



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**



**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.

<b>PLO Number</b>	<b>PLO Statement</b>
PLO1.	<b>Disciplinary Knowledge</b> - Capability of demonstrating comprehensive knowledge of mathematics and understanding of one or more discipline.
PLO2.	<b>Communication Skills</b> - Ability to use mathematics as a precise language of communication in other branches of human knowledge
PLO3.	<b>Critical thinking and analytical reasoning</b> - Ability to employ critical thinking, analyze the results and apply them in various problems appearing in different branches of mathematics.
PLO4.	<b>Information/digital literacy</b> - Capability to use appropriate software's to mathematical investigations and problem solving
PLO5.	<b>Self-directed learning:</b> Ability to work independently and do in-depth study of various notions of mathematics.
PLO6.	<b>Problem solving:</b> -. 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.	<b>Lifelong learning:</b> 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 :  $2 \times 3 = 6$

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

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

**Total:45Marks**

### ESE Question Paper Pattern : $5 \times 15 = 75$ Marks

#### Question from each unit comprising of

One question with a weightage of 2Marks :  $2 \times 5 = 10$

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

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

**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
<b>Total</b>	:	<b>25 Marks</b>

#### 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

<b>Main idea</b>	Clearly presents a main idea.	Main idea supported throughout	Vague sense	No main idea
<b>Organisation:</b> Overall	Well planned	Good over all organization	There is a sense of organization	No sense of organization
<b>Content</b>	Exceptionally well presented	Well presented	Content is sound	Not good
<b>Style:</b> 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
<b>Level of Engagement in Class</b>	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	
<b>Listening Skills</b>	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.	
<b>Behavior</b>	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	
<b>Preparation</b>	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
<b>COURSE -TH23C01 ADVANCED CALCULUS WITH SCILAB</b>							
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
<b>COURSE – TH23C02 DIFFERENTIAL EQUATIONS AND VECTOR ANALYSIS WITH SCILAB</b>							
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
<b>COURSE – TH23A01 MATHEMATICAL STATISTICS – I WITH R</b>							
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
<b>COURSE – TH22C03 CALCULUS OF TRANSFORMS WITH SCILAB</b>							
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
<b>COURSE – TH22C04 NUMBER THEORY AND SUMMATION OF SERIES WITH MAPLE</b>							
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
<b>COURSE – TH22A05 MATHEMATICAL STATISTICS – II</b>							
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

<b>COURSE CODE</b> TH23C01	<b>COURSE NAME</b> CORE I ADVANCED CALCULUS WITH SCILAB SEMESTER I	<b>Category</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b> 4
		Theory	73	2	-	

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

<b>Unit I</b>	Chapter 8 Chapter 10 Chapter 11	Section: 1.3-1.7 Section: 2.1-2.8 Section: 1-4
<b>Unit II</b>	Chapter 5 Chapter 6	Section: 1-7 Section: 1.1-2.4
<b>Unit III</b>	Chapter 7	Section: 2.1-6
<b>Unit IV</b>	Part IV:– A Chapter 1	Sections – 1.1 to 1.21
<b>Unit V</b>	Part IV:– A	

### 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	<a href="http://www.heikell.fi/downloads/cilabpdf.pdf">http://www.heikell.fi/downloads/cilabpdf.pdf</a>	

### Digital Demonstration using SCILAB

[http://cajael.com/eng/control/LaplaceT/LaplaceT-1\\_Example\\_2\\_6\\_OGATA\\_4editio.php](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](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](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

<b>COURSE CODE</b> TH23C02	<b>COURSE NAME</b> <b>CORE II</b> <b>DIFFERENTIAL EQUATIONS</b> <b>AND VECTOR ANALYSIS WITH</b> <b>SCILAB</b> <b>SEMESTER I</b>	<b>Category</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
		<b>Theory</b>	<b>73</b>	<b>2</b>	<b>-</b>	<b>4</b>

### 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 <b>Unit I – III</b>	Differential Equations	Firewall Media, An imprint of Laxmi Publications Pvt, Ltd, New Delhi	10 <sup>th</sup> Edition, 2017
2.	Susan Jane Colley <b>Unit IV – V</b>	Vector Calculus	Pearson Education, Inc	4 <sup>th</sup> Edition, 2012
3.	Dr.HemaRamachandran &Dr.AchuthsankarS.Nair	Scilab (A free Software to Matlab)	S Chand and company	1 <sup>st</sup> Edition, 2015
4.	Lecture notes/Lab manual/Tutorials on Sci Lab			

