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)

2021 – 2024

Department of Mathematics

Programme: B.Sc. Mathematics

2021 - 2024 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

Programme Learning Outcomes

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

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

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

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

DEPARTMENT OF MATHEMATICS

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

SYLLABUS AND SCHEME OF EXAMINATIONS – I - VI SEMESTER

2021 – 2024 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	TAM2101/ HIN2101/ FRE2101	Language Paper I	Lang	6	86	4	3	50	50	100	3
	II	ENG2101	English Paper I	Eng	6	86	4	3	50	50	100	3
	III	TH21C01	Advanced Calculus with SCILAB	CC	5	71	4	3	50	50	100	4
	III	TH21C02	Differential Equations and Vector Analysis with SCILAB	CC	5	71	4	3	50	50	100	4
	III	TH21A01/ HI21A01/ ES21A01/ ES21A02/ EG21A01	Allied Mathematical Statistics –I with R/Principles of Modern Government/Indian Economic Development/International Marketing/English through Classics	GE	6	86	4	3	50	50	100	5
	IV	NME19B1/ NME19A1/ NME20WS/ NME20GS/ NME20AS/ NME21ES	Basic Tamil/ Advanced Tamil / Women Studies/ Gandhian studies /Ambedkar studies/Introduction to Entrepreneurship	AEC	2	28	2	3	50/50	50/50	100/100	2
II	I	TAM2102/ HIN2102/ FRE2102	Language Paper II	Lang	6	86	4	3	50	50	100	3
	II	ENG2102	English Paper II	Eng	5	71	4	3	50	50	100	3
	III	TH21C03	Calculus of transforms with SCILAB	CC	5	71	4	3	50	50	100	4
	III	TH21C04	Number Theory And Summation of Series with MAPLE	CC	5	71	4	3	50	50	100	4

	III	TH21A05/ ES21A03/ ES21A04/ ES21A05/ HI21A02/ EG21A02	Allied - Mathematical Statistics II /Economic Analysis/Econometrics/Monetary Economics/Indian Constitution/English throughClassics II	GE	6	86	4	3	50	50	100	5
	IV	**	(Self-study- Online Course)		-	-	-	-	-	-	-	Grade
		21PEPS1/	Professional English for physical sciences/		3	26	4	2	50	50	100	2
		NME19B2/ NME19A2	Basic Tamil /Advanced Tamil	AEC	-	-	-	3	50		50	-
III	I	TAM2103/ HIN2103/ FRE2103	Language Paper III	Lang	6	86	4	3	50	50	100	3
	II	ENG2103	English Paper III	Eng	5	71	4	3	50	50	100	3
	III	TH21C05	Analytical Geometry with Geogebra	CC	3	41	4	3	50	50	100	4
		TH21C06	Statics with GNU - FISICA lab	CC	4	56	4	3	50	50	100	5
		PS21A03/ PL21A01/ AS21A01	Allied -Physics / Botany /Zoology / Paper I	GE	4	56	4	3	50	50	100	4
		PS16AP1/ PL16AP1/ AS17AP1	Allied Physics Botany / Zoology / Practicals	GE	3	45	--	--	--	--	--	--
III		TH21SB01/ TH21SB02 / TH21SB03 / TH21SBCE	SBS - R Programming / Data Visualization and Tableau / Python Programming / Coursera IBM Data Science /	SEC	3	41	4	2	25	75	100	3
		NM21EVS	Environmental Studies*	AEC	_	_	__	__	100	-	100	Grade
		NM21UHR	Universal Human values and Human Rights	AEC	2	26	4	2	100	--	100	2
			Job Oriented Course	AEC	--			3	--	--	Grade	--
IV	I	TAM2104/ HIN2104/ FRE2104	Language Paper IV	Lang	5	71	4	3	50	50	100	3
	II	ENG2104	English Paper - IV	Eng	6	86	4	3	50	50	100	3

	III	TH21C07	Trigonometry, Fourier Series, Z-Transforms, Tensors and Maple applications	CC	3	41	4	3	50	50	100	4
		TH21C08	Dynamics with GNU – FISICA lab	CC	4	56	4	3	50	50	100	5
		PS21A04/ PL21A02/ AS21A02	Allied –Physics / Botany / Zoology / Paper II	GE	4	56	4	3	30	45	75	4
		PS21AP1/ PL21AP1/ AS21AP1	Allied Physics/Botany/Zoology Practicals	GE	3	45		3	25	25	50	2
	III	TH21SB01/ TH21SB02/TH 21SB03 / TH20SBCE	SBS - RProgramming / Data Visualization and Tableau / Python Programming / Coursera IBM Data Science	SEC	1	14	1	2	25	75	100	3
		COCOACT	NSS/NCC/YRC/ECOwatch club/YiNET/Rotract/Sports &Games		--			--	--	--	100	1
	IV		Internship				Two weeks	100	2			
	IV	NM21DTG	Design Thinking	FS	2	26	4	2	100	--	100	2
			Community Oriented Service		-	-	-	-	-	-	-	Grade
V	III	TH21C09	Real Analysis with Tableau	CC	7	103	2	3	50	50	100	5
		TH21C10	Abstract Algebra with Maple Applications	CC	7	103	2	3	50	50	100	5
		TH21E01/ TH21E02	Elective I- Number Theory and Numerical Methods with C/ Graph Theory with open Modelica	ELE	7	103	2	3	50	50	100	4
		TH16PROJ	Group Project	GP	4	60		–	20 Viva	80 Dissertation	100	5
	III	TH21SB02/ TH20SBCE	SBS – Data Visualization and Tableau/Coursera-IBM Data Science	SBS	3	44	1	--	100		100	3
		NM21CS1	Cyber Security 1	CS	2	30		3	100	--	100	--
V		TH16AC1	Advanced Learners Course Astronomy I	ALC	__	__	__	3	25	75	100*	5*

		TH16AC2	Fuzzy Mathematics I	ALC		–		3	25	75	100*	5*
		TH16AC3	Topics in Fluid Dynamics I	ALC		–		3	25	75	100*	5*
		TH16CE	Comprehensive Examination	ALC	Online Examination	Grade	—					
			Supportive Course	SC								Submission of certificate
VI	III	TH21C11	Complex Analysis with Tableau	CC	6	88	2	3	50	50	100	5
		TH21C12	Linear Algebra with Maple Applications	CC	6	88	2	3	50	50	100	5
		TH21C13	Operations Research with Tora	CC	7	103	2	3	50	50	100	5
			Library		1			--	--	--	--	--
		TH21E03/ TH21E04	Elective II – Mathematical Modelling with open Modelica /Discrete Mathematics	ELE	7	103	2	3	50	50	100	5
		TH16AC4	Advanced learners course – Astronomy II	ALC	--			3	25	75	100*	5*
		TH16AC5	Fuzzy Mathematics II	ALC	--			3	25	75	100*	5*
		TH16AC6	Topics in Fluid Dynamics II	ALC	--			3	25	75	100*	5*
	IV	TH21SB03	SBS – Data Visualization and Tableau	SBS	3	41	4	-	100	-	100	3
										Total	3800	140

* *Self Study*

CC – Core Courses
GE – Generic Elective
AEC – Ability Enhancing Course
ELE – Elective

CA – Continuous Assessment
ESE – End Semester Examination
SEC - Skill Enhancement Course
ALC – Advanced Learner's Course

QUESTION PAPER PATTERN

For the academic year 2021 - 23

CIA Question Paper Pattern: 2 x 25 = 50 Marks

One question from each unit with each question comprising of

- Two questions with a weightage of 2 marks (no choice)
- Two questions with a weightage of 6 marks (no choice)
- One question with weightage of 9 marks (Internal Choice at the same CLO level)

ESE Question Paper Pattern: 5 x 20 = 100 Marks

One question from each unit with each question comprising of

- One question with a weightage of 2 marks (no choice)
- One question with a weightage of 6 marks (Internal Choice at the same CLO level)
- One question with weightage of 12 marks (Internal Choice at the same CLO level)

