PSGR
Krishnammal College for Women

DEPARTMENT OF MATHEMATICS (AIDED)

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

BACHELOR OF MATHEMATICS (B.Sc Mathematics)

2023 - 2026

PSGR
Krishnammal College for Women

Department of Mathematics

Programme: B.Sc. Mathematics (AIDED)

2023 Batch and 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

Department of Mathematics

Programme: B.Sc. Mathematics (AIDED)

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.

DEPARTMENT OF MATHEMATICS (AIDED)

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

SYLLABUS AND SCHEME OF EXAMINATIONS – I & II SEMESTER
2023 Batch and Onwards

Semester	Part	Subject Code	Title of the Paper		Instruction hours per week	Contact Hours	Tutorial Hours	Duration of Examination (in hours)	Examination Marks			Credits
									CA	ESE	TOTAL	
I	I	TAM2301/ HIN2301/ FRE2301	Language Paper I	Language	6	88	2	3	25	75	100	3
	II	ENG2301	English Paper I	English	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	TH23A01/ HI23A01/ ES23A01/ ES23A02/ EG23A01	Allied Mathematical Statistics – I with R/Principles of Modern Government/Indian Economic Development/International Marketing/English through Classics	GE	6	88	2	3	25	75	100	5
	IV	NME23B1/ NME23A1	Basic Tamil/ Advanced Tamil	ACE	2	28	2	-	100		100	2
		NME23ES	Introduction to Entrepreneurship	ACE	2	30	-	-	100		100	2
II	I	TAM2302/ HIN2302/ FRE2302	Language Paper II	Language	6	88	2	3	25	75	100	3
	II	ENG2302	English Paper II	English	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	TH23C04	Number Theory And Summation of Series with MAPLE	CC	5	73	2	3	25	75	100	4
	III	TH23A05/ ES23A03/ ES23A04/ ES23A05/ HI23A02/	Allied - Mathematical Statistics II /Economic Analysis/Econometrics/Monetary Economics/Indian Constitution/English through	GE	6	88	2	3	25	75	100	5

		EG22A02	Classics II									
	IV	**	(Self-study- Online Course)		-	-	-	-	-	-	-	Grade
		23PEPS1	Professional English for physical sciences	ACE	2	25	5	-	100	-	100	2
		NME23B2/ NME23A2	Basic Tamil /Advanced Tamil	ACE	2	-	-	-	100	-	100	Grade
		NM23GAW	General Awareness	GAW	Self Study	-	-	-	100	-	100	Grade

CC – Core Courses
GE – Generic Elective
ACE – Ability Enhancing Course

CA – Continuous Assessment
ESE – End Semester Examination

UG- Core and Allied - (First 3 Units)

CA Question from each unit comprising of

One question with a weightage of 2Marks :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 8Marks(Internal Choice at the same CLO level) :8x3=24

Total:45Marks

ESE Question Paper Pattern : 5x15=75Marks

Question from each unit comprising of

One question with a weightage of 2Marks : 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:75Marks

CIA components for 2023-26 Batch with CIA: ESE pattern 25:75 Marks

INTERNAL COMPONENT MARKS:

CIA Test	:	5 marks **(conducted for 45marks after 50 days)**
Model Exam	:	7 marks **(conducted for 75 marks after 85days (Each Unit 15 Marks))**
Seminar/Assignment/Quiz	:	5 marks
ClassParticipation	:	5marks
Attendance	:	3 marks
Total	**:**	**25 Marks**

RUBRICS

Assignment/ Seminar

Maximum - 20 Marks (converted to 4 marks)

Criteria	4 Marks	3 Marks	2 Marks	1 Mark
Focus Purpose	Clear	Shows awareness	Shows little awareness	No awareness

Main idea	Clearly presents a main idea.	Main idea supported throughout	Vague sense	No main idea
Organisation: Overall	Well planned	Good over all organization	There is a sense of organization	No sense of organization
Content	Exceptionally well presented	Well presented	Content is sound	Not good
Style: Details and Examples	Large amounts of specific examples and detailed description	Some use of examples and detailed descriptions	Little use of specific examples and details	No use of examples

CLASS PARTICIPATION

Maximum - 20 Marks (converted to 5 marks)

Criteria	5 Marks	4 Marks	3 Marks	2 Marks	1 Mark	Points scored
Level of Engagement in Class	Student proactively contributes to class by offering ideas and asks questions more than once per class.	Student proactively contributes to class by offering ideas and asks questions once per class	Student contributes to class and asks questions occasionally	Student rarely contributes to class by offering ideas and asking no questions	Student never contributes to class by offering ideas	
Listening Skills	Student listens when others talk, both in groups and in class. Student incorporates or builds off of the ideas of others.	Student listens when others talk, both in groups and in class.	Student listens when others talk in groups and in class occasionally	Student does not listen when others talk, both in groups and in class.	Student does not listen when others talk, both in groups and in class. Student often interrupts	

					when others speak.	
Behavior	Student almost never displays disruptive behavior during class	Student rarely displays disruptive behavior during class	Student occasionally displays disruptive behavior during class	Student often displays disruptive behavior during class	Student almost always displays disruptive behavior during class	
Preparation	Student is almost always prepared for class with required class materials	Student is usually prepared for class with required class materials	Student is occasionally prepared for class with required class materials	Student is rarely prepared for class with required class materials	Student is almost never prepared for class.	

MAPPING OF PLOs WITH CLOs

COURSE	PROGRAMME OUTCOMES						
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
COURSE -TH23C01 ADVANCED CALCULUS WITH SCILAB							
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
COURSE – TH23C02 DIFFERENTIAL EQUATIONS AND VECTOR ANALYSIS WITH SCILAB							
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
COURSE – TH23A01 MATHEMATICAL STATISTICS – IWITH R							
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
COURSE – TH22C03 CALCULUS OF TRANSFORMS WITH SCILAB							
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
COURSE – TH22C04 NUMBER THEORY AND SUMMATION OF SERIES WITH MAPLE							
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
COURSE – TH22A05 MATHEMATICAL STATISTICS – II							
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

COURSE CODE TH23C01	COURSE NAME CORE I ADVANCED CALCULUS WITH SCILAB SEMESTER I	Category	L	T	P	Credit
		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; L-Low

Syllabus

SEMESTER I

CORE I - Advanced Calculus with SCILAB

Credits : 4 **Hours: 73**

Subject 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 **14 hrs**

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 **15 hrs**

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

Unit I	Chapter 8 Chapter 10 Chapter 11	Section: 1.3-1.7 Section: 2.1-2.8 Section: 1-4
Unit II	Chapter 5 Chapter 6	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

Reference Books

S. No	Author	Title of the book	Publishers	Year & Edition
1	Serge Lang	A First Course in Calculus	Springer Publication	2013
2	A.K. Sharma	Advanced Differential Equations	Discovery Publishing Pvt Ltd	2004
3	Shahriar	Approximately Calculus	First Indian Edition, American Mathematical Society	2012
4	N.P. Bali	Integral Calculus	Lakshmi Publication Pvt Ltd	2011
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.HarishankarMahato, 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 TH23C02	COURSE NAME CORE II DIFFERENTIAL EQUATIONS AND VECTOR ANALYSIS WITH SCILAB SEMESTER I	Category	L	T	P	Credit
		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; L-Low

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 **15 hrs**

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.HemaRamachandran &Dr.AchuthsankarS.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) PageNo:(170-178,185-189,190-195,209-213,222-226,235-240) PageNo:(269-279)
Unit II	Chapter5 Chapter6 Chapter7	PageNo:(286-289,297-302,308-313) PageNo:(314-329) PageNo:(335-339,348-351,353-354)

Unit III	Chapter8 Chapter9	PageNo:(356-367,383-390) PageNo:(400-404,416-428)
Unit IV	Chapter3	Sections–3.3to3.5
Unit V	Chapter 6 Chapter 7	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
2	M.D Raisinghania	Advanced differential equations	S.Chand& Co New Delhi	2009
3	George F.Simmons& Steven G.Krantz	Differential Equations Theory, Technique and Practice	Tata McGraw Hill Education Private Ltd	Tenth reprint 2011
4	Nathaniel Coburn	Vector and Tensor Analysis	The Macmillan Company, New York	2012
5	Erwin Kreyszig	Advanced Engineering Mathematics	Wiley Plus	Tenth 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)

- Lesson 36 Gradient Lesson 37 Curl and divergence
- Lesson 41 Directional derivatives Lesson 44 Applications to Mechanics

For Assignments/ Case Studies Only

IntroductiontoIndustry4.0 -Need–ReasonsforAdoptingIndustry - Definition – Goals and Design Principles - Technologies of Industry 4.0- Skills requiredforIndustry 4.0- Advancementsin Industry 4.0– Impactof Industry 4.0 on Society,Business,Governmentand People.

Reference

P.Kaliraj and T.Devi,	HigherEducation forIndustry4.0and Transformation toEducation5.0	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 TH23A01	COURSE NAME ALLIED - MATHEMATICAL STATISTICS – I WITH R SEMESTER I	Category	L	T	P	Credit
		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; M-Medium; L-Low

Syllabus

SEMESTER I – ALLIED I

ALLIED – MATHEMATICAL STATISTICS – I WITH R

Credits : 5 **Hours: 88**
Subject Code : TH23A01

UNIT I **18 hrs**

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 **18 hrs**

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	8th Edition, 2019

Unit I	**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	4th Edition, 2006
2	A.K.Goon, M.K.Gupta, Das Gupta	Fundamentals of Statistics Vol – I	The World Press, Calcutta	8th Edition, 2002.
3	Murray R.Spiegel, Larry J.Stephens	Schaum's Outline of Theory and Problems of Statistics	Tata McGraw Hill Publishing Company Ltd, New Delhi	3rd Edition, 2005

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 , Head & Associate Professor, Department of Mathematics
2. Dr.D.Sasikala , Assistant Professor, Department of Mathematics

SEMESTER – I - FOUNDATION COURSE

INTRODUCTION TO ENTREPRENEURSHIP

SUBJECT CODE :NME23ES

CREDITS : 2 **TOTAL HOURS : 30**

Unit 1: (5 hrs)

Nature of Entrepreneurship:

Meaning –Need for Entrepreneurship –Qualities of Successful Entrepreneurs - Myths of Entrepreneurship

Activity: Assignment, Discussion (2hrs)

Unit 2: (6 hrs)

Role of Entrepreneurs

Significance of Entrepreneurship to the nation –Environmental Factors influencing Entrepreneurship– Entrepreneurial Process and Functions - Challenges faced by Entrepreneurs

Activity: Quiz / Role Play (2hrs)

Unit 3: (6 hrs)

Formulation of Business Idea:

Business Idea Generation - Entrepreneurial Imagination and Creativity – Role of Innovation– Opportunity Evaluation

Activity: Business Idea Pitch (2hrs)

Unit 4: (6 hrs)

Business Planning:

Need for Market Study – Securing Finance from various Sources - Significance of Business plan– Components of Business plan

Activity: Schemes available for Entrepreneurs (2hrs)

Unit 5: (7 hrs)

Project:

Interface with Successful Entrepreneurs – 4 hrs

Business Plan Presentation – 3 hrs

Reference Books

1. D.F. Kuratko and T.V. Rao, Entrepreneurship - South Asian Perspective, 2016, Cengage Learning India Pvt. Ltd. Delhi.

2. Arya Kumar, Entrepreneurship: Creating and Leading an Entrepreneurial Organization, 2012, Pearson Education India .

Exam Pattern for Introduction to Entrepreneurship

Quiz	:	50 Marks
Assignment	:	25 Marks
Project/Casestudy	:	25 Marks
Total	**:**	**100 Marks**

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

Preamble

- To understand the practical applications of Integral transforms in solving problems of signal 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	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 - CORE PAPER III
Calculus of Transforms with SCILAB

Credits: 4 **Hours: 88**
Subject Code: TH23C03

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 - 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.	LokenathDebnath 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 2.10-2.12 (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	Tata McGraw Hill, New Delhi.	3rd Edition,

		Mathematics		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, Associate Professor, Department of Mathematics
2. Dr.(Mrs) G. Arthi, Assistant Professor, Department of Mathematics

COURSE CODE TH23C04	COURSE NAME 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	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
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

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: TH23C04

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 sines and cosines – Infinity and the extended complex plane **C***

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	ArihantPrakashan, Meerut	2008

Digital Demonstration using maple

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 TH23A05	COURSE NAME MATHEMATICAL STATISTICS – II (Problems in Applied statistics using R)	Category	L	T	P	Credit
		Theory	88	2	-	5

Preamble

- To introduce statistical techniques of analysis and inference that are useful in many areas of scientific research.
- To present descriptive statistics and utilize the probability distributions to perform statistical inference.

Prerequisite

- Critically evaluate the design, including sampling techniques, of a statistical study,
- Effectively use statistical software R to perform statistical computations and display numerical 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,	K2
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 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; L-Low

Syllabus

SEMESTER II – ALLIED – II

ALLIED – MATHEMATICAL STATISTICS - II

(Problems in Applied statistics using R)

Credits : 5 **Hours: 86**

Subject Code :TH23A05

UNIT I **17 hrs**

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 hrs**

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 hrs**

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 hrs**

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 hrs**

Vital Statistics-Definition-Utility of vital statistics-Measures of population and Vital statistics-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 BalaRastogi	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	Sections: 10.3-10.6

	Chapter 11	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, Associate Professor, Department of Mathematics
2. Mrs. S.Lakshmi, Assistant Professor, Department of Mathematics

COURSE NUMBER 23PEPS1	COURSENAME I BSc Physics, Chemistry, Mathematics SEMESTER– II PROFESSIONAL ENGLISH FOR PHYSICAL SCIENCES	Category	L	T	P	Credit
			40	5		2

Objectives

- To develop the language skills of students by offering adequate practice in professional contexts.
- To enhance the lexical, grammatical and socio-linguistic and communicative competence of first year physical sciences students
- To focus on developing students' knowledge of domain specific registers and the required language skills.
- To develop strategic competence that will help in efficient communication
- To sharpen students' critical thinking skills and make students culturally aware of the target situation.

CourseOutcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Recognise their own ability to improve their own competence in using the language	K1
CLO2	Use language for speaking with confidence in an intelligible and acceptable manner	K2
CLO3	Read independently unfamiliar texts with comprehension and understand the importance of reading for life	K3
CLO4	Understand the importance of writing in academic life	K3
CLO5	Write simple sentences without committing error of spelling or grammar	K3

(Outcomes based on guidelines in UGC LOCF – Generic Elective)

Syllabus

UNIT 1: COMMUNICATION **8 hours**

Listening: Listening to audio text and answering question

Listening toInstructions

Speaking: Pair work and small group work.

