation of visually appealing presentations.
- Working with appropriate website builder Gen-AI tools to develop professional websites with AI assistance.

Pedagogy:

Demonstration of AI Tools, Lectures and Case studies.

Course Designers:

1) Mrs. S. Ponmalar, Assistant Professor, Department of Computer science.

Allied Courses Offered to other Programs

For the Students Admitted During the Year 2024 -2025

Semester III

Batch	Semester	Course Code	Title	Contact hrs/week	CA	ESE	Total	Credits	Offered to
2024-2025	III	TH24A18	Mathematics I	7	25	75	100	5	B.Sc Physics Aided
2024-2025	III	TH24A19	Mathematics for Sciences I	7	25	75	100	5	B.Sc.(Chemistry/Botany)
2024-2025	III	TH24A07	Mathematics for Commerce	5	25	75	100	4	Bcom (Aided and SF)

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

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

Mapping with Programme Learning Outcomes

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.ManicavachagamPillai 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 KayalalPachaiyappa	Vector Analysis	S Chand Publications	2014 ,RevisedEdn.
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 (VolumeII)
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=eEo7K8iPS9Y

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

5. Tensor Calculus with differential Geometry

i) https://www.youtube.com/watch?v=noimyj5OTis

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 withindustry 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, sinhat , 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.ManicavachagamPillai and S. Narayanan	Ancillary Mathematics (For Unit III & IV) Volume I & Volume 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 KayalalPachaiyappa	Vector Analysis	S Chand Publications	2014 , 1st Edn.
2	Shanthinarayan a nd 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 a nd Partialdifferential 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

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDITS
TH24A07	MATHEMATICS FOR COMMERCE	Theory	73	2	-	4

Preamble

- To present the basic concepts of Mathematics to the students.
- To enable the students to find the practical applications to the real-world problems.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CLO1	Recollect about several diverse examples of mathematics not in secondary school mathematics, problems using mathematics in unfamiliar settings, and explain why mathematical thinking is valuable in daily life based on the series and Mathematics of Finance.	K1
CLO2	Understand in analyzing, solving, and computing real-world applications on the limits of Algebraic functions and simple differentiation	K2
CLO3	Apply the abilities to describe the concepts of simple integration and its application in business. Solve problems in a range of mathematical applications using the integral.	K3
CLO4	Analyze Linear Programming models for service and manufacturing systems, and apply operations research techniques and algorithms to solve these LPP problems and transportation problems	K4

Mapping with Programme Outcomes

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

S- Strong; M-Medium

Syllabus

MATHEMATICS FOR COMMERCE
B.Com (Aided and SF)

Hours:73

Credits:4

Unit I **13Hrs**

Simple Interest- Compound Interest- Annuities.

Unit II **15Hrs**

Differentiation: Introduction – Limits – Limits of a function – properties of limits – Standard limit theorems – Continuity – Properties of Continuous functions – Differentiation - Derivatives of x^n- Derivatives of e^x – Derivatives of log e^x – product rule – quotient rule –Applications of Derivatives – Marginal cost – Marginal revenue –Elasticity – Relation between marginal revenue and elasticity of demand -. Maxima and minima – Point of inflexion (Excluding Trigonometric functions).

Unit III **15Hrs**

Integration: Arbitrary constant – Two general rules – Some standard results – Integration by Substitution – I – Integration by substitution - II - Integration by Partial fractions - Integration by parts – Definite integral – properties of definite integrals (problems only) – An Application of integration – Marginal cost – Total cost and average cost – Marginal revenue, Total revenue and Average revenue (Excluding Trigonometric functions).

Unit IV **15 Hrs**

Linear Programming: Meaning and Formulation of LPP - Graphical Method - Simplex Method - Transportation problem: Mathematical formulation of the problem - Initial Basic feasible solution (Matrix Minima Method - North – West Corner rule and VAM)- Simple problems only.

Unit V **13 Hrs**

Assignment Problem: Introduction- Mathematical formulation of assignment problem- Assignment algorithm- unbalanced Assignment model-maximization case in assignment problems-Simple problems only.

Textbooks

S. No	Author	Title of the book	Publishers	Year & Edition
1.	P.R. Vittal	Business Mathematics and Statistics	Margham Publications	2002

	UNIT I: Chapter -8,9 &10 UNIT -II: Chapter -15 (P.No.-236-258, 304-328) (Excluding Trigonometric functions) UNIT -III: Chapter -16 (P.No.-337-354, 363-396) (Excluding Trigonometric functions)			
2.	V. Sunderesan, K.S. Ganapathy Subramaniam , K. Ganesan	Operations research	A.R. Publications, 3rd Edition	2005
	UNIT IV: Chapter 2 Section: 2.1 -2.8, Chapter - 3 : Section: 3.1.1 -3.1.4 , Chapter 5 - Section :5.1 UNIT V: Chapter 6 section 6.1-6.7			

Reference Books

S. No	Author	Title of the book	Publishers	Year & Edition
1.	P.A. Navnitham	Business Mathematics and Statistics	Jai Publishers, Trichy.	2003
2.	P. Rama Murthy	Operations research	New age international Publishers	2007, 2nd Edn.
3.	Manmohan and Gupta P K	Operations Research	Sultan Chand & Sons	2011 & 5th revised edition

MOOC learning

https://nptel.ac.in/courses/111/107/111107128/

(4 Lectures by Prof.Kusum Deep, Department of Mathematics, Indian Institution of Technology Roorkee) Lecture 03 Graphical method Lecture 05 Simplex method Lecture 28 Transportation Problem Lecture 29 Assignment Problem

Note

Question paper setters to confine to the above textbooks only

Pedagogy

Chalk and Talk, Powerpoint presentation, E-content, Group discussion, Assignment, Quiz, Peer learning, Seminar

Course Designers

1. Dr. R. Sakthikala, Associate Professor, Department of Mathematics

2. Ms. S. Narmatha, Assistant Professor, Department of Mathematics