INTERNAL COMPONENT MARKS:

Components	***Marks***
CIA I	7
CIA II	7
MODEL	10
ASSIGNMENT	4
SEMINAR	5
QUIZ	4
CLASS PARTICIPATION	5
APPLICATION ORIENTED/INNOVATION/CREATIVITY ASSIGNMENT	5
ATTENDANCE	3
TOTAL	**50**

RUBRICS

Rubrics for 5 Marks
(Application Oriented/Innovation/Creativity Assignment)

Criteria	***Marks***
Originality	2
Presentation	2
References or Library Resources	1
TOTAL	**5**

For the academic year 2023 - 24

UG Core and Allied - (First 3 Units)

Question from each unit comprising of

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

One question with a weightage of 6 Marks (Internal Choice at the same CLO level) : 6 x 3 =15

One question with a weightage of 12 Marks (Internal Choice at the same CLO level) :12x3 = 36

Total :60 Marks

ALC

Section A (Paragraph answer) (4 out of 6) 4 x 4	:	16 Marks
Section B (Essay type) 1 out of 2	:	9 Marks
Total	**:**	**25 Marks**

UG Core and Allied courses:

ESE Question Paper Pattern: 5 x 20 = 100 Marks

Question from each unit comprising of

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

One question with a weightage of 6 Marks (Internal Choice at the same CLO level) :6 x 5 = 30

One question with a weightage of 12 Marks (Internal Choice at the same CLO level):12x5 =60

Total :100 Marks

End Semester for UG - Advance Learner Courses

Section A : 5 questions out of 8 - open choice 5 x 5	:	25 marks
Section B : 5 questions out of 8-open choice 5x10	:	50 marks
Total	**:**	**75 marks**

Internal Components

CIA Test	:	10 marks **(Conducted for 60 marks after 50 days)**
Model Exam	:	20 marks **(Conducted for after 85 days 100 marks (Each Unit 20 Marks))**
Seminar/Assignment/Quiz	:	10 marks
Class Participation	:	7 marks
Attendance	:	3 marks
Total	**:**	**50 Marks**

Skill Based Subject : 100 Marks

Test 1 (Theory / Practical)	:50 marks
Test 2 (Theory / Practical / Project)	:50 marks
Total	**:100 Marks**

CIA components for 2021-22 Batch with CIA: ESE pattern 50:50 Marks

RUBRICS

Assignment/ Seminar

Maximum - 20 Marks (converted to 4 marks)

Criteria	4 Marks	3 Marks	2 Marks	1 Mark
Focus Purpose	Clear	Shows awareness	Shows little awareness	No awareness
Main idea	Clearly presents a main idea.	Main idea supported throughout	Vague sense	No main idea
Organisation: Overall	Well planned	Good over all organization	There is a sense of organization	No sense of organization
Content	Exceptionally well presented	Well presented	Content is sound	Not good
Style: Details and Examples	Large amounts of specific examples and detailed description	Some use of examples and detailed descriptions	Little use of specific examples and details	No use of examples

CLASS PARTICIPATION

Maximum - 20 Marks (converted to 5 marks)

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

	groups and in class. Student incorporates or builds off of the ideas of others.	both in groups and in class.	class occasionally	others talk, both in groups and in class.	others talk, both in groups and in class. Student often interrupts when others speak.	
Behavior	Student almost never displays disruptive behavior during class	Student rarely displays disruptive behavior during class	Student occasionally displays disruptive behavior during class	Student often displays disruptive behavior during class	Student almost always displays disruptive behavior during class	
Preparation	Student is almost always prepared for class with required class materials	Student is usually prepared for class with required class materials	Student is occasionally prepared for class with required class materials	Student is rarely prepared for class with required class materials	Student is almost never prepared for class.	

MAPPING OF PLOs WITH CLOs

COURSE	PROGRAMME OUTCOMES						
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
COURSE - TH21C01 ADVANCED CALCULUS WITH SCILAB							
CLO1	S	M	S	S	S	S	S
CLO2	S	M	S	S	S	S	S
CLO3	S	M	S	S	S	S	S
CLO4	S	M	S	S	S	S	S
CLO5	S	M	S	S	S	S	S
COURSE – TH21C02 DIFFERENTIAL EQUATIONS AND VECTOR ANALYSIS WITH SCILAB							
CLO1	S	M	S	S	S	S	S
CLO2	S	M	S	S	S	S	S
CLO3	S	M	S	S	S	S	S
CLO4	S	M	S	S	S	S	S
CLO5	S	M	S	S	S	S	S
CLO6	S	M	S	S	S	S	S
COURSE – TH21A01 MATHEMATICAL STATISTICS – I WITH R							
CLO1	S	S	S	S	S	S	S
CLO2	S	S	S	S	S	S	S
CLO3	S	S	S	S	S	S	S
CLO4	S	S	S	S	S	S	S
CLO5	S	S	S	S	S	S	S
COURSE - TH21C03 CALCULUS OF TRANSFORMS WITH SCILAB							
CLO1	S	M	S	S	S	S	S
CLO2	S	M	S	S	S	S	S
CLO3	S	S	S	S	S	S	S
CLO4	S	S	S	S	S	S	S
CLO5	S	S	S	S	S	S	S
COURSE – TH21C04 NUMBER THEORY AND SUMMATION OF SERIES WITH MAPLE							
CLO1	S	S	S	S	S	S	S
CLO2	S	M	S	S	S	S	S
CLO3	S	M	S	S	S	S	S
CLO4	S	S	S	S	S	S	S
CLO5	S	M	S	S	S	S	S
CLO6	S	S	S	S	S	S	S
COURSE – TH21A05 MATHEMATICAL STATISTICS – II (Problems in Applied statistics using R)							
CLO1	S	S	S	S	S	S	S

CLO2	S	S	S	S	S	S	S
CLO3	S	S	S	S	S	S	S
CLO4	S	S	S	S	S	S	S
CLO5	S	S	S	S	S	S	S
COURSE - TH21C05 ANALYTICAL GEOMETRY WITH GEOGEBRA							
CLO1	S	M	S	S	S	S	S
CLO2	S	M	S	S	S	S	S
CLO3	S	S	S	S	S	S	S
CLO4	S	S	S	S	S	S	S
COURSE – TH21C06 STATICS WITH GNU-FISICA LAB							
CLO1	S	S	S	S	S	S	S
CLO2	S	S	S	S	S	S	S
CLO3	S	S	S	S	S	S	S
CLO4	S	S	S	S	S	S	S
COURSE – TH21SB01 R PROGRAMMING							
CLO1	S	S	S	S	S	S	S
CLO2	S	S	S	S	S	S	S
CLO3	S	S	S	S	S	S	S
CLO4	S	S	S	S	S	S	S
COURSE – TH21C07 FOURIER SERIES, Z- TRANFORMS TENSORS AND MAPLE APPLICATIONS							
CLO1	S	S	S	S	S	S	S
CLO2	S	S	S	S	S	S	S
CLO3	S	S	S	S	S	S	S
CLO4	S	S	S	S	S	S	S
COURSE – TH21C08 DYNAMICS WITH GNU - FISICA LAB							
CLO1	S	S	S	S	S	S	S
CLO2	S	S	S	S	S	S	S
CLO3	S	S	S	S	S	S	S
CLO4	S	S	S	S	S	S	S
COURSE – TH21SB02 PYTHON PROGRAMMING							
CLO1	S	S	S	S	S	S	S
CLO2	S	S	S	S	S	S	S
CLO3	S	S	S	S	S	S	S
CLO4	S	S	S	S	S	S	S
COURSE – TH21C09 REAL ANALYSIS WITH TABLEAU							
CLO1	S	S	S	S	S	S	S
CLO2	S	S	S	S	S	S	S
CLO3	S	S	S	S	S	S	S
CLO4	S	S	S	S	S	S	S