Reading: Comprehension passages –Differentiate between facts and opinion

Writing: Developing a story with pictures**.**

Vocabulary: Register specific - Incorporated into the LSRW tasks

UNIT 2: DESCRIPTION **8 hours**

Listening: Listening to process description.-Drawing a flow chart.

Speaking: Role play (formal context)

Reading: Skimming/Scanning- Reading passages on products, equipment and gadgets.

Writing: Process Description –Compare and Contrast Paragraph-Sentence Definition and Extended definition- Free Writing.

Vocabulary: Register specific -Incorporated into the LSRW tasks.

UNIT 3: NEGOTIATION STRATEGIES **8 hours**

Listening: Listening to interviews of specialists / Inventors in fields (Subject specific)

Speaking: Brainstorming. (Mind mapping).

Small group discussions (Subject- Specific)

Reading: Longer Reading text.

Writing: Essay Writing (250 words)

Vocabulary: Register specific - Incorporated into the LSRW tasks

UNIT 4: PRESENTATION SKILLS **8 hours**

Listening: Listening to lectures.

Speaking: Short talks.

Reading: Reading Comprehension passages

Writing: Writing Recommendations -Interpreting Visuals inputs

Vocabulary: Register specific - Incorporated into the LSRW tasks

UNIT 5: CRITICAL THINKING SKILLS **8 hours**

Listening: Listening comprehension- Listening for information.

Speaking: Making presentations (with PPT- practice).

Reading : Comprehension passages –Note making.

Comprehension: Motivational article on Professional Competence, Professional Ethics and Life Skills)

Writing: Problem and Solution essay– Creative writing –Summary writing

Vocabulary: Register specific - Incorporated into the LSRW tasks

Textbook

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	TamilNadu State Council for Higher Education (TANSCHE)	English forPhysical Sciences Semester 1	--	--

Reference Books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	Sreedharan, Josh	The Four Skills for Communication	Foundation books	2016
2	Pillai, G Radhakrishna, K Rajeevan, P Bhaskaran Nair	Spoken English for you	Emerald	1998
3	Pillai, G radhakrishna, K Rajeevan, P Bhaskaran Nair	Written English for you	Emerald	1998

Exam Pattern for Professional English

The course offered in alignment with TANSCHE norms with 2 credits.

Quiz (5x20 Marks) : 100Marks

Allied Courses Offered to other Programs

For the Students Admitted During the Year 2023 -2024

Allied Courses Offered to other Programs

For the Students Admitted During the Year 2023 -2024

Semester I

B.SC (CS), B.SC (CS with Cognitive Systems& CS with Cyber Security), BCA, B.SC (IT)- Semester I– Allied – Numerical and Statistical Techniques (TH23A03)

B.COM (CA, E-COM, FS, A & F) - Semester I - Allied – Mathematics for Commerce I – (TH23A07)

B. Com (BA) – Semester I – Allied - Statistics I (TH23A15)

BBA, BBA (IB & RM), BBA (BPM) – Allied – Semester I - Mathematics for Management I (TH23A02)

Semester II

B.SC (CS), B.SC (CS with Cognitive Systems), BCA, B.SC (IT) - Semester II - Allied - Discrete Mathematics (TH23A06)

B.COM (CA, E-COM, FS, A & F) - Semester II - Allied – Statistics for Commerce (TH23A08)

B. Com (BA) – Semester II – Allied - Statistics II (TH23A16)

BBA, BBA (IB & RM), BBA (BPM) – Allied - Mathematics for Management II (TH23A24)

B.SC CS (AI) - Allied – Statistics for Computer Science-I (TH23A26)

B.SC CS (Cyber Security) - Allied – Number Theory & Algebra (TH23A32)

COURSE CODE TH23A03	COURSE NAME ALLIED - NUMERICAL AND STATISTICAL TECHNIQUES SEMESTER I	CATEGORY	L	T	P	CREDIT
		Theory	88	2	-	5

Preamble

- To present students the Basic concepts of Numerical Methods and Statistics.
- To enable the students to find the practical applications to the real world problems.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall basic Mathematics and Statistical concepts	K1
CLO2	Understand results from the application of standard statistical and numerical methods.	K2
CLO3	Apply the concepts of Numerical differentiation and Theoretical distributions	K3
CLO4	Analyze numerical and statistical methods to solve complex problem.	K4

Mapping with Programme Learning Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

SEMESTER I

Numerical and Statistical Techniques

(Common to B.SC (CS), B.SC (CS with Cognitive Systems), BCA, B.SC (IT)- Semester I

Credits:5 **Hours:88**

Subject Code:TH23A03

UnitI **17 Hrs**

SolutionofLinear Simultaneous Equations: Gauss elimination - Gauss Jordan - Gauss Seidel and Gauss Jacobi methods -simple problems. Interpolation: Newton Forward and

Backward Interpolation Formulae.

Unit II **17 Hrs**

Numerical Differentiation, Formulae for Derivatives: Newton's Forward Difference - Newton's Backward Difference, Numerical Integration: Introduction, Newton-Cotes Quadrature formulas: trapezoidal rule, Simpson's 1/3 and 3/8 rules, Taylor's series method.

Unit III **18 Hrs**

Skewness - Correlation analysis: Introduction - Significance of the study of correlation - correlation and causation - Types of correlation - Methods of studying correlation - Graphic method - Karl Pearson's coefficient of correlation - Coefficient of correlation and probable error - Coefficient of determination - Properties of the coefficient of the correlation - Rank correlation coefficient - Features of Spearman's correlation coefficient, Regression analysis.

Unit IV **17 Hrs**

Probability: Introduction - probability defined - Importance of the concept of probability - Calculation of probability - Theorems of probability (statements only) –Mathematical expectation-Simple problems.

Unit V **19 Hrs**

Theoretical Distributions: Binomial distribution - Poisson distribution and normal distribution (without derivations & proof).

Text Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	B.S. Grewal	Numerical Methods in Engineering and Science with Programs in C & C++	Khanna Publishers	2014
	Unit I: Chapter III &VII: 3.3, 3.4, 3.5 &7.1-7.3 Unit II: Chapter VIII& X: 8.1, 8.2:(1,2),8.4, 8.5:(I, II, III),10.3			
2.	S.P.Gupta	Statistical methods	Sultan Chand & Sons Publications	2005
	Unit III: Volume I: Chapter 9(till measures of skewness),10,11. (pg: 329-341, 377-412, 435-454) Unit IV: Volume-II Chapter 1(till Baye's theorem) (pg: 751-771) Unit V : Volume-II Chapter2 (pg:805-824, 826-834, 836-856)			

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	P.A.Navanitham	Business Mathematics And Statistics	Jai Publishing Company	2003
2.	S.C Gupta and V.K. Kapoor	Fundamentals of Mathematical Statistics	Sultan Chand & Sons Publications	2001
3.	P.Kandasamy, K.Thilagavathy and	Numerical Methods	S.Chand and company LTD	Reprint

	K.Gunavathy			2007
4.	V.K.Kapoor	Fundamentals of Applied Statistics	Sultan Chand & Sons	2007

MOOC learning

https://nptel.ac.in/courses/111/107/111107105/

(Lectures by Prof.Ameeya Kumar Nayak and Prof. Sanjeev Kumar, Department of Mathematics, Indian Institution of Technology Roorkee)

Lecture 02 Gaussian elimination with partial pivoting
Lecture 04 Jacobi and Gauss Seidel methods
Lecture 20 Newton's Forward Difference & Newton's Backward Difference
Lecture 34 Simpsons 1/3rd rule and 3/8 rule

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

(6 Lectures by Prof.G.Srinivasan, Department of Management Studies, Indian Institution of Technology Madras)

Lecture 12 Probability
Lecture 13 Rules of probability
Lecture 19 Binomial distribution
Lecture 20 Poisson distribution

Note

Question paper setters to confine to the above text books only

Pedagogy

Chalk and talk, ppt, Group discussion, Seminar, Quiz, Assignment

Course Designers

1.Ms.J.Rejula Mercy, Assistant Professor, Department of Mathematics

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

COURSE CODE TH23A07	COURSE NAME- ALLIED MATHEMATICS FOR COMMERCE SEMESTER I	CATEGORY	L	T	P	CREDIT
		Theory	88	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 Learning 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 analysing, 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	Analyse Linear Programming models for service and manufacturingsystems, and apply operations research techniques and algorithms tosolvetheseLP problemsand transportation problems	K4

Mapping with Programme Learning 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; L-Low

Syllabus

SEMESTER I

ALLIED - MATHEMATICS FOR COMMERCE

(COMMON TO SEMESTER I -B.COM (CA, E-COM, FS, A&F))

Credits: 4 **Hours: 88**

Subject Code: TH23A07

Unit I **17 Hrs**

Arithmetic Progression - Geometric Progression. Simple Interest- Compound Interest - Annuities.

Unit II **18 Hrs**

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 – Function of a function rule – Logarithmic Differentiation – Differentiation of Implicit function – Relation between dy/dx and dx/dy – Parametric Differentiation – Successive Differentiation – 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 **18 Hrs**

Integration : Arbitrary constant – Two general rules – Some standard results – Integration by Substitution – I – Integration by substitution - II - Integration by substitution – III – Standard results – Integration of rational function of the type – Integration by Partial fractions - Integration of the function of the type 1/((ax+b)sqrt(lx^2+mx+n)) – Integration by parts – Definite integral – properties of definite integrals – An Application of integration – Marginal cost – Total cost and average cost – Marginal revenue, Total revenue and Average revenue (Excluding Trigonometric functions).

Unit IV **17 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 **18 Hrs**

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

Textbooks

S. No	Author	Title of the book	Publishers	Year of Publication
1.	P.R. Vittal	Business Mathematics and Statistics	Margham Publications	2002
	UNIT I: Chapter -6,7,8,9 &10 UNIT -II: Chapter -15 (Excluding Trigonometric functions) UNIT -III: Chapter -16 (Excluding Trigonometric functions)			
2.	V. Sunderesan, K.S. GanapathySubramaniam	Operations research	A.R. Publications, 3rd Edition	2005

	, K. Ganesan			
	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 6.1,6.2,6.3,6.4,6.5,6.6, 6.7, 6.9			

Reference Books

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

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

Lecture by Chalk and talk, Power point presentation, E-content, Group discussion, Assignment, Quiz, Peer learning, Seminar.

Course Designers

1. Dr. R. Sakthikala, Assistant Professor, Department of Mathematics
2. Ms. S. Narmatha, Assistant Professor, Department of Mathematics

COURSE CODE TH23A15	COURSE NAME ALLIED STATISTICS I SEMESTER I	CATEGORY	L	T	P	CREDIT
		Theory	88	2	-	4

Preamble

- To present students the Basic concepts of statistics in terms of theory and practical.
- To enable the students to find the practical applications to the real world problems using EXCEL.

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	Perform statistical inference in several circumstances and interpret the results in an applied context.	K2
CLO3	Using Excel to gain proficiency skill for data analysis.	K3
CLO4	Distinguish types of studies and their limitations and strengths of Times Series and Index Numbers.	K4

Mapping with Programme Learning Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

SEMESTER I
ALLIED - STATISTICS I
(For B COM BUSINESS ANALYTICS)

Credits: 4 **Hours: 88**
Subject Code: TH23A15

UNIT I **16 Hrs**

Introduction-Meaning and objectives of Classification-Types of Classification-Formation of a discrete and continuous frequency Distribution-Tabulation of data- Parts of Table-General rules of

tabulation- Types of tables. Diagrammatic and Graphic Presentation: Introduction- Significance of diagrams and graphs- General rules for constructing Diagrams-Types of diagrams- Graphs-Graphs of frequency distributions. Introduction to statistical software (like Excel) and learning graphs and diagrams using Excel.

UNIT II **19 Hrs**

Measures of central tendency: Introduction-Objectives of Averaging-Requisites of a good average- Types of Averages-Geometric Mean-Harmonic Mean- Relationship among the averages - Measures of dispersion: Significance of Measuring variation – Properties of good measures of variation-methods of studying variation. Simple problems related to above mentioned concepts using Excel.

UNIT III **18 Hrs**

Skewness: Introduction- Tests of skewness – Measures of skewness- Correlation analysis: Introduction - Significance of the study of correlation - correlation and causation - Types of correlation - Methods of studying correlation - Graphic method - Karl Pearson's coefficient of correlation - Coefficient of correlation and probable error - Coefficient of determination - Properties of the coefficient of the correlation - Rank correlation coefficient - Features of Spearman's correlation coefficient - Regression analysis.(Verification by excel)

UNIT IV **18 Hrs**

Analysis of time Series -Introduction - Utility of time series - Components of time series - Preliminary adjustments before analyzing time series - Measurement of trend - Free hand or graphic method - Method of semi averages - Moving average method - Measurement of seasonal variations - Method of simple averages only - Ratio-to-trend Method - Ratio-to - moving average method - Link relative method.

UNIT V **17 Hrs**

Index Numbers: Introduction - Uses of index numbers - Classification of index numbers - Problems in construction of index numbers - Methods of constructing index numbers - Quantity of volume index numbers - Value index numbers - Tests of adequacy of index number formulae. Interpolation: Introduction - Significance of interpolation and extrapolation - Assumptions of interpolation and extrapolation - Methods of interpolation: Binomial expansion methods - Newton's method - Lagrange's method- Extrapolation

Text book

S. No	Author	Title of the book	Publishers	Year of Publication
1.	S P Gupta	Statistical Methods	Sultan Chand & Sons publishers	2004
	Unit I: Volume I: Chapter: 5, 6 Unit II: Volume I: Chapter: 7, 8. UNIT III: Volume I: Chapter: 9 (Pg No.329-341) (till measures of skewness),10,11. UNIT IV: Volume I: Chapter: 14 (Up to Link Relative Method) UNIT V:Volume I: Chapter: 13 & 15.			