<b>Unit I</b>	Chapter 2	Page No: (21 -25, 40-43,48-54,70-79,86-92,105-108, 116-120,141-148,154-162)
	Chapter 3	PageNo:(170-178,185-189,190-195,209-213,222-226,235-240)
	Chapter 4	PageNo:(269-279)
<b>Unit II</b>	Chapter5	PageNo:(286-289,297-302,308-313)
	Chapter6	PageNo:(314-329)
	Chapter7	PageNo:(335-339,348-351,353-354)

<b>Unit III</b>	Chapter8 Chapter9	PageNo:(356-367,383-390) PageNo:(400-404,416-428)
<b>Unit IV</b>	Chapter3	Sections–3.3to3.5
<b>Unit V</b>	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](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](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](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,	Higher Education for Industry 4.0 and Transformation to Education 5.0	Taylor and Francis group-CRS press	2021
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## 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

<b>COURSE CODE</b> TH23A01	<b>COURSE NAME</b> ALLIED - MATHEMATICAL STATISTICS – I WITH R SEMESTER I	<b>Category</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
		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	8 <sup>th</sup> Edition, 2019

<b>Unit I</b>	<b>Chapter 1</b>	1.1 to 1.7
<b>Unit II</b>	<b>Chapter 2</b>	1.8 - 1.10 , 2.1 – 2.5
<b>Unit III</b>	<b>Chapter 3</b>	3.1-3.2, 3.4, 3.5.1
<b>Unit IV</b>	<b>Chapter 5</b>	5.1-5.4
<b>Unit V</b>	<b>Chapter 8</b>	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	4 <sup>th</sup> Edition, 2006
2	A.K.Goon, M.K.Gupta, Das Gupta	Fundamentals of Statistics Vol – I	The World Press, Calcutta	8 <sup>th</sup> 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	3 <sup>rd</sup> 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.Srinivasan, 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**

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

### 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.	Lokenath Debnath and Dambaru Bhatta  <b>Unit I- IV</b>	Integral Transforms and their Applications	Chapman & Hall/CRC	3 <sup>rd</sup> Edition, 2015
2.	Dr. V.N. Vedamurthy and Dr. N. Ch. S. N. Iyengar  <b>Unit V</b>	Numerical Methods	Vikas Publishing House Pvt. Ltd.	2015
3	Lecture notes/Lab manual/Tutorials on SciLab			

<b>UNIT I</b>	Chapter 4	4.1 -4.6(Except Page. No. 181 - 188, 196 - 197, 204 - 214, 222 - 230)
<b>UNIT II</b>	Chapter 2	2.1 – 2.5 and 2.10-2.12 (9 - 37, 60 - 73)
<b>UNIT III</b>	Chapter 7	7.1 – 7.4 (315 - 328)
<b>UNIT IV</b>	Chapter 8	8.1-8.4 and 8.6, 8.7 (339 - 353, 358 - 364)
<b>UNIT V</b>	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.	39 <sup>th</sup> Edition, 2007
2	Veerarajan. T	Engineering	Tata McGraw Hill, New Delhi.	3 <sup>rd</sup> 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](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](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  $\mathbf{R}^*$  - 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  $\mathbf{C}^*$

**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 <b>Unit I &amp; II</b>	Mathematical Analysis	Narosa Publishing House	2002
2	T.K. Manicavachagom Pillay, T. Natarajan & K.S. Ganapathy <b>Unit III – V</b>	Algebra Vol I	S.Viswanathan, Printers & Publishers, PVT., LTD	2017
	<b>UNIT I</b>	Chapter 1	Sections 1.1 -1.33	
	<b>UNIT II</b>	Chapter 2	Sections 2.1 – 2.15	

<b>UNIT III</b>	Chapter 2	Sections 8 - 19, 21 - 24
<b>UNIT IV</b>	Chapter 6	Sections 1 to 12, 15 to 19, 21 & 24
<b>UNIT V</b>	Chapter 6	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://www.academia.edu/5241092/VISUALIZING_THE_BEHAVIOR_OF_INFINITY_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  $\bar{X}$  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	3 <sup>rd</sup> Edition, 2010
2.	Veer BalaRastogi	Biostatistics Unit - V	Medtech	3 <sup>rd</sup> Edition, 2015