COURSE – TH21C10 ABSTRACT ALGEBRA WITH MAPLE APPLICATIONS							
CLO1	S	S	S	S	S	S	S
CLO2	S	S	S	S	S	S	S
CLO3	S	S	S	S	S	S	S
CLO4	S	S	S	S	S	S	S
COURSE – TH21E01 NUMBER THEORY AND NUMERICAL METHODS WITHC							
CLO1	S	M	S	S	S	S	S
CLO2	S	S	S	M	S	S	S
CLO3	S	S	M	S	S	S	M
CLO4	S	S	S	M	S	S	S
COURSE –TH21E02 GRAPH THEORY WITH OPEN MODELICA							
CLO1	S	S	S	S	S	S	S
CLO2	S	S	S	S	S	S	S
CLO3	S	S	S	S	S	S	S
CLO4	S	S	S	S	S	S	S
COURSE – TH21C11 COMPLEX ANALYSIS WITH TABLEAU							
CLO1	S	S	S	S	S	S	S
CLO2	S	M	S	S	S	S	S
CLO3	S	S	M	S	S	S	S
CLO4	M	S	S	M	S	S	S
COURSE – TH21C12 LINEAR ALGEBRA WITH MAPLE APPLICATIONS							
CLO1	S	S	S	S	S	S	S
CLO2	S	S	S	S	S	S	S
CLO3	S	S	S	S	S	S	S
CLO4	S	S	S	S	S	S	S
COURSE – TH21C13 OPERATIONS RESEARCH WITH TORA							
CLO1	S	S	S	S	S	S	S
CLO2	S	S	S	S	S	S	S
CLO3	S	S	S	S	S	S	S
CLO4	S	S	S	S	S	S	S
COURSE – TH21E03 MATHEMATICAL MODELLING WITH OPEN MODELICA							
CLO1	S	S	S	S	S	S	S
CLO2	S	S	S	S	S	S	S
CLO3	S	S	S	S	S	S	S
CLO4	S	S	S	S	S	S	S
COURSE – TH21E04 DISCRETE MATHEMATICS							
CLO1	S	S	S	S	S	S	S
CLO2	S	S	S	S	S	S	S
CLO3	S	S	S	S	S	S	S
CLO4	S	S	S	S	S	S	S

COURSE CODE TH21C01	COURSE NAME CORE I – ADVANCED CALCULUS WITH SCILAB SEMESTER I	Category	L	T	P	Credit
		Theory	71	4	-	4

Preamble

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

Prerequisite

Knowledge of limits, Differential derivatives and related formulas

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1.	Define curvature, evolutes, envelops and asymptotes	K1
CLO2.	Explain and translate integrals of physical problems	K2
CLO3.	Demonstrate and solve physical problems using Laplace Transform	K3
CLO4.	Apply special functions like Beta and Gamma to evaluate multiple integrals	K3
CLO5.	Use computational tools like SciLab to compute complex problems	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
CLO5.	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: 71**

Subject Code : TH21C01

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 **13 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 **14 hrs**

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

Text Books

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

Unit I	Chapter 8 Chapter 10 Chapter 11	Section: 1.3-1.7 Section: 2.1-2.8 Section: 1-4
Unit II	Chapter 5 Chapter 6	Section: 1-7 Section: 1.1-2.4
Unit III	Chapter 7	Section: 2.1-6

Unit IV	Part IV:– A Chapter 1	Sections – 1.1 to 1.21
Unit V	Part IV:– A Chapter 2	Sections – 2.1 to 2.12

Reference Books

S. No	Author	Title of the book	Publishers	Year & Edition
1	Serge Lang	A First Course in Calculus	Springer Publication	2013
2	A.K. Sharma	Advanced Differential Equations	Discovery Publishing Pvt Ltd	2004
3	Shahriar	Approximately Calculus	First Indian Edition, American Mathematical Society	2012
4	N.P. Bali	Integral Calculus	Lakshmi Publication Pvt Ltd	2011
5	Johnny Heikell	Scilab for real Dummies	http://www.heikell.fi/downloads/scilabpdf.pdf	

Digital Demonstration using SCILAB

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

- Laplace Transforms with partial fraction

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

- Laplace Transforms of some functions

http://cajael.com/eng/control/LaplaceT/LaplaceT-7_Example_2_17_OGATA_4ed_La.php

- Solving differential equation with SciLab

MOOC learning

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

(6 Lectures by Prof. HarishankarMahato, IIT, Kharagpur)

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

Note

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

Pedagogy

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

Course Designers

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

COURSE CODE TH21C02	COURSE NAME CORE II - DIFFERENTIAL EQUATIONS AND VECTOR ANALYSIS WITH SCILAB SEMESTER I	Category	L	T	P	Credit
		Theory	71	4	-	4

Preamble

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

Prerequisite

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

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1.	Understand the fundamental concepts of differential equations and vector Analysis and their role in modern Mathematics.	K1
CLO2.	Demonstrate 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	K4
CLO4.	Explain the use and applications of differential equations and/or vector calculus to some topic related to undergraduate study, employment or other experience.	K3
CLO5.	Develop the ability to apply differential equations to significant applied and/or theoretical problems.	K4
CLO6.	Understand the various integral theorems relating line, surface and volume integrals and about industry 4.0	K3

Mapping with Programme Learning Outcomes

CLOS/PLOS	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1.	S	M	S	S	S	S	S
CLO2.	S	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
CLO5.	S	M	S	S	S	S	S
CLO6.	S	M	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

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

Credits: 4 **Hours: 71**

Subject Code: TH21C02

UNIT I **14 hrs**

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 **14 hrs**

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

UNIT III **14 hrs**

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

UNIT IV **15hrs**

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

UNIT V **14hrs**

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

Text Books

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

Unit I	Chapter 2 Chapter 3	Page No: (21 -25, 40-43,48-54,70-79,86-92,105-108, 116-120,141-148,154-162) Page No:(170-178,185-189,190-195,209-213,222-226,235-240)

	Chapter 4	Page No:(269-279)
Unit II	Chapter 5 Chapter 6 Chapter 7	Page No:(286-289,297-302,308-313) Page No:(314 -329) Page No:(335-339,348-351,353-354)
Unit III	Chapter 8 Chapter 9	Page No:(356-367,383-390) Page No:(400-404,416-428)
Unit IV	Chapter 3	Sections – 3.3 to 3.5
Unit V	Chapter 6 Chapter 7	Sections 6.1 to 6.3 Sections – 7.1 to 7.3

Reference Books

S. No	Author	Title of the book	Publishers	Year & Edition
1	N.M Kapur	A text book of Differential equations	Pitambar Publishing Company Educational Publishers, New Delhi - 110005.	2008
2	M.D Raisinghania	Advanced differential equations	S.Chand & Co New Delhi	2009
3	George F.Simmons & Steven G.Krantz	Differential Equations Theory, Technique and Practice	Tata McGraw Hill Education Private Ltd	Tenth reprint 2011
4	Nathaniel Coburn	Vector and Tensor Analysis	The Macmillan Company, New York	2012
5	Erwin Kreyszig	Advanced Engineering Mathematics	Wiley Plus	Tenth Edition

Digital Demonstration using SciLab

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

- Evaluation of ordinary differential equations

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

- Setting options for ODE solver

http://www.tf.uns.ac.rs/~omorr/radovan_omorjan_003_prII/s_examples/Scilab/Gilberto/scilab04.pdf

- Vector operations in SciLab

MOOC learning

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

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

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

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

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

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

For Assignments/ Case Studies Only

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

Reference

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

Note

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

Pedagogy

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

Course Designers

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

COURSE CODE TH21A01	COURSE NAME ALLIED - MATHEMATICAL STATISTICS – I WITH R SEMESTER I	Category	L	T	P	Credit
		Theory	86	4	-	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.	Learn 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.	Critically evaluate the design, including sampling techniques of a statistical study	K2
CLO4.	Effectively apply statistical software R to perform statistical computations and display numerical and graphical summaries of data sets	K3
CLO5.	Analyse, compute and interpret the coefficient of correlation and the "line of best fit" for bivariate data	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
CLO5.	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: 86**