Reference Books

S. No	Author	Title of the book	Publishers	Year of

				Publication
1.	P.A. Navnitham	Business Mathematics and Statistics	Jai Publishers, Trichy.	2003
2.	V.K.Kapoor	Fundamentals of Applied Statistics	Sultan Chand & Sons	2007

Digital Demonstration using Excel

https://www.vertex42.com/edu/charts-and-graphs-in-excel.html

- Graphs and charts

https://www.syncfusion.com/ebooks/statistics/descriptive-statistics

- Measures of central tendency, Measures of dispersion

https://www.excel-easy.com/examples/regression.html

- Regression

MOOC learning

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

(1 lesson by Prof.Arunkanda, Department of Mechanical Engineering, IIT,Delhi)

- Lecture 35 - Analysis of Time Series

https://www.youtube.com/watch?v=JT9o8b43Gk0

- Index numbers

Note

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

Pedagogy

Lecture by Chalk and talk, Power point presentation, E-content, Group discussion, Assignment, Quiz, Peer learning, Seminar.

Course Designers

1. Ms.M.Mohanapriya, Assistant Professor, Department of Mathematics
2. Dr. R. Sakthikala, Assistant Professor, Department of Mathematics

COURSE CODE TH23A02	COURSE NAME ALLIED -MATHEMATICS FOR MANAGEMENT I SEMESTER I	CATEGORY	L	T	P	CREDIT
		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 fundamental mathematical concepts and analysis of real-world problems to non-Mathematician	K1
CLO2	Understand the mathematical results to find solutions in the real life like annuities and sampling theory	K2
CLO3	Apply the fundamental mathematical concepts and analysis of real-world problems to non-Mathematician	K3
CLO4	Analyze mathematical statements and essential skills that are progressively developed throughout the curriculum.	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; L-Low

Syllabus

SEMESTER I

ALLIED - MATHEMATICS FOR MANAGEMENT I

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

Credits:4 **Hours : 73**

Subject Code:TH23A02

UNIT I **14 hrs**

Arithmetic Progression-Geometric Progression-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, Discount on Bills.

UNIT III **14 hrs**

Meaning and scope, statistical survey, collection of data, classification and tabulation, diagrams and graphs. Introduction to statistical software (like Excel) 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- Seasonal Variation- Method of Simple Average. Index numbers: Weighted and unweighted indices, cost of living index.

Text Books

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

Reference Books

S.No.	Author	Title of Book	Publishers	Year of publication
1	S.P .Gupta	Statistical Method	Sultan Chand Publications	2002

MOOC learning

https://nptel.ac.in/courses/111/104/111104120/

Prof Shalabh, Department of Mathematics, IIT Kanpur

Lecture 14Airthmetic 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, PPT, Group discussion, Seminar, Quiz, Assignment

Course Designers

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

COURSE CODE TH23A06	COURSE NAME ALLIED DISCRETE MATHEMATICS SEMESTER II	CATEGORY	L	T	P	CREDIT
		Theory	88	2	-	5

Preamble

- Principle of Mathematical Structures which are essential and related to the concepts of Computer Science. This helps the students to approach any Mathematical Problem which arise in the field of Computer Science

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Identify Mathematical logic and definitions and well-formed formula and Outline the understanding of Tautology and Equality relations thereby helps students to understand ambiguity and disagreement in real world problems	K1
CLO2	Lattices and Boolean algebras enables one to understand applications in logic, circuit theory, and probability	K2
CLO3	Demonstrate the importance of Graph Theory in Computer Science	K3
CLO4	Apply and Demonstrate algebraic concepts in Coding theory using group codes enhances their ability to detect and correct errors	K4

Mapping with Programme Learning Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

SEMESTER – II

ALLIED - DISCRETE MATHEMATICS

Common to B.SC (CS), B.SC (CS with Cognitive Systems), BCA, B.SC (IT)

Credits 5 **Hours 88**

Subject Code :TH23A06

Unit I **18Hrs**

Mathematical Logic: Connectives– Statement Formulas and Truth Tables - Conditional and Biconditional - Well formed Formulas - Tautologies - Equivalence of Formulas -Duality law - Tautological implications -Normal forms –Theory of inference for the Statement Calculus - Predicate Calculus.

Unit II **17 Hrs**

Coding Theory: Introduction – Hamming distance – Encoding a message – Group codes – Procedure for generating Group Codes – Decoding and Error Correction – An example of a Simple error correcting code.

Unit III **18 Hrs**

Formal languages and Automata: Grammar and Languages -Phrase Structure grammar – Types of Phrase Structure Grammar – Backus-Naur form [BNF] - Finite State Acceptors and Regular Grammars : Deterministic finite automata-Non-Deterministic finite-State automata-Conversion of Non-Deterministic finite automata to finite state automata.

Unit IV **19 Hrs**

Lattice and Boolean Algebra: Lattices as Partial ordering set – Some Properties of Lattices- Distributive lattices-Complemented Distributive Lattices-Boolean algebra – Boolean Function – Representation and Minimization of Boolean function using K-Map.

Unit V **16 Hrs**

Graph Theory: Basic Concepts of Graph Theory – Path, Reachability and Connectedness – Circuits-Hamiltonian Paths- Euler paths-Matrix representation-Incidence matrix-Adjacency matrix-Tree and Binary tree – Theorems-Statement only(No Proof).

Text Books

<table>
<tr><td>S. No</td><td>Author</td><td>Title of the book</td><td>Publishers</td><td>Year of Publication</td></tr>
<tr><td rowspan="2">1.</td><td>J.P.Tremblay and R.Manohar</td><td>Discrete Mathematical Structures with Applications to Computer Science</td><td>McGraw Hill Publishing Company</td><td>Edition 1997,
Reprint 2008</td></tr>
<tr><td colspan="4">Unit I : Section: 1.2.1 -1.2.4, 1.2.6 -1.2.11, 1.3.1 -1.3.4, 1.4.1 – 1.4.2, 1.5.1 -1.5.4
Unit III : Section: 3.3.1 -3.3.3, 6.1.1
Unit IV : Section: 4.1.1 -4.3.1 ,4.4.1, 4.4.2
Unit V : Section: 5.1.1 -5.2.2</td></tr>
<tr><td rowspan="2">2.</td><td>Dr. M.K. Venkataraman,
Dr. N. Sridharan and N. Chandrasekaran</td><td>Discrete Mathematics</td><td>The National Publishing company, Chennai</td><td>First edition Reprint 2003,</td></tr>
<tr><td colspan="4">Unit II: Chapter 8 Sections 8.1 – 8.7</td></tr>
</table>

Reference books

S.NO	Author	Title of the book	Publishers	Year of publication
1	T.Veerarajan	Discrete Mathematics with Graph Theory and Combinatorics	Tata mcgraw-Hill publishing company Limited	2008
2	NarSinghDeo	Graph Theory with Applications to Engineering and Computer Science	PHI, India	2006
3	T. Santha and P. Radha	Discrete Mathematics for Computer Science and Applications	Kalaikathir Publications	2002

MOOC learning

https://nptel.ac.in/courses/111/107/111107058/

(Lectures by Dr.AditiGangopadhyay, Dr.SugataGangopadhyay and Dr.TanujaSrivastava, Department of Mathematics, IIT Roorkee)

Lecture 06 Logical Inferences
Lecture 32 Lattices
Lecture 33 Boolean algebra
Lecture 17 Basic definition
Lecture 18 Isomorphism and sub graphs
Lecture 19 Walks, paths and circuits operations on graphs
Lecture 20 Euler graphs, Hamiltonian circuits

Note

Question paper setters to confine to the above text books only

Pedagogy

Chalk and talk, Powerpoint Presentation, E-Content, Group discussion, Seminar, Quiz, Assignment and Peer learning

Course Designers

1. Ms.S.Sreeja, Assistant Professor, Department of Mathematics

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

COURSE CODE TH23A08	COURSE NAME ALLIED STATISTICS FOR COMMERCE SEMESTER II	CATEGORY	L	T	P	CREDIT
		Theory	88	2	-	4

Preamble

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

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Indicate the strength and direction of a linear relationship between two variables, regression and time series.	K1
CLO2	Construct simple price, quantity, and value indexes.	K2
CLO3	Understand the concepts of a random variable and a probability distribution.	K3
CLO4	To measure progress toward quality improvement and public health goals.	K4

Mapping with Programme Learning Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

SEMESTER II/IV
Allied - Statistics for Commerce
B.COM (CA, E-COM, FS, A&F) - SEMESTER II

Credits 4 **Hours 86**

Subject Code : TH23A08

UNIT I **16Hrs**

Correlation analysis: Introduction - Significance of the study of correlation - correlation and causation - Types of correlation - Methods of studying correlation - Graphic method - Karl

Pearson's coefficient of correlation - Coefficient of correlation and probable error -Regression analysis. Analysis of time Series: Introduction - Utility of time series - Components of time series - Preliminary adjustments before analysing time series - Measurement of trend - Free hand graphic method - Method of semi averages - Moving average method - Measurement of seasonal variations - Method of simple averages - ratio to moving average – link relative method.

UNIT II **19 Hrs**

Index Numbers: Introduction - Uses of index numbers - Classification of index numbers - problems in construction of index numbers - Methods of constructing index numbers - Quantity or volume index numbers - Value index numbers - Tests of adequacy of index number formulae- Consumer price index numbers-meaning and need-method of constructing the index- Index number of industrial production.

UNIT III **18 Hrs**

Concepts of probability- Addition theorem-Multiplicative theorem – Conditional probability-Bayes theorem-Mathematical Expectation-Theoretical distributions-Binomial Distribution -Poisson distribution- Normal distribution.

UNIT IV **17 Hrs**

Statistical Inference-Tests of hypothesis-Introduction—Procedure-Types of errors-Two-tailed and one-tailed tests of hypothesis-standard error and sampling distribution-Tests of significance for large samples-Difference between small and large samples- Two tailed test and standard error of the difference between small and large samples-chi-square test and goodness of fit.

UNIT V **17 Hrs**

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

Text Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	S P Gupta	Statistical Methods	Sultan Chand &Sons publishers	2004
	Unit I :Volume I: Chapter: 10,11,14. Unit II: Volume I: Chapter: 13 Unit III: Volume II: Chapter: 1&2 Unit IV: Volume II: Chapter:3&4.			
2.	Veer BalaRastogi	Biostatistics Third Revised Edition	MEDTECH	2015
	Unit V: Chapter20; Sections:20.2, 20.2.1.,20.2.2. Chapter21:21.1, 21.2, 21.2.1, 21.3,21.4,21.5			

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	P.A. Navnitham	Business Mathematics and Statistics	Jai Publishers, Trichy.	2003
2.	V.K.Kapoor	Fundamentals of Applied Statistics	Sultan Chand & Sons	2007
3.	P.N.ARORA SUMEET ARORA , S.ARORA	Comprehensive Statistical Methods	Sultan Chand & Sons	2008

MOOC learning

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

(1 lesson by Prof.Arunkanda, Department of Mechanical Engineering, IIT ,Delhi)

Lecture 35 - Analysis of Time Series

https://www.youtube.com/watch?v=JT9o8b43Gk0

Index numbers

https://nptel.ac.in/courses/102106051/
26 Lessons by Prof.MukeshDoble , IIT Madras
Lecture 1 – Introduction
Lecture 2 – Binomial Distribution
Lecture 3 – Poisson Distribution
Lecture 4 – Normal Distribution
Lecture 5-10 – T- test
Lecture 22-24 – Chi-Square test

Note

Question paper setters to confine to the above text books only

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Quiz, Assignment

Course Designers

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

COURSE CODE TH23A16	COURSE NAME ALLIED STATISTICS II SEMESTER II	CATEGORY	L	T	P	CREDIT
		ALLIED	88	2	-	4

Preamble

- To provide the use of mathematical process skills to identify, pose and solve problems creatively , critically and practically
- To make students to understand statistical principles with theoretical concepts and problems.
- To provide the wide knowledge of real time applications and to clear the competitive exams.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall basic concepts of data description and its representation and understand the basic principles of probability and sampling theory	K1
CLO2	Understand the logic and framework of the inference of hypothesis testing.	K2
CLO3	Formulate and apply small samples, large sample and non-parametric tests in real life problems.	K3
CLO4	Apply probability as a tool for anticipating the distribution of data and using appropriate method to draw conclusions.	K4

Mapping with Programme Learning Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

SEMESTER II
ALLIED – STATISTICS II
(FOR B COM (BUSINESS ANALYTICS))

Credits: 4 **Total Hours: 88**
Subject Code: TH23A16

Unit I **18 Hrs**

Brief History- meaning & Usefulness-Mathematical properties- permutation & Combination-Trail, event- sample space-mutually exclusive cases- exhaustive events-independent

events-dependent events, simple and compound events- measurement-classical, relative frequency – theory of probability-limitations- personalistic view of probability and axiomatic approach of probability- addition and multiplication theorems.

Unit II **18 Hrs**

Theoretical Distributions: Binomial Distributions - Poisson Distributions – Normal Distributions.

UNIT III **18 Hrs**

Tests of hypotheses- Introduction- Standard error and Sampling Distribution-Estimation-Test of significance for large samples- Test of significance for small samples: Students t distribution- chi-square test and goodness of fit (Except Yates correction). Simple problems using SPSS.

UNIT IV **17 Hrs**

F test – Analysis of variance: One-way classification-two-way classification. Simple problems using SPSS.

UNIT V **17 Hrs**

Experimental Design- Introduction-Randomized Block Design-Latin Squares-Randomized Blocks Vs Latin Squares-Latin cubes.

Text Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	R .S .N. Pillai, V. Bagavathi	Statistics	S. Chand & company Ltd.	2001
	Unit I : Chapter: 18 Unit II: Chapter : 19			
2.	S P Gupta	Statistical Methods	Sultan Chand & Sons publishers	2004
	UNIT III : Volume II: Chapter: 3&4. UNIT IV : Volume II: Chapter: 5. UNIT V: Volume II: Chapter: 6.			

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	S.C. Gupta	Fundamentals of Mathematical Statistics	Sultan Chand & Sons publishers.	2002
2.	EelkoHuizingh	Applied Statistics with SPSS	Sage Publications	2007

Digital Demonstration using SPSS

https://academic.udayton.edu/gregelvers/psy216/spss/ttests.htm

- t test

https://statistics.laerd.com/spss-tutorials/one-way-anova-using-spss-statistics.php

- One way ANOVA

https://statistics.laerd.com/spss-tutorials/two-way-anova-using-spss-statistics.php

- Two way ANOVA

MOOC learning

https://nptel.ac.in/courses/102106051/

(26 Lessons by Prof.MukeshDoble , IIT Madras)

- Lecture 1 – Introduction
- Lecture 2 – Binomial Distribution
- Lecture 3 – Poisson Distribution
- Lecture 4 – Normal Distribution
- Lecture 5-10 – T- test
- Lecture 11-13 – F test
- Lecture 14-20 – ANOVA
- Lecture 22-24 – Chi-Square test
- Lecture 32- Design of Experiments (Introduction)

Note

Question paper setters to confine to the above text books only

Pedagogy

Lecture by Chalk and talk, Power point presentation, E-content, Group discussion, Assignment, Quiz, Peer learning, Seminar.