<b>UNIT I</b>	Chapter 12	Sections: 12.1 - 12.3,12.7,12.8, 12.9
<b>UNIT II</b>	Chapter 9 Chapter 10	Sections: 9.1-9.5 Sections: 10.1-10.2
<b>UNIT III</b>	Chapter 10	Sections: 10.3-10.6

	Chapter 11	Sections: 11.1-11.5
<b>UNIT IV</b>	Chapter 13	Sections: 13.1-13.4, 15.1-15.3
<b>UNIT V</b>	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.	11 <sup>th</sup> Edition, 2014
2.	E.L.Lehmann Joseph P.Romano	Testing Statistical Hypotheses	Springer Private Ltd,	3 <sup>rd</sup> Edition, 2009
3.	Murray R.Spiegel Larry J.Stephens	Theory and problems of Statistics	Tata McGraw Hill Publishing Company Ltd	3 <sup>rd</sup> 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

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

### 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

<b>CLO Number</b>	<b>CLO Statement</b>	<b>Knowledge Level</b>
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 to Instructions

**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**

Solution of Linear 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

<b>COURSE CODE</b> TH23A07	<b>COURSE NAME-</b> <b>ALLIED MATHEMATICS FOR</b> <b>COMMERCE</b> <b>SEMESTER I</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
		<b>Theory</b>	<b>88</b>	<b>2</b>	<b>-</b>	<b>4</b>

### 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

<b>CO Number</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
<b>CLO1</b>	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
<b>CLO2</b>	Understand in analysing, solving, and computing real-world applications on the limits of Algebraic functions and simple differentiation	K2
<b>CLO3</b>	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
<b>CLO4</b>	Analyse Linear Programming models for service and manufacturing systems, and apply operations research techniques and algorithms to solve these LP problems and transportation problems	K4

### Mapping with Programme Learning Outcomes

<b>CLOs/PLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
<b>CLO1</b>	S	S	M	S	M
<b>CLO2</b>	M	S	M	S	S
<b>CLO3</b>	M	S	S	M	S
<b>CLO4</b>	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
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				<b>Publication</b>
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

<b>COURSE CODE</b> TH23A02	<b>COURSE NAME</b> ALLIED -MATHEMATICS FOR MANAGEMENT I SEMESTER I	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
		<b>THEORY</b>	<b>73</b>	<b>2</b>	<b>-</b>	<b>4</b>

### 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 3<sup>rd</sup> 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
	<b>UNIT II:</b> Ch-8,9,10			
2.	P.A. Navnitham	Business Mathematics And Statistics	Jai Publishers	2003
	<b>UNIT I</b> : Vol I Ch-4 sections :1,2,3,4,5,6,7,9,10 <b>UNIT III</b> : Vol II Ch-1-5, 6 <b>UNIT IV</b> : Vol II Ch-7, 8. Ch-12: (pg 503-521) <b>UNIT V</b> : 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 14 Arithmetic 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

<b>COURSE CODE</b> TH23A06	<b>COURSE NAME</b> ALLIED DISCRETE MATHEMATICS SEMESTER II	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
		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**

S. No	Author	Title of the book	Publishers	Year of Publication
1.	J.P.Tremblay and R.Manohar	Discrete Mathematical Structures with Applications to Computer Science	McGraw Hill Publishing Company	Edition 1997, Reprint 2008
	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			
2.	Dr. M.K. Venkataraman, Dr. N. Sridharan and N. Chandrasekaran	Discrete Mathematics	The National Publishing company, Chennai	First edition Reprint 2003,
	Unit II: Chapter 8	Sections 8.1 – 8.7		

## 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

<b>COURSE CODE</b> TH23A16	<b>COURSE NAME</b> ALLIED STATISTICS II <b>SEMESTER II</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
		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.Ganapathy S. bramaniam, 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 sections 13.1 – 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 <i>linear</i> relationship between two variables, <i>regression and time series</i> .	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: Chapter 10,11 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](https://www.youtube.com/watch?v=_WM8vzYSQhs)

Module 1: Lecture 39: Regression Analysis and Correlation

<https://www.youtube.com/watch?v=zIZaOnBbpUg>

(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

<b>COURSE CODE</b> TH23A32	<b>ALLIED – NUMBER THEORY AND LINEAR ALGEBRA</b>  <b>SEMESTER II</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
		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 Diophantine 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.	Ivan Niven and H. Zuckerman	An introduction to theory of numbers	Cambridge University press	2019
2.	Kumaravelu S, Susheela Kumaravelu	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