Subject Code : TH21A01

UNIT I **17 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 **17 hrs**

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

UNIT V **18 hrs**

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

Text Book

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

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

Reference Books

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

Digital Demonstration using R

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

- ❖ Finding mean

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

- ❖ Finding median

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

- ❖ Binomial distribution

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

- ❖ Poisson distribution

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

- ❖ Hypothesis testing

MOOC learning

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

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

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

Note

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

Pedagogy

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

Course Designers

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

COURSE CODE TH21C03	COURSE NAME CORE III CALCULUS OF TRANSFORMS WITH SCILAB SEMESTER II	Category	L	T	P	Credit
		Theory	71	4	-	4

Preamble

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

Prerequisite

- Knowledge in differential and integral calculus

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Learn and acquire knowledge of Integral Transforms	K1
CLO2	Understand the concepts of Fourier, Laplace, Hankel and Mellin Transforms and the formation of difference equations	K2
CLO3	Solve difference equations using single step and multistep numerical methods	K3
CLO4	Demonstrate competency to solve differential and integral equations using the Fourier, Laplace, Hankel and Mellin Transforms	K3
CLO5	Analyse and apply the Fourier, Laplace, Hankel and Mellin Transforms to solve problems arising in applied sciences& Learn to use SCILAB to solve Integral equations involving Integral 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
CLO5.	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: 71**

Subject Code: TH21C03

UNIT I **14 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 **14 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 **14 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 **14 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 **15 Hrs**

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

Text Books

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

UNIT I	Chapter 4	4.1 -4.6(Except Page. No. 205-212,214-219, 232-234, 237-238)
UNIT II	Chapter 2	2.1 – 2.5 and 2.10-2.12 (Except Page. No. 91-98)
UNIT III	Chapter 7	7.1 – 7.4
UNIT IV	Chapter 8	8.1-8.4 and 8.6, 8.7
UNIT V	Chapter 10	10.1 to 10.8

Reference Books

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

Digital Demonstration using SciLab

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

❖ Evaluation of definite integrals

https://help.scilab.org/docs/5.5.2/en_US/fft.html

❖ Fast Fourier transforms

https://www.bragitoff.com/2016/03/fourier-series-and-scilab/

❖ Fourier series and scilab

https://www.bragitoff.com/2016/03/calculating-fourier-series-and-plotting-it-scilab/

❖ Fourier series and plotting

https://www.bragitoff.com/2016/03/polynomial-fitting-scilab/

❖ polynomial fitting using scilab

MOOC learning

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

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

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

Note

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

Pedagogy

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

Course Designers

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

COURSE CODE TH21C04	COURSE NAME CORE IV NUMBER THEORY AND SUMMATION OF SERIES WITH MAPLE SEMESTER II	Category	L	T	P	Credit
		Theory	71	4	-	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	K2
CLO4.	Apply convergence tests to infinite series	K2
CLO5.	Solve the problems related to convergence / divergence.	K3
CLO6.	Analyse how abstract ideas and rigorous methods in real analysis can be applied to practical problems	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: 71**

Subject Code: TH21C04

UNIT I **14 hrs**

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

UNIT II **14 hrs**

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

UNIT III **15 hrs**

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

UNIT IV **16 hrs**

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

UNIT V **12 hrs**

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

Text Book

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

UNIT I	Chapter 1	Sections 1.1 -1.33
UNIT II	Chapter 2	Sections 2.1 – 2.15

UNIT III	Chapter 2	Sections 8 - 19, 21 - 24
UNIT IV	Chapter 6	Sections 1 to 12, 15 to 19, 21& 24
UNIT V	Chapter6	Sections 25,26, 27, 30

Reference Books

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

Digital Demonstration using maple

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

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

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

- Conversion of numbers with various bases

MOOC learning

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

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

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

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

Note

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

Pedagogy

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

Course Designers

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

COURSE CODE TH21A05	COURSE NAME MATHEMATICAL STATISTICS – II (Problems in Applied statistics using R)	Category	L	T	P	Credit
		Theory	86	4	-	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.	K2
CLO4	Understand, apply and compute maximum likelihood estimation	K3
CLO5	Take up a career in statistical analysis	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
CLO5	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 : TH21A05

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 **17 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 **17 hrs**

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

UNIT IV **18 hrs**

Chi-Square Goodness-of-Fit Tests- Introduction -- Chi-Squared Goodness-of-Fit Tests - Testing for Independence in Populations Classified According to Two Characteristics. Quality Control - Introduction - The ***X*** Control Chart for Detecting a Shift in the Mean -Problems - When the Mean and Variance Are Unknown- ***S***Control Charts – Problems - Control Charts for Fraction Defective .

UNIT V **17 hrs**

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

Text Books

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

UNIT I	Chapter 12	Sections: 12.1 - 12.3,12.7,12.8, 12.9
UNIT II	Chapter 9 Chapter 10	Sections: 9.1-9.5 Sections: 10.1-10.2
UNIT III	Chapter 10 Chapter 11	Sections: 10.3-10.6 Sections: 11.1-11.5
UNIT IV	Chapter 13	Sections: 13.1-13.4, 15.1-15.3

UNIT V	Chapter 20 Chapter 21	Sections: 20.2., 20.2.1., 20.2.2 Sections: 21.1-21.5

Reference Books

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

Digital Demonstration with R and MOOC learning

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

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

Note

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

Pedagogy

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

Course Designers

1. Dr.(Mrs). C.R.Parvathy, Associate Professor, Department of Mathematics
2. Mrs. S.Lakshmi, Assistant Professor, Department of Mathematics

COURSE CODE TH21C05	COURSE NAME – CORE V ANALYTICALGEOMETRY WITH GEOGEBRA	Category	L	T	P	Credit
		Core	41	4	-	4

Preamble

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

Prerequisite

Knowledge in Basic vector algebra, trigonometric functions and identities

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall and classify geometric shapes using correct mathematical language. Draw and label figures based on verbal descriptions.	K1
CLO2	Understanding various equations of Planes, Straight Line, Sphere, Cone, andCylinder.	K2
CLO3	Applying theorems involving vertical angles, Complementary angles, supplementary angles, transversals, internal angle measure in triangles, circles and tangent lines to circles and applying geometric concepts to solve problems.	K3
CLO4	Analyse transform from polar co-ordinate system to rectangular co-ordinatesystem and vice versa.	K4

Mapping with Programme Learning Outcomes

CLOs/POs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1	S	M	S	S	S	S	S
CLO2	S	M	S	S	S	S	S
CLO3	S	S	S	S	S	S	S
CLO4	S	S	S	S	S	S	S

S- Strong;M-Medium;L-Low

Syllabus

SEMESTER III– CORE PAPER
ANALYTICAL GEOMETRY WITH GEOGEBRA

Credits: 4 **Hours: 41**

UNIT I **8 hrs**

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

UNIT II **8 hrs**

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

UNIT III **8 hrs**

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

UNIT IV **8 hrs**

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

UNIT V **9 hrs**

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

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

Text Books

1.	P.R.VITAL	Analytical Geometry 2d and 3d (All Five Units)	Pearson Publication
2.	Department of Mathematics	Lab Manual on GEOGEBRA	
3.	Geogebra Manual –The Official Manual of Geogebera Research.shu.ac.uk/geogebra/GIF–Guides/officialGeogebramanual.pdf(2011)		

Unit I: Chapter9
Unit II: Chapter 12
Unit III: Chapter13
UnitIV:Chapter14
UnitV:Chapter15 &16