Course Designers

1. Ms. M. Mohanapriya, Assistant Professor, Department of Mathematics

2. Dr. R. Sakthikala, Assistant Professor, Department of Mathematics

COURSE CODE TH23A24	COURSE NAME MATHEMATICS FOR MANAGEMENT II SEMESTER II	CATEGORY	L	T	P	CREDIT
		Theory	73	2	-	4

Preamble

To impart the students with knowledge in basic mathematical concepts.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the basic concepts and application of operation research in various fields.	K1
CLO2	Understand and applying the managerial problems in industry so that they are able to use resources (capitals, materials, staffing, and machines) more effectively.	K2
CLO3	Formulate and solve the transportation problems using both manual methods and interpret the solutions.	K3
CLO4	Illustrate the theoretical framework to conceive social situations among competing players and produce optimal decision-making of independent and competing actors in a strategic setting.	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	S	M	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

SEMESTER II
MATHEMATICS FOR MANAGEMENT II
Common to BBA (Aided), BBA (IB & RM), BBA (BPM)

Credits 4 **Hours 73**

Subject Code:TH23A24

UNIT I **14Hrs**

Introduction to operation research: Meaning and Objective of OR – Scope of OR in Retail Business – Models in OR – Characteristics – Benefits – Limitations.

UNIT II **15 Hrs**

Linear Programming: Meaning and Formulation of LPP - Graphical Method - Simplex Method.

UNIT III **15 Hrs**

Transportation problem: Mathematical formulation of the problem - Initial Basic feasible solution (Matrix Minima Method - North – West Corner rule and VAM) - Moving towards optimality - Assignment problem -Travelling salesmen problem.

UNIT IV **14 Hrs**

Game Theory: Useful Terminology - Rules for Game Theory - Pure Strategy - Mixed Strategy (2x2 games, 2 x n games or m x 2 games) - dominance property.

UNIT V **15 Hrs**

Network Analysis: Network (Arrow diagram) Logic - Critical Path Method (CPM) - Programme Evaluation and Review Technique (PERT).

Text book

S. No	Author	Title of the book	Publishers	Year of Publication
1.	V.Sunderesan K.S.GanapathySubramaniam, K.Ganesan	Operations research	A.R.Publications, 3rd Edition	2005
	UNIT I: Chapter 1 sections 1.1 - 1.9 UNIT II: Chapter 2 sections 2.1- 2.8 Chapter 3 sections 3.1.1 - 3.1.4. UNIT III: Chapter 5 sections 5.1 – 5.5 Chapter 6 sections 6.1 - 6.9 UNIT IV :Chapter 13 sections13.1 – 13.7 UNIT V : Chapter 8 sections 8.1-8.7			

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	S.Kalavathy	Operations Research	Vikas publishing house	2008
2	D.S.Cheema	Operations Research	LaxmiPublicatons	2010
3	Prem Kumar gupta	Operations Research	S.Chand	2004
4	Michael W.carter	Operations Research	Crp press	2008

MOOC learning

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

Prof Kusum Deep, Department of Mathematics, IIT Roorkee

Lecture 1 : Introduction to OR model

Lecture 3 : Graphical method for Linear programming problem

Lecture 15: Simplex method

Lecture 8: Unbounded solution

Lecture 7 : Multiple solution

https://nptel.ac.in/courses/112/106/112106134/

Prof G. Srinivasan ,Department of Management Studies, IIT Madras

Lecture 1 : Introduction to LPP

Lecture 13 : Transportation problem

Lecture 16 : Assignment problem

Lecture 17 :Hungarian method.

Note

Question paper setters to confine to the above text books only

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Quiz, Assignment

Course Designers

1.Ms.S.Lakshmi, Assistant Professor, Department of Mathematics

2.Dr.C.R.Parvathy, Associate Professor, Department of Mathematics

COURSE CODE TH32A26	COURSE NAME ALLIED – STATISTICS FOR COMPUTER SCIENCE I SEMESTER II	CATEGORY	L	T	P	CREDIT
		Theory	88	2	-	5

Preamble

- This course introduces the fundamental concepts of probability and random variables.
- It also provides knowledge in discrete and continuous distributions. It deals with various sampling distributions like t, F, chi-square distributions etc..

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Demonstrate the basic concepts of statistics	K1
CLO2	Identify the methods for different measures of central tendency, dispersion	K2
CLO3	Indicate the strength and direction of a *linear* relationship between two variables, *regression and time series.*	K3
CLO4	Demonstrate advanced understanding of the concepts of time series	K4

Mapping with Programme Learning Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

BSC CS(AI)

STATISTICS FOR COMPUTER SCIENCE I

Credits 5 **Hours 88**

Subject Code: TH23A26

UNIT I **17 hrs**

Introduction-Meaning and objectives of classification-Types of classification-Formation of a discrete and continuous frequency distribution-Tabulation of data- Parts of table- General rules of tabulation- Types of tables. Diagrams and graphs. Introduction to statistical software (like Excel) and learning graphs and diagrams using Excel.

UNIT II **19 hrs**

Measures of location or central tendency: Arithmetic mean, Median, Mode, Geometric mean, Harmonic mean. Partition values: Quartiles, Deciles and percentiles. Measures of dispersion: Mean deviation, Quartile deviation, Standard deviation, Coefficient of variation. Moments: measures of skewness, Kurtosis.

UNIT III **18 hrs**

Correlation analysis: Introduction - Significance of the study of correlation - correlation and causation - Types of correlation - Methods of studying correlation - Graphic method - Karl Pearson's coefficient of correlation - Coefficient of correlation and probable error - Coefficient of determination - Properties of the coefficient of the correlation - Rank correlation coefficient - Features of Spearman's correlation coefficient, Regression analysis.

UNIT IV **17 hrs**

Analysis of time Series -Introduction - Utility of time series - Components of time series - Preliminary adjustments before analyzing time series - Measurement of trend - Free hand graphic method - Method of semi averages - Moving average method - Measurement of seasonal variations - Method of simple averages only - Ratio-to-trend Method - Ratio-to - moving average method - Link relative method.

UNIT V **17 hrs**

Index Numbers: Introduction - Uses of index numbers - Classification of index numbers - Problems in construction of index numbers - Methods of constructing index numbers - Quantity of volume index numbers - Value index numbers - Tests of adequacy of index number formulae. Interpolation: Introduction - Significance of interpolation and extrapolation - Extrapolation - Assumptions of interpolation and extrapolation - Methods of interpolation - Binomial expansion methods - Newton's method - Lagrange's method.

Text Book

S. No	Author	Title of the book	Publishers	Year of Publication
1.	S P Gupta	Statistical Methods	Sultan Chand &Sons publishers	2004
	Unit I: Volume I: Chapter: 1 Unit II: Volume I: Chapter: 2 Unit III:Volume I: Chapter10,11 Unit IV: Volume I:Chapter 14 Unit-V : Volume I: Chapter 13			

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	P.N.Arora SumeetArora,	Comprehensive Statistical Methods	Sultan Chand & Sons	2008

	S.Arora			
2.	David Lane,	Introduction to Statistics	David Lane	2003
3.	Krishnan Vijaya	Statistics for Beginners	Atlantic Publishers & Distributors Pvt Ltd	2011
4.	S.C Gupta and V.K. Kapoor	Fundamentals of Mathematical Statistics	Sultan Chand & Sons Publications	2001

Note

Question paper setters to confine to the above text books only

MOOC learning

https://nptel.ac.in/courses/110/107/110107114/

Lecture 1**:**Introduction-Meaning and objectives of classification, Diagrams and graphs
Lecture 2: Measures of location or central tendency

https://nptel.ac.in/courses/111/105/111105042/

Lecture 1: Regression analysis

https://www.youtube.com/watch?v=_WM8vzYSQhs

Module 1: Lecture 39: Regression Analysis and Correlation

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

(Lesson by Prof.Arunkanda, Department of Mechanical Engineering, IIT ,Delhi)

Lecture 35 - Analysis of Time Series

https://www.youtube.com/watch?v=JT9o8b43Gk0

Index numbers***https://nptel.ac.in/courses/102106051/***

Pedagogy

Chalk and talk, ppt, Group discussion, Seminar, Quiz, Assignment

Course Designers

1. Dr.C.R.Parvathy, Associate Professor, Department of Mathematics
2. Dr.R.Sakthikala, Assistant Professor, Department of Mathematics

COURSE CODE TH23A32	ALLIED – NUMBER THEORY AND LINEAR ALGEBRA SEMESTER II	CATEGORY	L	T	P	CREDIT
		Theory	88	2	-	5

Preamble

- This course introduces the fundamental concepts of Number Theory & Linear algebra.
- It also enable the students to find the practical applications to the real world problems.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Define and interpret the concepts of divisibility, induction and greatest common divisor	K1
CLO2	Formulate and prove conjectures about numeric patterns centered on number theory.	K2
CLO3	Develop the use of matrix algebra techniques which is needed by engineers for practical applications	K3
CLO4	Apply the concepts of vector spaces and Compute Eigen values and Eigen vectors and use them to diagonalizable matrices.	K4

Mapping with Programme Learning Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

B.Sc CS(CYBER SECURITY)

NUMBER THEORY AND LINEAR ALGEBRA

Credits 5 **Hours 88**

Subject Code: TH23A32

UNIT I **17 hrs**

Mathematical induction - The binomial theorem - Early number theory-Division algorithm-The greatest common divisor

UNIT II **18 hrs**

Euclidean algorithm - The Diaphantine equation ax+by=c-Basic properties of congruence-linear congruence and the Chinese Remainder theorem

UNIT III **18 hrs**

Vector Arithmetic, Arithmetic of Matrices, Matrix Algebra, The Transpose and Inverse of a Matrix, Types of Solutions, The Inverse Matrix Method

UNIT IV **18 hrs**

Properties of Vectors, Further Properties of Vectors, Linear Independence, Basis and Spanning Set, Introduction to General Vector Spaces

UNIT V **17 hrs**

Determinant of a Matrix, Introduction to Eigen values and Eigenvectors, Properties of Eigen values and Eigenvectors, Diagonalization.

Text Book

S. No	Author	Title of the book	Publishers	Year of Publication
1.	David M. Burton	Elementary number theory	Mc-Graw-Hill	2011 (seventh edition)
	Unit – I: Chapter I 1.1,1.2,2.1 to 2.3 Unit – II: Chapter II 2.4,2.5,4.2 and 4.4			
2.	Kuldeep Singh	Linear Algebra Step by Step	Oxford University Press	2014
	Unit-III : Chapter I 1.3 – 1.8 Unit-IV: Chapter II 2.1 – 2.4 Chapter III 3.1 Unit-V: Chapter VI - 6.1, Chapter VII -7.1-7.3			

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	IvanNivenand. H, Zukerman	An introduction to theory of numbers	Cambridge University press	2019
2.	Kumaravelu. S, SusheelaKumaravelu	Elements of number theory	SKV publication	2002(First edition)
3.	Gilbert Strang	Introduction to Linear Algebra	Wellesley-Cambridge Press	2016(5th Edition)
4.	David C. Lay, Steven R. Lay, Judi J. McDonald.	Linear Algebra and Its Applications,	Pearson Education	2014

Note

Question paper setters to confine to the above text books only

Pedagogy

Chalk and talk, ppt, Group discussion, Seminar, Quiz, Assignment

Course Designers

1. Dr.M. Deepa, Assistant Professor, Department of Mathematics
2. Dr. S. Sreeja, Assistant Professor, Department of Mathematics

College of Excellence
(An Autonomous Institution Affiliated to Bharathiar University
Reaccredited with 'A++' Grade by NAAC |An ISO 9001:2015 Certified Institution)
Programme&Branch : B.Sc. Mathematics

Scheme of Examinations

(Applicable to students admitted during the academic year 2023-26 Batchs and onwards)

Semester	Part	Course Code	Title of the Paper	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	ENG2303	English Paper III	E	5	73	2	3	25	75	100	3
	III	TH23C05	Analytical Geometry with Geogebra	CC	3	43	2	3	25	75	100	3
		TH23C06	Statics with GNU - FISICA lab	CC	4	58	2	3	25	75	100	4
		PS23A03/ PL23A01	Physics Paper I/ Paper I – Fundamentals of Botany	GE	4	58/ 73	2	3	25	75	100	4
		PS23AP1/ PL23AP1	Physics practicals/ Botany Practicals	GE	3	45/ 30	--	--	--	--	--	--
III		CS23SBGP/ TH23SBCE	GEN AI / Introduction to Logic	SEC	3	45/ 44	-/1	__	100	--	100	3
	IV	NM23DTG	Design Thinking	AEC	2	30	2	__	100	-	100	2
	IV	NM22UHR	Universal Human Values and Human Rights #	AECC	-	-	-	-	100	--	100	Grade
			Job Oriented Course	AEC	-			3	--	--	Grade	--
I-V	VI	16BONL1 16BONL2	Online course I Online course II	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
AECC- Ability Enhancement Compulsory Course
- Self Study

COURSE CODE	COURSE NAME	Category	L	T	P	Credit
TH23C05	CORE V 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 andengineering.

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	Analyse transform 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

SEMESTER III– COREPAPER V
ANALYTICAL GEOMETRY WITH GEOGEBRA

Credits:3 **Hours: 43**

Subject Code : TH23C05

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 (x1,y1,z1) and (x2,y2,z2) 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 (x1,y1,z1) to the Sphere x2 +y2+z2+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

Simple Problems using Geogebra.

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.

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 Edition
2.	Department of Mathematics	Lab Manual on GEOGEBRA		
3.	Geogebra Manual – The Offical Manual of Geogebera Research.shu.ac.uk/geogebra/GIF – Guides/official Geogebra manual.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 Edition
2	P.Duraipandian, Laxmi Duraipandian & D.Muhilan	Analytical Geometry – Three Dimensional	Emerald Publishers	2010 & First Edition
3	D.Chatterjee	Analytical Geometry-Two and Three Dimensions	Narosa Publishing House	2011 & Standard Edition
4	George.F.Simmons	Calculus with Analytical Geomentry	Mc. Graw-Hill Publisher	Second Edition
5	Shanti Narayan	Analytical Solid Geometry	S.Chand& Company Ltd	2009 & Fifteenth Edition

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 NAME	Category	L	T	P	Credit
TH23C06	CORE VI - 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

SEMESTER III – CORE PAPER VI
STATICS with GNU – FISICA Lab

Credits:4 **Hours:58**

Subject Code : TH23C06

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 aforce–Physical significance and Geometrical representation of a moment – Varigon's theorem of moments– Generalised 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 **12Hrs**

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-*SimpleProblemsusing GNU -fisicaLab.*

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 Edition
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
2.	N.P. Bali	Statics	Golden Mathematics Series, Laxmi publications	1992 & Fully Revisied Edition

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

Pedagogy:

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

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=iv5CeOa7JWw**

   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=qvS54OwpiI4

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**

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
CS23SBGP	SBS - Gen-AI	Theory	44	1	-	3

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

SBS I: 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.