Reference Books

1	V.V.Koney	Linear Algebra, Vector Algebra and Analytical Geometry	TPUPress,2009
2	P.Duraipandian, Laxmi Duraipandian & D.Muhilan	Analytical Geometry –Three Dimensional	Emerald Publishers, 2010
3	D.Chatterjee	Analytical Geometry-Two and Three Dimensions	Narosa Publishing House,2011
4	George.F.Simmons	Calculus with Analytical Geometry	Second Edition
5	Shanti Narayan	Analytical Solid Geometry	Fifteenth Edition, S.Chand & Company Ltd, 2009

MOOClearning

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

E- Content

1. Relation between Cartesian Coordinates and Polar Coordinates :https://www.youtube.com/watch?v=Oh2DefOhcA&ab

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

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

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

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

Pedagogy:

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

Course Designers:

1. Mrs.M.MohanaPriya,Assistant Professor,Department of Mathematics (UG-SF)
2. Mrs.S.Narmatha, Assistant Professor,Department of Mathematics (UG-SF)

COURSE CODE TH21C06	COURSE NAME - CORE VI STATICS WITH GNU- FISICA LAB	Category	L	T	P	Credit
		Theory	56	4	-	5

Preamble

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

Prerequisite

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

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the basic principles and concepts of statics to develop real concepts	K1
CLO2	Understand the relation between constraints imposed by supportive forces and develop the ability to describe position, forces and moments. Select suitable reference coordinate axes, construct free body diagrams.	K2
CLO3	Apply knowledge of mathematics, physical sciences and an ability to recognize, formulate and solve engineering problems.	K3
CLO4	Analyse the properties (components, resultants and moments) of a force and force systems in 2D & 3D. Solve the properties (centroid, centre of gravity and moment of inertia) of areas, lines and volumes and apply these properties in equilibrium problems. Gain ability to apply the results from physical models to create real target systems	K4

Mapping with Programme Learning Outcomes

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

S- Strong;M- Medium;L- Low

Syllabus

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

Credits:5 **Hours: 56**

Subject Code:TH21C06

UNIT I **11 Hrs**

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

UNIT II **11Hrs**

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

UNIT III **11 Hrs**

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

UNIT IV **11 Hrs**

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

UNIT V **12 Hrs**

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

Text Books

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

Reference Books

S. No	Author	Titleofthe book	Publishers
1.	K.Viswanatha Naik & M.S.Kasi	Statics	EmeraldPublishers,1992
2.	N.P.Bali	Statics	Golden Mathematics Series, Laxmipublications,1992

UNITI : Chapter2:Sections 1to 16
UNITII : Chapter3:Sections 1to 13, Chapter4: Sections1 to10
UNITIII : Chapter5: Sections 1 to 5, Chapter6: Sections1 to9
UNITIV : Chapter7:Sections 1 to 12, Chapter8:Sections 1to 6&18
UNITV : Chapter10:Sections 1to 3, Chapter11: Sections1 to6

MOOCCourses

➢ https://nptel.ac.in/courses/122/102/122102004/#
(6 LecturesbyProf.R.K.Mittal,IITDelhi)

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

E–Content

1. Resolution of a force

   i) https://www.youtube.com/watch?v=Nc8ZthC65xs

   ii) https://www.youtube.com/watch?v=2-R0erl1cVw

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

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

3. Moment of a force

   i)https://www.youtube.com/watch?v=iy5CeQa7JWw

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

4. Resultant of a Couple and a Force -

   i) https://www.youtube.com/watch?v=oueKQ5-dJQc

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

5. Varigon's theorem of moments–

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

6. Coplanar forces

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

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

7. Angle of friction

   i)https://www.youtube.com/watch?v=SK0FNS9seqA

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

8. Centre of gravity

   i)https://www.youtube.com/watch?v=-OTix-fhEUE

9. Equilibrium of strings–

   i) https://www.youtube.com/watch?v=A4Db16NcHiI

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

Pedagogy:

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

CourseDesigners:

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

COURSE CODE TH21SB01	COURSE NAME - R Programming Semester III	CATEGORY	L	T	P	CREDIT
		Theory	28	4	13	3

Preamble

To extract valuable information for use in strategic decision making

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Identify the basics of R	K1
CLO2	Explain the use of data to find the statistical measures	K2
CLO3	Apply various concepts to write programs in R.	K3
CLO4	Analyze data and generate reports based on the data.	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1	S	S	S	S	S	S	S
CLO2	S	S	S	S	S	S	S
CLO3	S	S	S	S	S	S	S
CLO4	S	S	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

Semester III
R Programming

Credits: 3 **Hours: 41**
Subject code: TH21SB01

OBJECTIVE

To enhance career opportunities for the students by promoting skills in R programming relevant to big data analytics

UNIT I **9 hrs (6 L+3 P)**

Exploring R Basics- Introduction- Getting started-R Studio-**R basic data types**-R operators- R objects Vectors-list, arrays-Matrix- factors-Data frame- R file formats- Importing and Exporting files – Simple programs related to the following topics

- Creating Vectors, Matrices, Factors
- Import Data, copy data from Excel to R

- ❖ Working with variables and Data in R

UNIT II **7 hrs (5 L +2P)**

Data Visualization in R- Exploratory data Analytics- **Lattice package**- Data sets- different types of diagrams in Statistics - Simple programs related to the following topics

- ❖ Bar charts and pie charts in R, Histograms in R, plotting of graphs

UNIT III **7 hrs (5 L +2P)**

Statistical Measures – **Introduction** – Understanding data distribution – Use cases- Central Tendency Measure - Simple programs related to the following topics

- ❖ Summary statistics in R: Mean, Median, Mode
- ❖ Frequencies

UNIT IV **9 hrs (6 L +3P)**

Measures of Variability - Standard deviation - **Probability distributions**. - Simple programs related to the following topics

- ❖ Standard Deviation, Range, Quartile Deviation
- ❖ t-Test
- ❖ ANOVA
- ❖ Chi-Square

UNIT V **9 hrs(6 L +3P)**

Regression Analysis – **Data types of regression** – Linear regression- Inferential Analysis- Residuals and coefficients- plot Diagnostics- Multi linear regression using ANOVA.- Simple programs related to the following topics

- ❖ Correlation
- ❖ Regression

Text Book

S.No	Author	Title of the book	Publishers
1	V.Bhuvaneswari	Data Analytics with R Step by Step Unit I: Chapter 3,Pg no.21-45 Unit II: Chapter 4 Pg no.49-67 Unit III: Chapter 5 Page No. 83-96 Unit IV: Chapter 5 Page No. 97-106 Unit V: Chapter 6 Page No. 107-115	Lean Publishers,2016

Reference Books

Book Name	Author	Publisher	Year & Edition
The Art of R Programming	Norman Matloff	No Starch Press	2011
The R Book	Michael J. Crawle	Wiley	2008
Statistical Analysis with R.	M. John	Tata McGraw Hill Publishing Co. Ltd	October 2010
Learning R	Richard Cotton	O'Reilly Media	September 2013

Digital learning

1. R basic data types –

i) Learn about the R Data Types | R Tutorial #3 - Bing video

ii) Data Science With R Tutorial | Lesson 4 - R Data Structures | Simplilearn - Bing video

2.Lattice package

i)Lattice Graphs in R - Bing video

3. Introduction

i)Introduction to R Studio; Basic Summary Statistics - Bing video

4. Probability distributions

i)Introduction to R: Probability Distributions - Bing video

ii)Using and exploring probability distributions using R - Bing video

5. Data types of regression

i) Linear Regression in R | Linear Regression in R With Example | Data Science Algorithms | Simplilearn - Bing video

ii)How To Do Simple Linear Regression In R - Full R Tutorial! - Bing video

Course Designers:

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

COURSE CODE TH21A12	COURSENAME- ALLIED MATHEMATICS FOR PHYSICS I	Category	L	T	P	Credit
		Theory - Allied	101	4	-	5

Preamble

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

Prerequisite

- Knowledge in basic concepts of calculus and matrices

Course Learning Outcomes

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

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

Mapping with Programme Learning Outcomes

CLOS/PLOS	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	S	S	S	S	S	S
CLO2	S	S	S	S	S	S
CLO3	S	S	S	S	S	S
CLO4	S	S	S	S	S	S
CLO5	S	S	S	S	S	S