Evaluation pattern for Gen-AI

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

Allied Courses Offered to other Programs

For the Students Admitted During the Year 2023 -2024

Semester III

Batch	Semester	Course Code	Title	Contact hrs/week	CA	ESE	Total	Credits	Offered to
2023-2024	III	TH23A12	Mathematics I	7	25	75	100	5	B.Sc Physics Aided
2023-2024	III	TH23A09	Mathematics for Sciences I	7	25	75	100	5	B.Sc.(Chemistry/Botany)
2023-2024	III	TH23A33	Mathematics for Commerce	5	25	75	100	4	Bcom (Aided and SF)

Practicals for III & IV semester

Online Exam : 25 Marks (Departments to plan and conduct the exam)

Total : **100 Marks**

COURSE CODE	COURSE NAME	Category	L	T	P	Credit
TH23A12	MATHEMATICS I	Theory - Allied	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

SEMESTER III –ALLIED

MATHEMATICS - I

Credits:5 **Hours:103**

Subject Code :TH23A12

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 Axisymmmetry 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 edition
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 Edition
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
2	Shanthinarayan and P.K Mital	Vector Calculus	S Chand publications	2016 & Fourth Edition
3	P.C .Mathews	Vector Calculus	Springer Verlang London Ltd.	1998 & Seventh Printing
4	B. D. Gupta	Mathematical Physics	Vikas Publications	1993 & Fourth Edition

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

Pedagogy:

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

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=noimyi5OTis

Course Designers:

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

COURSE CODE	COURSE NAME	Category	L	T	P	Credits
TH23A09	ALLIED – MATHEMATICS FOR SCIENCES I SEMESTER III	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

SEMESTER III

ALLIED - MATHEMATICS FOR SCIENCES I

Credits:5 **Hours:103**

Subject Code :TH23A09

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 of 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 Edition
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	Mathematics Volume II (For Unit V)	S Chand & Company LTD	2004 & 1st edition
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 Edition
2	Shanthinarayan P.K. Mital	Vector Calculus	S Chand publications	2016 & 4th Edition
3	P.C. Mathews	Vector Calculus	Springer Verlang London Ltd.	1998 & 7th Printing
4	G. Balaji	Transforms and Partialdifferential equations	G. Balaji publishers, Revised edition	2011 & Revised Edition

Note

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

Pedagogy

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

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

Course Designers:

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

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDITS
TH23A33	ALLIED- MATHEMATICS FOR COMMERCE SEMESTER - I	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

SEMESTER III

ALLIED - MATHEMATICS FOR COMMERCE

B.Com (Aided and SF)

Credits:4 **Hours:73**

Subject Code: TH23A33

Unit I **13 Hrs**

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. GanapathySubramaniam , 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 Edition
3.	Manmohan and Gupta P K	Operations Research	Sultan Chand & Sons	2011 & 5th revised edision

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

Lecture by Chalk and talk, Power point presentation, E-content, Group discussion, Assignment, Quiz, Peer learning, Seminar.

Course Designers

1. Dr. R. Sakthikala, Assistant Professor, Department of Mathematics
2. Ms. S. Narmatha, Assistant Professor, Department of Mathematics

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 2023-26 Batch

Scheme of Examinations

SEMESTER IV

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	
IV	I	TAM2304/ HIN2304/ FRE2304	Tamil Paper IV/ Hindi Paper IV / French Paper IV	L	5	73	2	3	25	75	100	3
	II	ENG2304	English Paper IV	E	6	88	2	3	25	75	100	3
	III	TH23C07	Trigonometry, Fourier Series, Z-Transforms, Tensors and Maple Applications	CC	3	43	2	3	25	75	100	3
		TH23C08	Dynamics with GNU - FISICA lab	CC	4	58	2	3	25	75	100	4
		PS23A04/ PL23A01	Physics Paper II/ Paper II– Fundamentals of Botany	GE	4	58/ 73	2	3	20	55	100	4
		PS23AP1/ PL23AP1	Physics practicals/ Botany Practicals	GE	3	45/ 30	--	3	25	25	50	2
IV		CS23SBGP/ TH23SBCE	GEN AI / Introduction to logic	SEC	3	45	-	_-_	100	--	100	3
	IV	NM23EII	Entrepreneurship and Innovation (Ignitex)	AECC	2	30	-	__	-	-	100	2
	IV	NM23EVS	Environmental Studies	AECC	SS	-	-	-	100	--	100	Grade
I-IV	V	COCOACT	Co-Curricular Activities	GC	-	-	-	-	100	-	100	1
	VI	COM15SER	Community Services 30 hours	GC	-	-	-	-	-	-	-	-
I-V	VI	16BONL1 16BONL2	Online course 1 Online course 2	ACC	-	-	-	-	-	-	-	-

***Self Study* CC–Core Course CA –Continuous Assessment GE–Generic Elective ESE– End Semester Examination
AEC – Ability Enhancing Compulsory Course SEC - Skill Enhancement Course ACC – Additional Credit course

COURSE CODE TH23C07	CORE VII TRIGONOMETRY, FOURIER SERIES, Z-TRANFORMS TENSORS AND MAPLE APPLICATIONS SEMESTER IV	Category	L	T	P	Credit
		Theory	43	2	-	3

Preamble

- To use Trigonometry concepts to solve applied problems
- To introduce students to the fundamentals of vector calculus and tensor analysis

Prerequisite

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	To find solutions of a Trigonometric equation	K1
CLO2	Work with the Trigonometric form of complex numbers	K2
CLO3	To understand the applications of Z transforms	K3
CLO4	To understand the importance of tensors	K4

Mapping with ProgrammeLearning 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; L-Low

Syllabus

SEMESTER IV - CORE PAPER VII
TRIGONOMETRY, FOURIER SERIES, Z- TRANFORMS,TENSORS AND MAPLE APPLICATIONS

Credits: 3 **Hours: 43**
Subject Code : TH23C07
UNIT I **9Hrs**

Solutions of simple trigonometric functions - Expansion of $\cos n\theta$, $\sin n\theta$, $\cos^n\theta$, $\sin^n\theta$– Hyperbolic functions – Separation of real and imaginary parts of Sin $(\alpha+i\beta)$, Cos $(\alpha+i\beta)$, Tan $(\alpha+i\beta)$, Sin h $(\alpha+i\beta)$, Cos h $(\alpha+i\beta)$, Tan h $(\alpha+i\beta)$,Tan^{-1} $(\alpha+i\beta)$ – MAPLE Application for branches and branch cuts of inverse trigonometric and hyperbolic functions.
Brief introduction to the development of trigonometry

UNIT II

8 Hrs

Logarithm of a complex number – Summation of trigonometric series – Simple problems**.**

UNIT III

8 Hrs

Fourier series – Definition, finding fourier coefficient for a given periodic function with period 2π, odd and even functions– half range series Change of interval.

UNIT IV

9Hrs

Z- Transforms: Linear Property – First Shifting Theorem – Differentiation in Z- Domain – Dumping Rule- Second Shifting theorem-Z- Transform of Unit impulse Function- initial value theorem- final value theorem- Inverse Z – Transform – Partial Fraction Method- Methods of Residues – Power Series Method.

UNIT V **9 Hrs**

Tensor Analysis - Definition of Tensors – Contravariant - Covariant and mixed tensors - Addition and subtraction of Tensors - Summation convention - Symmetry and Axisymmmetry Tensor - Contraction and direct product - Quotient law - *MAPLE Application* - Tensor Calculus with differential Geometry.

Text Books

1	T.K.ManicavachagomPillay and S. Narayanan	Trigonometry (For Unit I,II)	S. Viswanathan (Printers and Publishers) Pvt. Ltd. (2010)
2	T.K.ManicavachagomPillay and S. Narayanan	*Fourier Series*- (For Unit III)	S.Viswanathan (Printers and Publishers) Pvt. Ltd. (2010)
3	Dr.A.Singaravelu	Transforms and Partial Differential Equations (For Unit IV)	Meenakshi Agency Chennai, (2014)
4	A.W.Joshi	Matrices and Tensors in Physics (Unit V)	New Age International Publishers, Revised Edition,(2010)
5	http://www.maplesoft.com/applications/		

Reference Books

1	Nathaniel Coburn	Vector and Tensor Analysis	The Macmillan Company, New York,
2	Shaheer Khan	Tensor Analysis and Its Applications	Partridge India, 2015
3	http://www.intmath.com/		

UNIT I **:** Chapter 3-Sections1, 4, 5, 6, 9, 10.
UNIT II **:** Chapter 4-Sections 1,2,3,5,6,7,9.

Chapter 5 –Sections 1, 2, 3.

UNIT III : Chapter 6- Sections – 1 to 6

UNIT IV : Chapter 5 – Sections 5.1-5.84

UNIT V : Part II – Chapter - 15, 16,17

MOOC learning

https://nptel.ac.in/courses/111/105/111105134/

- Fourier Series –Evaluation
- Convergence of Fourier Series –I
- Convergence of Fourier Series –II
- Fourier Series for Even and Odd Functions
- Half Range Fourier Expansions
- Differentiation and Integration of Fourier Series

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

- Introduction to Z-transform - Part 1
- Introduction to Z-transform - Part 2
- Introduction to Z-transform - Part 3

Separation of real and imaginary parts of Cos (α+iβ), Tan (α+iβ)

https://youtu.be/VZtb4DFxBgA

https://youtu.be/UxClYnal2KA

Logarithm of a complex number

https://youtu.be/ve7CmEIEv_U

Finding fourier coefficient for a given periodic function with period 2π, evenfnctions

https://youtu.be/eDoWQEU2l3A

Differentiation in Z- Domain

https://youtu.be/4q5b5ZzgQcc

Addition and subtraction of Tensors

https://youtu.be/ZaSfJs2fgUQ

Pedagogy

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

Course Designers:

1. Ms. A. Karpagam, Associate Professor, Department of Mathematics
2. Dr.(Mrs).C.R.Parvathy, Associate Professor, Department of Mathematics

COURSE CODE TH23C08	CORE VIII DYNAMICS WITH GNU - FISICA LAB SEMESTER IV	Category	L	T	P	Credit
		Theory	58	2	-	4

Preamble

- To develop an understanding of the principles of dynamics and the ability to analyze problems in a systematic and logical manner, including the ability to draw free-body diagrams
- To teach the students basic mathematical and computational tools for modeling and analysis of dynamic systems.

Prerequisite

- Knowledge in forces and Vector Algebra.

Course Learning Outcomes

CLO Number	CLO Statement	Knowledge Level
CLO1	Know basic kinematic concepts and dynamic concepts	K1
CLO2	Understand and work with practical problems in dynamics	K2
CLO3	Study the kinematics and kinetics of particles and rigid bodies using force and acceleration, work and energy, and impulse and momentum principles	K3
CLO4	Solving dynamics problems and determine which concepts to apply, and choose an appropriate solution strategy.	K4

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

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; L-Low

Syllabus

SEMESTER IV – CORE PAPER VIII
DYNAMICS WITH GNU-FISICA LAB

Credits: 4
Subject Code : TH23C08 **Hours: 58**
UNIT I

12Hrs

Kinematics**:** Composition of velocities – Parallelogram law – Components of a velocity along two given directions – Resultant of several simultaneous coplanar velocities of a particle – Relative velocity – Angular velocity– Angular velocity of a particle moving along a circle with uniform speed – Acceleration – Composition of accelerations – Relative acceleration - Motion in a straight line under uniform acceleration – Space described in any particular second – Motion in a straight line with variable acceleration – The equations of motion of a particle under constant acceleration: graphical method – Acceleration of falling bodies – Motion of a particle down a smooth inclined plane. Laws of motion**:** Introduction – Newton's laws of motion – Composition of forces – Gravitational units of forces. Work function of a varying

force– Tension in an elastic string – Power – Energy – Kinetic energy – Potential energy – Principle of conservation of energy. (simple problems only) - *Simple Problems using GNU - fisicaLab.*

UNIT II **12Hrs**

Projectiles**:**Introduction – Two fundamental principles – The path of a projectile is a parabola – Characteristics of a motion of a projectile – Moment of inertia**:** Theorem of parallel axes – Theorem of perpendicular axes – Moments of inertia in some particular cases. M.I of a thin uniform rod, rectangular laminar - Uniform rectangular parallelopiped of edges 2a, 2b, 2c - *Simple Problems using GNU - fisicaLab.*

UNIT III **11 Hrs**

Motion under the action of Central forces **:** Introduction – Velocity and acceleration in polar coordinates–Equations of motion in polar coordinates – Note on the equiangular spiral – Motion under a central force – Differential Equations of central orbit – Pedal equation – Velocities in a central orbit – Apses and apsidal distances – Law of inverse square, inverse cube (simple problems only)– *Simple Problems using GNU-fisicaLab*.

UNIT IV **11 Hrs**

Simple Harmonic motion **:** Introduction – S.H.M in a straight line – General solution – Geometrical representation of a S.H.M – Change of origin – Composition of two S.H.M of the same period and in the same straight line – Composition of two S.H.M of the same period in two perpendicular directions – Units and Dimensions - *Simple Problems using GNU-fisicaLab.*

UNIT V **12 Hrs**

Impulsive forces: Impulse – Impulsive force – Impact of two bodies – Loss of kinetic energy in impact – Motion of a shot and gun – Impact of water on a surface. Collision of Elastic Bodies: Introduction – Fundamental laws of impact – Impact of a smooth sphere on a fixed smooth plane – Direct impact of two smooth spheres – Loss of kinetic energy due to direct impact of two smooth spheres - Oblique impact of two smooth spheres – Loss of kinetic energy due to oblique impact of two smooth spheres (simple problems only)– *Simple Problems using GNU - fisicaLab.*

Text Books

1	Dr.M.K.Venkataraman	A Text Book of Dynamics	Agasthiar Publications-(2014)
2	https://www.gnu.org/software/fisicalab/manual/en/fisicalab.pdf		

Reference Books

1.	K.ViswanathaNaik&M.S.Kasi	Dynamics	Emerald Publishers, 1992
2.	N.P. Bali	Dynamics	(Golden Mathematics series), Laxmi Publications, New edition 2011
3.	M L Khanna	Dynamics	Jai PrakashNath company, 15th edition,1998

UNIT I **:** Chapter 3: Sections 3.1 to 3.12 & 3.17 to 3.29, 3.32
Chapter 4:Sections 4.1 to 4.9 & 4.24 to 4.35

UNIT II **:** Chapter 6: Sections 6.1 to 6.11
Chapter 12: Sections 12.1 to 12.4

UNIT III **:** Chapter 11: Sections 11.1 to 11.15

UNIT IV **:** Chapter 10: Sections 10.1 to 10.7
Chapter 14: Sections 14.1 to 14.5

UNIT V : Chapter 7: Sections 7.1 to 7.6
Chapter 8: Sections 8.1 to 8.8

MOOC learning

- https://nptel.ac.in/courses/112/106/112106180/
- https://ocw.mit.edu/courses/mechanical-engineering/2-003sc-engineering-dynamics-fall-2011/
- http://cecs.wright.edu/~sthomas/dynamicslectureslides.html

- **Relative velocity**
- https://youtu.be/08au89dJxfw
- **Angular velocity**
- https://youtu.be/JXEkU0aOMOY
- **Newton's laws of motion**
- https://youtu.be/tjlKrVuFES8
- **Composition of forces**
- https://youtu.be/i12__Y7HS4k
- **Characteristics of a motion of a projectile**
- https://youtu.be/r2xbfyeJHBw
- **Velocity and acceleration in polar coordinates**
- https://youtu.be/MlNmlY_yoZ0
- **Geometrical representation of a S.H.M**
- https://youtu.be/hN0riCE-w_s
- **Oblique impact of two smooth spheres**
- https://youtu.be/XCCNWUhbbzE

Pedagogy
Chalk and Talk, Seminar, Group Discussion, Numerical Exercises, Quiz and Case Study.

Course Designers:

1. Dr.(Mrs). K.Sumathi, Associate Professor, Department of Mathematics
2 .Dr. (Mrs).G. Arthi, Assistant Professor, Department of Mathematics

COURSE CODE TH23A31	ALLIED MATHEMATICS II SEMESTER IV	Category	L	T	P	Credit
		Theory	103	2	–	5

Preamble

- To develop general skills in differentiation, integration and algebraic manipulation
- To introduce variety of differential equations and their solutions with emphasis on applied problems in Engineering and Physics
- To describe basic ideas of Fourier series

Prerequisite

Knowledge of Differential Calculus, Integral Calculus and Vector Calculus.

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 multiple integrals	K1
CLO2	Develop the ability to apply differential equations to significant applied or theoretical problems.	K2
CLO3	Solve problems in ordinary differential equations, dynamical systems	K3
CLO4	Analyze the how physical phenomena are modeled by differential equations and dynamical systems	K4

Mapping with ProgrammeLearning Outcomes

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 IV – ALLIED MATHEMATICS - II

Credits: 5 **Hours: 103**

Subject code: TH23A31

UNIT I **21Hrs**

Integration – Multiple integrals – Evaluation of double integrals – Changing the order of integration – Double integrals in polar Coordinates – Cylindrical co-ordinates (problems related cylindrical coordinates) - Application of double integrals in evaluating area between curves.

UNIT II **21Hrs**

Integration: Evaluation of triple integrals – Jacobian of two and three variables- Beta and Gamma functions – Relation-Evaluation of double and triple integrals using Beta and Gamma Functions – Bessel's function (Simple problems)

UNIT III **20 Hrs**

Differential equation of the form $(aD^2 + bD + C)y = e^{ax}\varphi(x)$ where a,b,c are constants,

$\varphi(x)$ = sin mx or cos mx or x^m- Solution of homogeneous linear differential equations of the form $(ax^2D^2 + bxD + c)y = X$ where X is a function of x – Equation reducible to homogeneous equation.

UNIT IV **20 Hrs**

Formation of partial differential equations by eliminating arbitrary constants and arbitrary functions– Solutions of standard types of first order equations. f(p,q) = 0, f(x,p,q)=0, f(y,p,q)=0, f(z,p,q)=0, $f_1(x,p) = f_2(y,q)$, z = px+qy+f(p,q) – Equations reducible to the standard forms - Lagrange method of solving linear partial differential equation Pp+Qq = R – Charpit's method (simple problems only).

UNIT V **21 Hrs**

Fourier series:Definition – Finding Fourier Coefficients for a given periodic function with period 2π - Odd and Even functions –Half range series – Change of Intervals – Applications.

Text Book

1	S. Narayanan and T.K.M Pillay	Calculus Volume II &III	S. Viswanathan (Printers and Publishers) Pvt. Ltd. – Reprint Volume III (2014), Volume II (2015)

Reference Books

1	Dr. M.D. Raisinghania	Ordinary and Partial differential Equations	S Chand and Company Ltd., Revised Edition (2013)
2	Richard C. Diprima William E.Boyce	Elementary Differential equations and Boundary value problems	Wiley India private Ltd., 9th Edition (2013)
3	A.K.Sharma	Multiple Integrals	Discovery Publishing House, First Edition (2005)

UNIT I &II	**:**	Chapter 5	Sections –2.1 to 4.0, 5.1to 5.4& 6.0 to 6.3
		Chapter 6	Sections-1.1 to 2.4
		Chapter 7	Sections-2.1 to 2.3,3,4,5,6
UNIT III	**:**	Chapter 2	Sections – 1.0 to 4, 8.0 to8.3
UNIT IV	**:**	Chapter 4	Sections 1.0 to 7.0
UNIT V	**:**	Chapter 6	Sections 1.0 to 6.0

E –CONTENT

Evaluation of double integrals
https://www.youtube.com/watch?v=2snhn2lK7-Y

Jacobian of two and three variables
https://www.youtube.com/watch?v=Bw5yEqwMjQU

Equation reducible to homogeneous equation
https://www.youtube.com/watch?v=pM5AdA6zipA

Eliminating arbitrary constants and arbitrary functions
https://www.youtube.com/watch?v=vw6fzRd-kvs

Odd and Even functions
https://www.youtube.com/watch?v=JyUJt8LLkU4

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.(Mrs).D.Sasikala, Assistant Professor, Department of Mathematics

COURSE CODE TH23A14	ALLIED - MATHEMATICS FOR SCIENCES II SEMESTER IV	Category	L	T	P	Credit
		Theory	103	2	-	5

Preamble

- To acquaint the students with the tools in Mathematics to problem solving in as many areas as possible.
- To acquire both a conceptual and operational understanding of differential and integral calculus in one and several variables

Prerequisite

- Knowledge in Differential and Integral Equations

Course Learning Outcomes

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

Mapping with ProgrammeLearning Outcomes

CLO Number	CLO Statement	Knowledge Level
CLO1.	Know basic concepts relating integration, differentiation and Fourier series	K1
CLO2.	Understand several techniques of differentiation and integration of real valued functions	K2
CLO3.	Learn methods of formation and solving differential equations of dimensions one and higher	K3
CLO4.	Impart the application of periodic functions through Fourier series	K4

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; L- Low

Syllabus

SEMESTER IV – ALLIED
MATHEMATICS FOR SCIENCES II

Credits: 5 **Hours: 103**

Subject code: TH23A14

UNIT I **21Hrs**

Integration – Integration by parts – Multiple integrals – Evaluation of the double integral – Changing the order of integration –Double integral in polar co-ordinates.

UNIT II **21Hrs**

Integration: Application of double integrals in evaluating area between curves – Evaluation of triple integrals – Jacobian of two and three variables– Beta and Gamma functions – Relation – Evaluation of double and triple integrals using Beta and Gamma Functions.

UNIT III **20 Hrs**

Differential equation of the form $(aD^2 + bD + C)y = e^{ax}\varphi(x)$, where a,b,c are constants,

$\varphi(x)$ = sin mx or cos mx or x^m–Solution of homogeneous linear differential equations of the form $(ax^2D^2 + bxD + c)\ y = X$, where X is a function of x–Equations reducible to the linear homogenous equation.

UNIT IV **20 Hrs**

Formation of partial differential equations by eliminating arbitrary constants and arbitrary functions – Solutions of standard types of first order equations: f(p,q) = 0, f(x,p,q)=0, f(y,p,q)=0, f(z,p,q)=0, $f_1(x,p) = f_2(y,q)$, z = px+qy+f(p,q) – Lagrange method of solving linear partial differential equation $P_p+Q_q = R$– Charpit's Method – Simple problems.

UNIT V **21 Hrs**

Fourier series: Definition – Finding Fourier coefficients for a given periodic function with period 2π. Odd and Even functions – Half range series – Change of intervals.

Text Book

1.	S. Narayanan and T.K.ManicavachagomPillay	Calculus Vol II & III	S.Viswanathan (Printers and Publishers) Pvt.Ltd.Reprint (2000).

Reference Books

1	Dr. M. D. Raisinghania	Ordinary and Partial differential Equations	S Chand and Company Ltd., Revised Edition (2013)
2	Richard C. Diprima William E.Boyce	Elementary Differential equations and Boundary value problems	Wiley India private Ltd., 9th Edition (2013)
3	A. K. Sharma	Multiple Integrals	Discovery Publishing House, First Edition (2005)

UNIT I & II : Vol II Chapter 1– Section – 12.0.
Chapter 5 –Sections – 2.1 to 4.0, 5.1 to 5.4 & 6.1 to 6.3.
Chapter 6 –Sections – 1.1 to 2.4.
Chapter 7 –Sections – 2.1 to 2.3,3,4,5,6.

UNIT III : Vol III Chapter 2 –Sections – 1.0 to 4, 8.0 to 8.3, 9.0.

UNIT IV : Chapter 4 –Sections – 1.0 to 7.0.

UNIT V : Chapter 6 –Sections – 1.0 to 6.0.

NOTE:

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

E-Content

Evaluation of double integrals

https://www.youtube.com/watch?v=2snhn2lK7-Y

Jacobian of two and three variables

https://www.youtube.com/watch?v=Bw5yEqwMjQU

Equation reducible to homogeneous equation

https://www.youtube.com/watch?v=pM5AdA6zipA

Eliminating arbitrary constants and arbitrary functions

https://www.youtube.com/watch?v=vw6fzRd-kvs

Odd and Even functions

https://www.youtube.com/watch?v=JyUJt8LLkU4

Pedagogy

Chalk and Talk, Seminar, Group Discussion, Numerical Exercises, Quiz and Case Study

Course Designers:

1.Dr.(Mrs).B.TamilSelvi, Associate Professor, Department of Mathematics
2.Dr.(Mrs). D.Sasikala, Assistant Professor, Department of Mathematics

COURSE CODE TH23A35	ALLIED STATISTICS FOR COMMERCE SEMESTER IV	CATEGORY	L	T	P	CREDIT
		ALLIED	73	2	-	4

Preamble

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

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Indicate the strength and direction of a *linear* relationship between two variables, *regression and time series.*	K1
CLO2	Construct simple price, quantity, and value indexes. Understand the concepts of a random variable and a probability distribution.	K2
CLO3	To measure progress toward quality improvement and public health *goals*.	K3
CLO4	Hypothesize various advanced statistical techniques for exploring practical situations.	K4

Mapping with Programme-learning Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

SEMESTER IV
Allied - Statistics for Commerce

Credits: 4 **Hours : 73**

Subject Code : TH23A35

UNIT I **16Hrs**

Correlation analysis: Introduction - Significance of the study of correlation - correlation and causation - Types of correlation- Methods of studying correlation - Graphic method - Karl Pearson's coefficient of correlation - Spearman's Rank Correlation- Concurrent

Deviation -Regression analysis. Analysis of time Series: Introduction - Components of time series - Measurement of trend - Free hand graphic method - Method of semi averages - Moving average method - Measurement of seasonal variations - Method of simple averages

UNIT II **14Hrs**

Index Numbers: Introduction - Uses of index numbers- Classification of index numbers - problems in construction of index numbers - Methods of constructing index numbers- Quantity or volume index numbers - Value index numbers - Tests of adequacy of index number formulae- Consumer price index numbers-meaning and need-method of constructing the index- Index number of industrial production.

UNIT III **15Hrs**

Concepts of probability- Addition theorem-Multiplicative theorem – Conditional probability-Bayes theorem-Theoretical distributions-Binomial Distribution -Poisson distribution- Normal distribution.

UNIT IV **15Hrs**

Statistical Inference-Tests of hypothesis-Introduction—Procedure-Types of errors-Two-tailed and one-tailed tests of hypothesis-standard error and sampling distribution-Tests of significance for large samples-Difference between small and large samples- Two tailed test and standard error of the difference between small and large samples-chi-square test and goodness of fit.