S- Strong;M- Medium; L-Low

Syllabus

SEMESTERIII– ALLIED

MATHEMATICS FOR PHYSICS-I

Credits: 5 **Hours: 101**

Subject Code: TH21A12

UNIT I **20 hrs**

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

UNIT II **20 Hrs**

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

UNIT III **20 Hrs**

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

UNIT IV **20 Hrs**

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

UNITV **21 Hrs**

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

Text Books

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

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

Reference Books

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

UnitI& II : Chapters 1 to3
Unit III :Chapter7(Volume II)
Unit IV :Chapter3 (Volume I)6.2, 14.0to17
UnitV :Part II,Chapters15,16,17

E–Content

1. Gradient, Divergence and curl –
i)https://www.youtube.com/watch?v=TYOYID9gJxM
ii) https://www.youtube.com/watch?v=v3ZC4Mo1fS0

2. Stoke's Problem–
i) https://www.youtube.com/watch?v=3NyLlzM_ImE
ii) https://www.youtube.com/watch?v=fWZCIUUrkuA

3. Inverse Laplace transforms of standard functions–
i) https://www.youtube.com/watch?v=Y8GXpS31CGI

4. Diagonalisation of matrices-Power of matrices–
i) https://www.youtube.com/watch?v=eEo7K8jPS9Y
ii) https://www.youtube.com/watch?v=LTb9V84hG9w

5. Tensor Calculus with differential Geometry
i) https://www.youtube.com/watch?v=noimyj5QTis

Pedagogy:

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

Course Designers:

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

COURSE CODE TH21A09	COURSE NAME ALLIED–MATHEMATICS FOR SCIENCES SEMESTER III	Category	L	T	P	Credit
		Theory	101	4	-	5

Preamble

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

Prerequisite

Knowledge in Calculus and Set theory.

Course Learning Outcomes

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

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

Mapping with Programme Learning Outcomes

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

S - Strong; M - Medium; L-Low

Syllabus

SEMESTER III

ALLIED-MATHEMATICS FOR SCIENCES I

Credits: 5

Hours:10

1

Subject Code: TH21A09

UNIT I **20Hrs**

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

UNIT II **20Hrs**

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

UNITIII **20Hrs**

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

UNITIV **20Hrs**

Matrices**: Eigen values and eigen vectors**- Cayley Hamilton theorem (without proof) Verification–Finding the inverse of a matrix (Using Cayley Hamilton theorem).

UNITV **21 Hrs**

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

TextBooks

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

Reference Books

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

Unit I &II : Chapters 1 to 3
Unit III : Chapter7 Volume II
Unit IV : Chapter3 Volume I
Unit V : Group Theory14 (Volume II)

E- Content

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

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

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

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

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

Note

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

Pedagogy

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

Course Designers

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

COURSE CODE TH21A07	COURS ENAME-ALLIED MATHEMATICS FOR COMMERCE SEMESTER I/III	CATEGORY	L	T	P	CREDIT
		Theory	86	4	-	5

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

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

Mapping with Programme Learning Outcomes

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	M	S	M
CLO2	M	S	M	S	S
CLO3	M	S	S	M	S
CLO4	S	M	M	S	S
CLO5	M	S	M	S	M

S-Strong; M-Medium; L-Low

Syllabus

SEMESTERI / III

ALLIED-MATHEMATICSFORCOMMERCE

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

Credits : 5 **Hours: 86**

Subject Code: TH21A07

Unit I **17 Hrs**

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

Unit II **17 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 **17Hrs**

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.

Text books

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. GanapathySubramania and K.Ganesan	Operations Research	A.R. Publications, 3rd edition	2005
	UNIT IV: Chapter 2 Section: 2.1 -2.8, Chapter - 3 : Section: 3.1.1 -3.1.4 , Chapter 5 - Section :5.1 UNIT V: Chapter 6 section 6.1,6.2,6.3,6.4,6.5,6.6, 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 ofTechnology 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. M. Mohanapriya, Assistant Professor, Department of Mathematics

E - Content

1. Simple Interest, Compound Interest - https://www.youtube.com/watch?v=B3IdfBcXrLA

2. Derivatives of function of a function and Logarithmic Differentiation
https://www.youtube.com/watch?v=Dp9sgIvaKPk&ab
https://www.youtube.com/watch?v=uGy681i2oRM&ab

3. Integration by Partial fractions
https://www.youtube.com/watch?v=6rXByMcuAyI&ab

4. Initial Basic feasible solution
https://www.youtube.com/watch?v=ItOuvM2KmD4

5. Mathematical formulation of assignment problem
https://www.youtube.com/watch?v=OX1ssZez_sY&ab

COURSE NUMBER TH21C07	COURSE NAME - CORE VII TRIGONOMETRY, FOURIER SERIES, Z-TRANFORMS TENSORS AND MAPLE APPLICATIONS SEMESTER IV	Category	L	T	P	Credit
		Theory	41	4	-	4

Preamble

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

Prerequisite

Knowledge of Functions and angles, Vector Algebra

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1.	Find solutions of a Trigonometric equation	K1
CLO2.	Work with the Trigonometric form of complex numbers and Calculate vector scalar and vector products	K2
CLO3.	To understand the applications of Z transforms	K3
CLO4.	To understand the importance of tensors	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 IV - CORE PAPER VII

TRIGONOMETRY, FOURIER SERIES, Z- TRANFORMS , TENSORS AND MAPLE APPLICATIONS

Credits: 4 **Hours: 41**

UNIT I **8 Hrs**

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

UNIT II **8 Hrs**

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

UNIT III **8 Hrs**

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

UNIT IV **8 Hrs**

Z- Transforms: Linear Property – First Shifting Theorem – **Differentiation in Z- Domain** –

Dumping Rule- Second Shifting theorem-Z- Transform of Unit impulse Function- initial value theorem- final value theorem- Inverse Z – Transform – Partial Fraction Method- Methods of Residues – Power Series Method.

UNIT V **9 Hrs**

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

Text Books

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

Reference Books

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

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

UNIT IV **:** Chapter 5 – Sections 5.1-5.84
UNIT V **:** Part II – Chapter - 15, 16,17

MOOC learning

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

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

- Differentiation and Integration of Fourier Series
  https://nptel.ac.in/courses/111/102/111102129/
- Introduction to Z-transform - Part 1
- Introduction to Z-transform - Part 2
- Introduction to Z-transform - Part 3

E- Content

Separation of real and imaginary parts of Cos ($\alpha+i\beta$), Tan ($\alpha+i\beta$)
https://youtu.be/VZtb4DFxBgA
https://youtu.be/UxClYnal2KA
Logarithm of a complex number
https://youtu.be/ve7CmEIEv_U
Finding fourier coefficient for a given periodic function with period 2π, evenfnctions
https://youtu.be/eDoWQEU2l3A
Differentiation in Z- Domain
https://youtu.be/4q5b5ZzgQcc
Addition and subtraction of Tensors
https://youtu.be/ZaSfJs2fgUQ

Pedagogy

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

Course Designers:

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

COURSE NUMBER TH21C08	COURSE NAME - CORE VIII DYNAMICS WITH GNU - FISICA LAB SEMESTER IV	Category	L	T	P	Credit
		Theory	56	4	-	5

Preamble

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

Prerequisite

- Knowledge in forces and Vector Algebra.