UNIT V **13 Hrs**

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

Text Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	S P Gupta	Statistical Methods	Sultan Chand &Sons publishers	2021 46th Revised Edition
	Unit I :Volume I: Chapter: 10 (10.2 - 10.32),11 (11.2 - 11.12),14 (14.2 - 14.29, 14.38 -14.40) . Unit II: Volume I: Chapter: 13 (13.2 - 13.28,13.37 -13.45) Unit III: Volume II: Chapter: 1 (1.2 - 1.20) & 2 (2.2 - 2.28, 2.30 - 2.46) Unit IV: Volume II: Chapter:3(3.2 - 3.36) & 4 (4.2 - 4.17).			
2.	Veer BalaRastogi	Biostatistics Third Revised Edition	MEDTECH	2015
	Unit V: Chapter20; Sections:20.2, 20.2.1.,20.2.2. Chapter21:21.2.1 - 21.5.6			

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	P.A. Navnitham	Business Mathematics and Statistics	Jai Publishers, Trichy.	2003
2.	V.K.Kapoor	Fundamentals of Applied Statistics	ltan Chand & Sons	2007
3.	P.N.Arora Sumeet Arora ,S.Arora	Comprehensive Statistical Methods	ltan Chand & Sons	2008

MOOC learning

https://www.youtube.com/watch?v=zlZaOnBbpUg
(1 lesson by Prof.Arunkanda, Department of Mechanical Engineering, IIT ,Delhi)
Lecture 35 - Analysis of Time Series
https://www.youtube.com/watch?v=JT9o8b43Gk0
Index numbers
https://nptel.ac.in/courses/102106051/
26 Lessons by Prof.MukeshDoble , IIT Madras
Lecture 1 – Introduction
Lecture 2 – Binomial Distribution
Lecture 3 – Poisson Distribution
Lecture 4 – Normal Distribution
Lecture 5-10 – T- test
Lecture 22-24 – Chi-Square test

Types of correlation https://youtu.be/YkfZLB2WATA
Uses of index numbershttps://youtu.be/tKnH3bkpkWk

Methods of constructing index numbershttps://youtu.be/cLaOvJyWFKk

Addition theorem https://youtu.be/yoabBAPUdJg

Goodness of fit https://youtu.be/Qta_cIAlJ2M

Measures of population https://youtu.be/5mg69O5RESI

Note

Question paper setters to confine to the above text books only

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Quiz, Assignment

Course Designers

1. Dr.(Mrs).M.Deepa, Assistant Professor, Department of Mathematics
2. Ms.S.Narmath, Assistant Professor, Department of Mathematics

PSGR
Krishnammal College for Women

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

Bachelor of Science in Mathematics
Choice Based Credit System (CBCS)
Learning Outcomes Based Curriculum Framework (LOCF)
Scheme and Syllabus of 2023-2026 Batch
Semester V

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	
V	III	TH23C09	Real Analysis with Tableau	CC	7	103	2	3	25	75	100	5
	III	TH23C10	Abstract Algebra with Maple Applications	CC	7	103	2	3	25	75	100	5
	III	TH23E01 TH23E02	Number Theory and Numerical Methods with C Graph Theory with open Modelica	DSE	7	103	2	3	25	75	100	5
	III	TH23PROJ	Project and VivaVoce	DSE	4	60	—	–	25	75	100	5
	III	TH21SB03	Data Visualization and Tableau	SEC	3	41	4	–	100	-	100	3
	IV	NM21CS1	Cyber Security I	AEC C	2	30	—	-	100	--	100	Gr.
	III	TH23AC1 TH16AC2 TH16AC3	Astronomy I Fuzzy Mathematics I Topics in Fluid Dynamics I	ACC	–	–	—	3	25	75	100	5$
	IV	TH23COM	Comprehensive Examination	GC	-	-	-	-	100	-	100	Gr.
	IV	TH23INST	Internship	DSE	-	-	-	-	100	-	100	2
I-IV	VI	COM15SER	Community Services 30 Hours	GC								
I - V	VI	16BONL 1 16BONL 2	Online Course Online Course	ACC	-	-	-	-	-	-	-	-

CC –Core Courses
GE - Generic Elective
AECC - Ability Enhancement Compulsory Course
GC- General Courses
ACC-Additional Credit Course
SEC –Skill Enhancement Course Course
Gr. - Grade
DSE – Discipline Specific Elective
$ - Credits applicable to candidates who take up Advanced level Course examination

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

a. Core & Elective – 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**

Question paper pattern and distribution of marks for CA

Core and Elective- (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

Cyber Security I

Quiz	: 60 Marks
Case Study	: 20 Marks
Poster	: 20 Marks
TOTAL	**: 100 Marks**

Field Work/ Institutional Training

Attendance	: 10 Marks
Work diary	: 15 Marks
Report	: 50 Marks
Viva Voce	: 25 Marks
Total	**: 100 Marks**

Project and Viva Voce

Internal	: 25 Marks
External	: 75 Marks
Total	**: 100 Marks**

Project (CA)

I Review – Selection of the field of study, Topic & literature collection	: 5 Marks
II Review – Research Design & Data Collection	: 10 Marks
III Review – Analysis & Conclusion, Preparation of rough draft	: 10 Marks
Total	**: 25 Marks**

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

ALC

Section A : 5 Questions out of 8 – open choice 5 x 5 : 25 Marks

Section B : 5 Questions out of 8 – open choice 5 x 10 : 50 Marks

Total : 75 Marks

COURSE CODE	COURSE TITLE	Category	L	T	P	Credit
TH23C09	CORE PAPER IX - REAL ANALYSIS WITH TABLEAU	Theory	103	2	-	5

Preamble

- To develop the basic material in a systematic and rigorous manner in the context of real-valued functions of a realvariable.
- Apply mathematical concepts and principles to perform numerical and symbolic computations.
- Able to construct, analyze and critique mathematical proofs inanalysis.

Prerequisite

Knowledge in basic properties of the real numbers that lead to the formal development of realanalysis.

CourseLearning 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 as they apply to sequences, series, differentiation and integration.	K1
CLO2	Analyze the precise proofs of results that arise in the context of real analysis.	K2
CLO3	Identify, formulate and solve problems by the implementation of a variety of proof techniques.	K3
CLO4	Apply critical thinking skills to solve problems that can be modelled mathematically.Analyze how abstract ideas and rigorous methods in real analysis canbe applied to practical problems	K4

Mapping with ProgrammeLearning 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

REAL ANALYSIS WITH TABLEAU

Credits:5 **Hours:103**

UNIT I **21hrs**

Some Basic notions of set theory – Countable and uncountable sets – uncountability of the real number system – set algebra – countable collections of countable sets. Elements of point set topology – Euclidean space R^n – open balls and open sets in R^n -The structure of open sets in R^n – closed sets and adherent points – the Bolzano Weierstrasstheorem. AI Tools for solving simple problems

UNIT II **20hrs**

The Cantor intersection theorem – covering – Lindelof covering theorem – the Heine Borel theorem – compactness in R^n- Metric space – point set topology in metric space – compact subsets of a metric space – convergent sequences in a metric space – Cauchy sequences – complete metric space. Simple visualizations using Tableau

UNIT III **21hrs**

Limit of a function – continuous functions – continuity of composite function – Examples of continuous functions – continuity and inverse images of open or closed sets – functions continuous on compact sets – topological mappings – Bolzano's theorem – connectedness – components of a metric space – arc wise connectedness- uniform continuity-fixed point theorem. Simple visualizations using Tableau

UNIT IV **20hrs**

Definition of derivatives – derivative and continuity – algebra of derivatives – the chain rule – one sided derivatives – zero derivatives – Rolle's theorem – the mean value theorem for derivative – Taylor's formula with remainder – functions of bounded variations – properties of monotonic functions – total variations – additive property – continuous function of bounded variations – total variation on [a,x] as a function of x.

UNIT V **21 hrs**

The Riemann Stieltjes integral : Introduction - notation – The definition of Riemann Stieltjes integral – linear properties – integration by parts – change of variable in a Riemann stieltjes integral – Reduction of a Riemann integral – step functions as integrators – reduction of a Riemann Stieltjes integral to a finite sum – Euler's summation formula – upper and lower integrals – Riemann's condition – Comparison theorems – necessary and sufficient condition for existence of Riemann Stieltjes integral. AI Tools for solving simple problems

Text Book

S.No	Author	Title of the Book	Publishers	Year & Edition
1.	T.M.Apostol	Mathematical analysis second edition	Narosa Publishing House	2002, Second Edn.
	https://public.tableau.com/en-us/s/download			

Books forReference

S.No	Author	Title of the Book	Publishers	Year & Edition
1.	R.R.Goldberg	Methods of Real Analysis	Oxford and IBH Publishing Co. Pvt. Ltd.	2017, First Edn.
2	Walter Rudin	Principles of Mathematical Analysis	McGraw – Hill	1976,Third Edn.

UNITI	**:**	Chapter 2 – Sections – 2.1 to2.15 Chapter 3 – Sections – 3.2 to 3.8
UNITII	**:**	Chapter 3 – Sections – 3.9 to3.15 Chapter 4 –Sections – 4.2 to 4.4
UNITIII	**:**	Chapter 4 – Sections – 4.5, 4.8 to4.21
UNITIV	**:**	Chapter 5 – Sections – 5.1 to5.12 Chapter 6 –Sections – 6.1 to 6.8
UNITV	**:**	Chapter 7 – Sections – 7.1 to7.17

Note :

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

Pedagogy:

Chalk and Talk, Seminar, Group Discussion, Numerical Exercises, Quiz and Case Study

CourseDesigners:

1. Ms.A. Karpagam, Associate Professor, Department ofMathematics.
2. Dr. D. Sasikala, Assistant Professor, Department ofMathematics.

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
TH23C10	ABSTRACT ALGEBRA WITH MAPLE APPLICATIONS	Theory	103	2	-	5

Preamble

- To acquaint the students with basic concepts of fundamental algebraic structures
- To construct and analyze mathematical proofs in algebra.

Prerequisite

Knowledge about Set Theory, Functions and Groups.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1.	Learn about Subgroups, Homomorphism, Automorphism, Rings, Ideals and Quotient rings and Euclidean rings.	K1
CLO2.	Identify, formulate and solve problems by using the implementation of a variety of proof techniques	K2
CLO3.	Demonstrate knowledge and understanding of the concept of cosets of a subgroup of a group and normal subgroups.	K3
CLO4.	Demonstrate knowledge and understanding of symmetric groups, cyclic groups, their Properties, direct product of groups and the concept of quotient groups. Analyze the application of Permutation groups, Sylow's theorem, Abelian groups.	K4

Mapping with ProgrammeLearning 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

ABSTRACT ALGEBRA WITH MAPLE APPLICATIONS

Credits :5 **Hours:103**

UNIT I **20hrs**

Subgroups - Congruence relation-cosets-Lagrange's Theorem -Order of an element - A counting Principle – Normal subgroups and quotient groups – Homomorphisms - Kernel of a homomorphism – Isomorphism- Cauchy's theorem for AbelianGroup – Sylow's theorem for Abelian Group.

UNIT II **21hrs**

Automorphisms –Inner Automorphisms- Cayley's theorem - Permutation groups- Another counting principle – Equivalence relation– Sylow's Theorem – Finite abelian group.

UNIT III **21hrs**

Rings – Definition and examples – Basic properties – Special classes of rings – The Pigeonhole Principle – Integral domains and fields – Homomorphisms of rings.

UNIT IV **20hrs**

Ideals and Quotient rings - Maximal, principal and prime ideals - The field of quotients of an integral domain.

UNIT V **21hrs**

Euclidean rings – A particular Euclidean ring – Polynomial rings – Polynomials over the rational field – Gauss' Lemma – The Eisenstein Criterion - Polynomial rings over commutative rings.

Text Books

S.No	Author	Title of the Book	Publishers	Year & Edition
1	I.N. Herstein	Topics in Algebra	Wiley Eastern Ltd.	2002, Second Edn.
2.	http://www.maplesoft.com/applications/			

Books for References:

S.No	Author	Title of the Book	Publishers	Year & Edition
1	S. Arumugam& A. Thangapandi Isaac	Modern Algebra	New Gamma Publishing House, 1990	1990

2	M.L. Khanna	Modern Algebra	Jai PrakashNath and Co	1990

UNIT I **:**Sections – 2.4 to2.7
UNITII **:** Sections – 2.8 to 2.12,2.14
UNITIII **:**Sections – 3.1 to 3.3
UNITIV **:**Sections – 3.4 to 3.6
UNITV **:**Sections – 3.7 to3.11

Note:

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

Pedagogy:

Chalk and Talk, Seminar, Group Discussion, Numerical Exercises, Quiz and Case Study

CourseDesigners:

1. Dr. G. Arthi, Assistant Professor, Department of Mathematics
2. Dr.K.Sumathi, Associate Professor, Department of Mathematics.

COURSE CODE	COURSE TITLE	Category	L	T	P	Credit
TH23E01	NUMBER THEORY AND NUMERICAL METHODS WITH C	Theory	103	2	-	4

Preamble

- To understand and appreciate the beauty of Number Theory, which has contributed significantly to the development of Algebra and Analysis.
- To provide the necessary basic concepts of numerical methods and give procedures for solving numerically different kinds of problems in scientific computing.

Prerequisite

- Knowledge in single variable calculus
- Knowledge in differential equations and linear algebra

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1.	Define and interpret the concepts of divisibility, congruence, greatest common divisor, prime, and prime-factorization	K1
CLO2.	Formulate and prove conjectures about numeric patterns and Produce rigorous arguments (proofs) centered on number theory.	K2
CLO3.	Derive numerical methods for approximating the solution of problems and Analyze the error incumbent in any such numerical approximation,	K3
CLO4.	Compare the viability of different approaches to the numerical solution of problems arising in roots of solution of non-linear equations, interpolation and approximation, numerical differentiation and integration, solution of linear systems.	K3

Mapping with Programme Learning Outcomes

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

S- Strong, M - Medium

NUMBER THEORY AND NUMERICAL METHODS WITH C

Credits : 5 **Hours:103**

UNITI **21hrs**

Peano's axioms- Mathematical induction – Addition and multiplication* – order relation – principle of well ordering.

Integers: Addition and multiplication- positive and negative integers- Trichotomy law- absolute value – Binomial theorem- Divisibility: Associates – Division algorithm – g.c.d (H.C.F) – Euclidean algorithm –l.c.m.

http://www.math.ucsd.edu/~benchow/Inequalities.pdfhttp://eaton.math.rpi.edu/coursematerials/fall08/mk1500/AppdxE.pdfhttp://ncert.nic.in/ncerts/l/keep208.pdf

UNIT II **21 hrs**

Distribution of primes: General discussion – Fermat's conjecture – Fermat numbers – Gold Bach's conjecture – Mersenne numbers – Gap theorem – infinitude of primes. Congruences : Definition - residue classes – complete and least residue systems – reduced residue systems – casting out 9 magic numbers – Divisibility tests – linear congruences – solution of congruences – Chinese remainder theorem. Theorems of Fermat and Wilson: Little Fermat's Theorem – Euler's extension

https://www.slideshare.net/ANKU3686/euler-and-fermat-theorem-14977572

UNIT III **21hrs**

Solution of numerical, algebraic and transcendental equation : The bisection method – Method of false position – Newton Raphson method ,Geometrical interpretation of Newton's method ,Gauss elimination method – Gauss seidal iteration method – Gauss Jordan and Gauss Jacobi methods – AI tools for solving simple problems

http://www.bspublications.net/downloads/0523a9f25106ff_M_III_ch_1.pdf

UNIT IV **20 hrs**

Finite differences – forward, backward and central differences – The operator E – Relation between E and the operator D and other difference operators- Interpolation: Gauss forward and backward interpolation formula, Numerical differentiation and integration: Derivatives using Newton's forward, backward and divided differences – Lagrange's interpolation formula – Inverse interpolation - Simple problems using C

https://byjus.com/lagrange-interpolation-formula/http://www.dailyfreecode.com/code/lagranges-interpolation-method-finding-2376.aspx

UNIT V **20 hrs**

Numerical solution of Ordinary Differential Equations: Introduction – Solution by Taylor's series (Type 1) - Taylor series method for simultaneous first order differential equations - Taylor series method for second order differential equations — Euler's method – Improved Euler method – Runge-Kutta method – Second order Runge-Kutta method (for first order O.D.E)

Numerical solution of Partial Differential Equations: Introduction – Difference Quotients – Graphical representation of Partial Quotients – Classification of Partial Differential Equations of the Second order – Elliptic Equations – Solution of Laplace's Equation (By Liebmann's iteration process). AI tools for solving simple problems

https://sam.nitk.ac.in/sites/default/Numerical_Methods/ODE/numerical_solution_to_ODE.pdf

S.No	Author	Title of the Book	Publishers	Year & Edition
Text B oks				
1	S.Kumaravelu&Susheela Kumaravelu	Elements of Number Theory	Raja Sankar offset Printers, Sivakasi	2002
	Unit I: Page No :1-59 Unit II : Page No :148 – 224			
2	P. Kandasamy, K. Thilagavathy and K. Gunavathy,	Numerical Methods	S.Chand Co. Ltd., New Delhi, Reprint	2010& Third Edn.
		UNIT III:Ch3 : 3.1, 3.3, 3.4, Ch 4: 4.2, 4.7, 4.8,4.9 UNITIV:Ch5 : 5.1, 5.2, 5.4 (problems involving operatorsalone), Ch7 : 6.1, 6.2, 6.3, Ch 8: 8.7,8.8, Ch 9 :9.1,9.2, UNITV:Ch11:11.1,11.5,11.6,11.9,11.10,11.12,11.13 Ch 12 : 12.1, 12.2, 12.3, 12.4, 12.5, 12.6		
3	Numerical methods with Programs in C (only for C programs)	T.Veerarajan&T.Ramachandran	Tata McGraw-Hill Publishing Company Limited, New Delhi	2006 Second Edition

Books for References:

S.No	Author	Title of the book	Publishers	Year & Edition
1.	Introduction to the theory of numbers	Ivan Niven and Herberts Zuckerman	Wiley Publishing House-Narosa	1991&Fifth edition
2.	Elementry Number Theory	David M.Burton	McGraw-Hill Companies, New York	New York, 2007, Sixth edition
3.	Numerical Methods in Science & Engineering	M.K.Venkataraman	National Publishing Company	1991 & Fifth edition
4.	Numerical Methods for Scientific and Engineering Computations	M.K.Jain, S.R.K.Iyengar&R.K.Jain	New Age International Publishers, New Delhi	2010

Note :

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

Pedagogy :

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

CourseDesigners:

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

COURSE CODE	COURSE TITLE	Category	L	T	P	Credit
TH23E02	GRAPH THEORY WITH OPEN MODELICA	Theory	103	2	-	4

Preamble

To introduce Graph theory concepts to solve the applied problems

Prerequisite

Knowledge of Blocks, Trees, Matrices and Partitions

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1.	Find solutions of Ramsey, Matroids, Graphical Partitions.	K1
CLO2.	Appreciate and use Konigsberg bridge problem, Menger's theorem, Hamiltonian Graphs, Eulerian Graphs.	K2
CLO3.	Calculate degrees cut points, no. of cycles, centers, centroids, connectivity, line connectivity.	K3
CLO4.	Recognize operations on graphs, characterization of trees, line graphs, properties of line graphs. Understand various Graphs relating extremal graphs, intersection graph cut point graphs, centers and centroids	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

GRAPH THEORY WITH OPEN MODELICA

Credits 5 **Hours :103**

UNIT I **21hrs**

Graphs : varieties of graphs – walks and connectedness – degrees – the problem of Ramsey – extremal graphs – intersection graphs– Konigsberg bridge problem-problems using openModelica

UNIT II **20hrs**

Operations on graphs - Blocks : cut points , bridges and blocks – block graphs and cutpoint graphs. problems using open Modelica

UNIT III **20hrs**

Trees : Characterization of trees – centers and centroids – block - cutpoint trees – independent cycles and co-cycles – matroids-problems using open Modelica.

UNIT IV **21hrs**

Connectivity and line - connectivity – graphical variations of Menger's theorem – further variations of Menger'stheorem .Matrices : the adjacency matrix – the incidence matrix – the cycle matrix problems -using open Modelica

UNIT V **20hrs**

Partitions – Traversability :Eulerian graphs – Hamiltonian graphs. Line graphs: Properties of line graphs – characterization of line graphs-problems using openModelica

Text Book :

S.No	Author	Title of the Book	Publishers	Year & Edition
1	Narsing Deo	Graph Theory with Applications to energy and computer science	Prentice Hall of India Publication	2004 Reprint

S.No	Author	Title of the book	Publishers	Year & Edition
1	Frank Harary	Graph theory	Narosa publishing house	2001& Tenth reprint
	https://www.openmodelica.org/			

Books for Reference:

UnitI :Chapters 1 and2
UnitII : Chapter 3
UnitIII : Chapter 4
UnitIV :Chapters 5 and13
UnitV :Chapters 6, 7 and 8

Note

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

Pedagogy

Chalk and Talk , Seminar , Group Discussion and Numerical Exercises

CourseDesigners:

1. Dr.R.Lakshmi, Assistant Professor, Department ofMathematics
2. Ms.A. Karpagam, Associate Professor, Department ofMathematics.

SEMESTER V

Advanced Learners' Course

ASTRONOMYI

Credits : 5 **Hours :60**

Subject Code: TH23AC1

OBJECTIVE:
To study the solar system and expose the mathematical tools used to solve the mysteries of the universe.

UNIT I:
A brief history of solar system - General description of the solar system-comets and meteorites-spherical trigonometry.

Basics of Indian Astronomy- Spherical Trigonomety
https://www.ugc.gov.in/e-book/Indian_knowledge_HEI/index.html#p=23

UNIT II:
Celestial sphere-celestial coordinates – diurnal motion – variation in length of the day

UNIT III:
Dip – twilight – geocentric parallax.

UNIT IV:
Refraction – Tangent formula – Cassini's formula

UNIT V:
Kepler's laws – Relation between true eccentric and mean anamolies.

Text Book:

S.No	Author	Title of the book	Publishers
1	S. Kumaravelu and SuseelaKumaravelu	Astronomy	Revised edition 2005.

Unit I	Chapter 11, 1	Headings 327 – 339, 1.1 – 1.13
Unit II	Chapter 2	Headings 39 - 86
Unit III	Chapter 3, 5	Headings 106 – 111, 135
Unit IV	Chapter 4	Headings 117 – 134
Unit V	Chapter 4	Headings 146 – 158

CourseDesigners:

1. Dr.K.Sumathi, Associate Professor, Department ofMathematics.
2. Dr. G. Arthi, Assistant Professor, Department ofMathematics.

SEMESTER V

Advanced Learners' Course

FUZZY MATHEMATICS I

Credits :5 **Hours :60**

Subject Code : TH16AC2

OBJECTIVE

To introduce basic concepts of fuzzy mathematics and its applications.

UNIT I :

From Classical sets to Fuzzy sets: Introduction – Crisp sets – Fuzzy sets – Basic Types – Basic concepts – Characteristics and significance of the paradigm shift.

UNIT II :

Fuzzy Sets versus Crisp Sets Additional properties of α sets – Representation of Fuzzy sets – Extension principle for Fuzzy sets.

UNIT III :

Operations on Fuzzy sets – Types of operations – Fuzzy compliments – Fuzzy intersections: t – norms – Fuzzy Unions: t – conforms.

UNIT IV :

Fuzzy Arithmetic Fuzzy Numbers – Linguistic variables-Arithmetic operations on intervals – Lattice of fuzzy numbers – Fuzzy equations.

UNIT V :

Fuzzy Relations Crisp versus Fuzzy relations-Projections and cylindric extensions – Binary Fuzzy relations-Fuzzy equivalence relations – Fuzzy compatibility relations – Fuzzymorphisms.

Text Book:

S.No	Author	Title of the book	Publishers	Year & Edition
1	George J. Klir/Bo Yuan	Fuzzy sets and Fuzzy logic Theory and applications	Prentice Hall of India	2001 & Fourth Edition

UNITI	:	Chapter 1	Sections 1.1 –1.5
UNITII	:	Chapter 2	Sections 2.1 – 2.3
UNITIII	:	Chapter 3	Sections 3.1 – 3.4
UNITIV	:	Chapter 4	Sections 4.1 –4.6
UNITV	:	Chapter 5	Sections 5.1 –5.3, 5.5, 5.6, 5.8

CourseDesigners:

1. Dr.R.Lakshmi, Assistant Professor, Department of Mathematics
2. Dr. D. Sasikala, Assistant Professor, Department of Mathematics.

SEMESTER V – Advanced Learners' Course

TOPICS IN FLUID DYNAMICS I

Credits:5 **Hours :60**

Subject Code : TH16AC3

OBJECTIVE

To introduce the basic concepts of fluid dynamics and expose the students to the practical applications of mathematics

UNIT I:

Basic concepts: Types of fluid - properties.

UNIT II:

Kinematics of flow field: Definitions – Velocity – Local, convective and material derivatives – equation of continuity in Cartesian co-ordinates – velocity potential, irrotational flow – rotational flow –vorticity

UNIT III:

Conservation of momentum – equation of motion of an inviscid fluid in Cartesian co- ordinates – Bernoullis' equation –Applications of Bernoullis' theorem

UNIT IV:

Irrotational motion: General motion of a fluid element – Vorticity – body forces and surface forces – flow and circulation – stokes' theorem – Kelvin circulation theorem

UNIT V:

Motion in two dimensions: Stream function – Physical interpretation of stream function – complex potential and complex velocity – Two dimensional source and sink – complex potential of a source – two dimensional doublet – complex potential of a doublet.

Text Book:

S.No	Author	Title of the book	Publishers	Year & Edition
1.	**Shanti Swarup**	*Fluid dynamics*	Krishna Prakashan media (p) ltd, Meerut11th edition 2003,	2003 & 11th Edition

UNITI	:	Chapter 1	Sections 1.0 –1.1
UNITII	:	Chapter 2	Sections 2.4 – 2.9, 2.14 – 2.15
UNITIII	:	Chapter 3	Sections 3.11, 3.3, 3.10
UNITIV	:	Chapter 4	Sections 4.0 –4.5
UNITV	:	Chapter 5	Sections 5.1 –5.7

CourseDesigners:

1. Dr. G. Arthi, Assistant Professor, Department of Mathematics.
2. Dr.R.Lakshmi, Assistant Professor, Department of Mathematics

COURSE CODE TH21SB03	COURSE NAME - DATA VISUALIZATION AND TABLEAU SEMESTER VI	CATEGORY	L	T	P	CREDIT
		Theory	41	4	-	3

Preamble

- To introduce the fundamental problems, concepts, and approaches in thedesign and analysis of data visualization systems.
- Fundamental concepts of data visualization and explore the Tableau interface,identifying and applying the various tools Tableau

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the foundations of the data visualization and its tools	K1
CLO2	Explain how to connect data	K2
CLO3	Apply effective best practice design principles to data visualizations and be able to illustrate examples	K3
CLO4	Analyze data using Tableau	K4

Mapping with Programme Learning Outcomes

CLOs	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

DATA VISUALIZATION AND TABLEAU

Subject code: TH21SB03 **Hours: 41**

UNIT I : **9 Hrs**

Ways of Representing Visual Data-Techniques Used for Visual Data Representation- Types of Data Visualization- Applications Data Visualization- Visualizing Big Data- Deriving Business Solutions- Turing Data into Information- Tools Used in Data Visualization- Open -Source Data Visualization- Analytical Techniques Used in in Big Data Visualization.

UNIT II: **9 Hrs**

A Brief Introduction to Tableau Desktop**:** Starting with Tableau-

Downloading the Tableau trial- Installing the trial software- Looking at the Tableau Workspace- Starting Tableau- Viewing a sample workbook or data source- seeing what Tableau can really do. Understanding the basics: Getting to know the Tableau Desktop Environment- Looking at theTableau start page- Understanding the Data source page- Using worksheets to explore data- Getting to know the Dashboard workspace- Understanding the Story workspace.

UNIT III: **9 Hrs**

Connecting to Data: Preparing your data – Using the data preparation features- Targeting data sources for manual corrections- Establishing a connection to your Data source- Keeping your Data fresh- Visualizing Data: Using the shelves and Cards- The columns shelf- The rows shelf- Using a quick filter to exclude data- The filters shelf- pages shelf- Marks card- Modifying the view- Fitting the space- Adding annotations-Adding mark lables.

UNIT IV: **7 Hrs**

Understanding the Tableau desktop environment: Looking at the Menus- File menu- Data menu- worksheet menu- Dashboard menu- Story menu- Analysis menu- Map menu- Format menu- Server menu- Window menu- Help menu- Making use of the Toolbar- Organizing sheets.

UNIT V **7 Hrs**

Considering Data display options: Using show me- Understanding the chart optionsin show me- Area charts(continuous)- Area charts(discrete)- Box and whisker plot- Bullet graphs- Circle views- Dual lines- Filled maps- Gantt- Heat maps- Highlight tables- Histogram- Horizontal bars- Lines(continuous)- Lines(discrete)- packed bubbles-Pie charts-Scatter plots-Side by side bars- Side by side circles-Stacked bars- Symbol maps- Text tables- Tree maps- viewing your data- Examining the data used in a view-Examining a subsetof the data.

Text Books:

S.No.	Author Name	Title of the Book	Publishers
1.	DT Editorial Services	Big Data Black BookUnit I: Chapter 26, Page.No. 715-731	Dreamtech Press
2.	Molly Monsey, Paul Sochan	Tableau for DummiesUnit II: Chapter 1,3 Page.No. 7-14, 35-42. Unit III: Chapter 5,6, Page.No.67-96 Unit IV: Chapter 7, Page.No. 99-115	Wiley India Pvt. Ltd.

		Unit V: Chapter 8, Page.No.119-141	

Books for Reference

S.No.	Author Name	Title of the Book	Publishers
1.	Chun-houh Chen, Wolfgang Hardle, Antony Unwin	Handbook of Data Visualization	Springer publication,2008
2.	Joshua N. Milligan	Learning Tableau - How Data Visualization Brings Business Intelligence to Life	Packt Publishing, Revised edition

Course Designers:

1. Dr. (Mrs).K.Sumathi, Associate Professor, Department of Mathematics

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