Course Learning Outcomes

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

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

Mapping with Programme Learning Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

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

Credits: 5 **Hours: 56**

UNIT I **11 Hrs**

Kinematics**:** Composition of velocities – Parallelogram law – Components of a velocity along two given directions – Resultant of several simultaneous coplanar velocities of a particle – **Relative velocity** – **Angular velocity**– Angular velocity of a particle moving along a circle with uniform speed – Acceleration – Composition of accelerations – Relative acceleration - Motion in a straight line under uniform acceleration – Space described in any particular second – Motion in a straight line with variable acceleration – The equations of motion of a particle under constant acceleration: graphical method – Acceleration of falling bodies – Motion of a particle down a smooth inclined plane. Laws of motion**:** Introduction – **Newton's laws of motion – Composition of forces** – Gravitational units of forces. Work function of a varying force– Tension in an elastic string – Power – Energy – Kinetic energy – Potential energy – Principle of conservation of energy. (simple problems only) - *Simple Problems using GNU - fisicaLab.*

UNIT II **11 Hrs**

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

UNIT III **11 Hrs**

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

UNIT IV **11 Hrs**

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

UNIT V **12 Hrs**

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

Text Books

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

Reference Books

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

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

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

UNIT III : Chapter 11: Sections 11.1 to 11.15

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

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

MOOC learning

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

E Content

Relative velocity
https://youtu.be/08au89dJxfw
Angular velocity
https://youtu.be/JXEkU0aOMOY
Newton's laws of motion
https://youtu.be/tjlKrVuFES8
Composition of forces
https://youtu.be/i12Y7HS4k
Characteristics of a motion of a projectile
https://youtu.be/r2xbfyeJHBw
Velocity and acceleration in polar coordinates
https://youtu.be/MlNmlY_yoZ0
Geometrical representation of a S.H.M
https://youtu.be/hN0riCE-w_s
Oblique impact of two smooth spheres
https://youtu.be/XCCNWUhbbzE

Pedagogy

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

Course Designers:

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

COURSE NUMBER TH21SB02	COURSE NAME Python Programming Semester IV	CATEGORY	L	T	P	CREDIT
		Theory	41	4	-	3

Preamble

To extract valuable information for use in strategic decision making

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Identify the basics of Python	K1
CLO2	Explainwhy Python is a useful scripting language for developers.	K2
CLO3	Apply various concepts to write programs in Python.	K3
CLO4	Analyze data and generate reports based on the data.	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1	S	S	S	S	S	S	S
CLO2	S	S	S	S	S	S	S
CLO3	S	S	S	S	S	S	S
CLO4	S	S	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

Semester IV

Python Programming

Credits: 3 **Hours: 41**

Subject code: TH21 SB 02

OBJECTIVE

To enhance career opportunities for the students by promoting skills in Python programming relevant to data analytics, machine learning, data visualization and natural language

processing.

UNIT I **9 Hours (6 L+3 P)**

The way of the program: the python programming language- what is a program? - What is debugging? - formal and natural languages-the first program. **Variables, expressions and statements**: values and types- variables – variables names and keywords- statements-evaluating expressions-operators and operands-order of operations-operations on strings-composition – comments.

- Program to Print Hello world!
- Program to Add Two Numbers
- Program to Find the Square Root

UNIT II **7 Hours (5 L +2P)**

Functions: Function calls-Type conversion-Type coercion-**Math functions**- composition-adding new functions-definitions and use-flow of execution-parameters and arguments-variables and parameters are local-stack diagrams-functions with results. Conditional and recursion: the modulus operator-boolean expressions-logical operators-conditional execution-alternative execution-chained conditionals-nested conditionals-the return statement- recursion-stack diagrams for recursive functions-infinite recursion-keyboard input.

- Program to Calculate the Area of a Triangle
- Program to Solve Quadratic Equation
- Program to Swap Two Variables

UNIT III **7 Hours (5 L +2P)**

Fruitful functions: return values-program development-composition-**boolean functions**-more recursion-leap of faith-one more example-checking types. Iteration: multiple assignment-the while statement-tables-two-dimensional tables-encapsulation and generalization-more encapsulation-local variables-more generalization-functions. Strings: a compound data type-length-traversal-and the for loop-string slices-string comparison-strings are immutable- a find function looping and counting- the string module-character classification.

- Program to Generate a Random Number
- Program to Convert Kilometres to Miles

UNIT IV **9 Hours (6 L +3P)**

Lists: list values-accessing elements –list length-list membership-lists and for loops-list operations-list slices-lists are mutable-list deletion-objects and values-aliasing-cloning lists-list parameters-nested lists-matrices-strings and lists. Tuples: mutability and tuples-tuple assignment-tuples as return values-random numbers-list of random numbers- counting many buckets-a single – pass

solution. Dictionaries: dictionary operations-**dictionary methods**-aliasing and copying-sparse matrices-hints-long integers-counting letters.

- Program to Convert Celsius To Fahrenheit
- Program to Check if a Number is Positive, Negative or 0
- Program to Check if a Number is Odd or Even
- Program to Check Leap Year

UNIT V **9 Hours (6 L +3P)**

File and exceptions: text files-writing variables-directories-pickling-exceptions. Classes and objects: user- defined compound types- attributes- instances as arguments-sameness-rectangles-instances as return values-objects are mutable-copying. Classes and functions: time- pure functions- modifiers- which is better? - **Prototype development versus planning**-generalization- algorithms.

- Program to Find the Largest Among Three Numbers
- Program to Check Prime Number
- Program to Find the Factorial of a Number

Text Book

S.No	Author	Title of the book	Publishers
1	**Allen Downey Jeffrey Elkner Chris Meyers**	**How to think like a computer scientist Learning with Python** https://greenteapress.com/thinkpython/thinkCSpy/thinkCSpy.pdf **Unit I** Chapter 1- 1.1-1.5 (Pg no.1-8) Chapter 2 – 2.1-2.10 (Pg no.11-19) **Unit II** Chapter 3-3.1-3.12(Pg no.23-33) Chapter 4-4.1-4.12 (Pg no.37-46) **Unit III** Chapter 5-5.1-5.8(Pg no. 49-58) Chapter 6-6.1-6.9 (Pg no.61-72)	**Dream tech press, Green tea press 2016**

		Chapter 7-7.1-7.7 (Pg no. 73-80) **Unit IV** Chapter 8-8.1-8.16(Pg no.83-96) Chapter 9-9.1-9.8 (Pg no. 97-104) Chapter 10-10.1-10.7(Pg no.107-113) **Unit V** Chapter 11-11.1-11.5(Pg no.117-124) Chapter 12-12.1-12.8(Pg no.129-135) Chapter 13-13.1-13.7(Pg no.139-144)	
2.	**Programs**	https://www.programiz.com/python-programming/examples	

Reference Books

Book Name	**Author**	**Publisher**	**Year & Edition**
Learning to Program with Python	Richard L.Haltman	Richard Publishing	-
Getting started with Python Data Analysis	Phuong Vo. T.H.,Martin Czygan	Packt Publishing	2015

Digital learning

1) **Variables, expressions and statements**

https://www.youtube.com/watch?v=tvwo09N9QTQ

2) **Math functions**

https://www.youtube.com/watch?v=OviXsGf4qmY

3) **Boolean functions**

https://www.youtube.com/watch?v=r526yum0EYQ

4) **Dictionary methods**

https://www.youtube.com/watch?v=daefaLgNkw0&t=6s

5) **Prototype development versus planning**

https://www.youtube.com/watch?v=6qaN6i_7LZI&t=1s

Course Designers:

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

COURSE NUMBER TH21A31	COURSE NAME ALLIED MATHEMATICS FOR PHYSICS II	Category	L	T	P	Credit
		Theory	101	4	–	5

Preamble

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

Prerequisite

Knowledge of Differential Calculus, Integral Calculus and Vector Calculus.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1.	Use multiple integration to find areas and volumes of simple geometrical objects	K1
CLO2.	Develop the ability to apply differential equations to significant applied or theoretical problems.	K1
CLO3.	Solve problems in ordinary differential equations, dynamical systems	K2
CLO4.	Demonstrate their understanding of how physical phenomena are modeled by differential equations and dynamical systems	K2
CLO5.	Compute the Fourier series representation of a periodic function, in both exponential and sine-cosine forms	K3

Mapping with Programme Learning Outcomes

CLOS/PLOS	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1.	S	S	S	S	S
CLO2.	S	S	S	S	S
CLO3.	S	S	S	S	S
CLO4.	S	S	S	S	S
CLO5.	S	S	S	S	S

S - Strong; M - Medium; L - Low

Syllabus

SEMESTER IV – ALLIED
MATHEMATICS FOR PHYSICS - II

Credits: 5 **Hours: 101**

UNIT I **20 Hrs**

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

UNIT II **20 Hrs**

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

UNIT III **20 Hrs**

Differential equation of the form $(aD^2 + bD + C)y = e^{ax}\varphi(x)$ where a,b,c are constants, $\varphi(x)$ = sin mx or cos mx or x^m- Solution of homogeneous linear differential equations of the form $(ax^2D^2$

+ bxD + c)y = X where X is a function of x – Equation reducible to homogeneous equation.

UNIT IV **20 Hrs**

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

UNIT V **21 Hrs**

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

Text Book

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

Reference Books

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

UNIT I &II : Chapter 5 Sections –2.1 to 4.0, 5.1to 5.4& 6.0 to 6.3
Chapter 6 Sections-1.1 to 2.4
Chapter 7 Sections-2.1 to 2.3,3,4,5,6

UNIT III : Chapter 2 Sections – 1.0 to 4, 8.0 to8.3

UNIT IV : Chapter 4 Sections 1.0 to 7.0

UNIT V : Chapter 6 Sections 1.0 to 6.0

Pedagogy

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

Course Designers:

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

COURSE NUMBER TH21A14	COURSE NAME ALLIED - MATHEMATICS FOR SCIENCES II	Category	L	T	P	Credit
		Theory	101	4	-	5

Preamble

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

Prerequisite

- Knowledge in Differential and Integral Equations

Course Learning Outcomes

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

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

Mapping with Programme Learning Outcomes

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

S - Strong; M - Medium; L- Low

Syllabus

SEMESTER IV – ALLIED
MATHEMATICS FOR SCIENCES II

Credits: 5 **Hours: 101**

UNIT I **20 Hrs**

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

UNIT II **20 Hrs**

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

UNIT III **20 Hrs**

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

UNIT IV **20 Hrs**

Formation of partial differential equations by eliminating arbitrary constants and arbitrary functions – Solutions of standard types of first order equations: f(p,q) = 0, f(x,p,q)=0,

$f(y,p,q)=0$, $f(z,p,q)=0$, $f_1(x,p) = f_2(y,q)$, $z = px+qy+f(p,q)$ – Lagrange method of solving linear partial differential equation $P_p+Q_q = R$– Charpit's Method – Simple problems.

UNIT V **21 Hrs**

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

Text Book

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

Reference Books

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

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

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

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

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

NOTE:

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

Pedagogy

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

Course Designers:

1.Dr.B.TamilSelvi,Associate Professor and Head, Department of Mathematics
2.Dr.D.Sasikala, Assistant Professor, Department of Mathematics

COURSE CODE TH21A08	COURSE NAME ALLIED STATISTICS FOR COMMERCE	CATEGORY	L	T	P	CREDIT
		ALLIED	86	4	-	5

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.Understand the concepts of a random variable and a probability distribution.	K2
CLO3	To measure progress toward quality improvement and public health *goals*.	K3
CLO4	Hypothesize various advanced statistical techniques for exploring practical situations.	K4

Mapping with Programme Learning Outcomes

CLOS/PLOS	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	M	S
CLO2	M	S	M	S	M
CLO3	S	M	S	M	S
CLO4	M	S	M	S	S
CLO5	S	S	S	M	S

S- Strong; M-Medium; L-Low

Syllabus

SEMESTER IV

Allied - Statistics for Commerce

COMMON TO B.COM(Aided & SF)

Credits 5 **Hours 86**

Subject Code : TH21A08

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 **17 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 populationand 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	ltan Chand & Sons	2007
3.	P.N.Arora Sumeet Arora , S.Arora	Comprehensive Statistical Methods	ltan Chand & Sons	2008

MOOC learning

https://www.youtube.com/watch?v=zlZaOnBbpUg
(1 lesson by Prof.Arunkanda, Department of Mechanical Engineering, IIT ,Delhi)
Lecture 35 - Analysis of Time Series
https://www.youtube.com/watch?v=JT9o8b43Gk0
Index numbers

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

Note

Question paper setters to confine to the above text books only

Pedagogy

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

Course Designers

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

COURSE CODE	COURSE NAME – CORE PAPER IX REAL ANALYSIS WITH TABLEAU SEMESTER V	Category	L	T	P	Credit
TH21C09		Theory	103	2	-	5

Preamble

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

Prerequisite

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

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 as they apply to sequences, series, differentiation and integration.	K1
CLO2	Analyze the precise proofs of results that arise in the context of real analysis.	K2
CLO3	Identify, formulate and solve problems by the implementation of a variety of proof techniques.	K2
CLO4	Apply critical thinking skills to solve problems that can be modelled mathematically.	K3
CLO5	Analyze how abstract ideas and rigorous methods in real analysis can be applied to practical problems	K3

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
CLO5	S	S	S	S	S	S	S

S-Strong; M-Medium; L-Low

Syllabus

SEMESTER V – CORE PAPER IX

REAL ANALYSIS WITH TABLEAU

Credits :5 **Hours:103**

Subject Code : TH21C09

UNITI **21hrs**

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

UNITII **20hrs**

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

UNITIII **21hrs**

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

UNIT IV **20hrs**

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

UNITV **21 hrs**

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

Text Book

1.	T.M.Apostol	Mathematical analysis second edition	Narosa Publishing House 2002
	https://public.tableau.com/en-us/s/download		

Book for reference

1.	R.R.Goldberg	Methods of Real Analysis	Oxford and IBH Publishing Co. Pvt. Ltd.(2017)
2	Walter Rudin	Principles of Mathematical Analysis	McGraw – Hill(1976)

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

Note :

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

Pedagogy :

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

Course Designers:

1. Dr.B.TamilSelvi, Associate Professor and Head, Department of Mathematics.
2. Dr. D. Sasikala, Assistant Professor, Department of Mathematics.

COURSE CODE TH21C10	COURSE NAME CORE PAPER X ABSTRACT ALGEBRA WITH MAPLE APPLICATIONS SEMESTER V	CATEGORY	L	T	P	CREDIT
		Theory	103	2	-	5

Preamble

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

Prerequisite

Knowledge about Set Theory, Functions and Groups.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1.	Learn about Subgroups, Homomorphism, Automorphism, Rings, Ideals and Quotient rings and Euclidean rings.	K1
CLO2.	Identify, formulate and solve problems by using the implementation of a variety of proof techniques	K2
CLO3.	Demonstrate knowledge and understanding of the concept of cosets of a subgroup of a group and normal subgroups.	K2
CLO4.	Demonstrate knowledge and understanding of symmetric groups, cyclic groups, their Properties, direct product of groups and the concept of quotient groups.	K3
CLO5.	Analyze the application of Permutation groups, Sylow's theorem, Abelian groups.	K3

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
CLO5.	S	S	S	S	S	S	S
CLO6.	S	S	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

SEMESTER V – CORE PAPER X
ABSTRACT ALGEBRA WITH MAPLE APPLICATIONS

Credits : 5 **Hours:103**

Subject Code : TH21C10

UNIT I **20 hrs**

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

UNIT II **21 hrs**

Automohisms –Inner Automorphisms- Cayley's theorem - Permutation groups- Another counting principle – Equivalence relation– Sylow's Theorem – Finite abelian group. **UNIT III** **21 hrs**

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

UNIT IV **20 hrs**

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

UNIT V **21 hrs**

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

Text Books

S.No	Author	Title of the book	Publishers
1	I.N. Herstein	Topics in Algebra	Wiley Eastern Ltd. - 2nd edition (2002)
2	http://www.maplesoft.com/applications/		

Books for Reference

S.No	Author	Title of the book	Publishers
1	S.Arumugam & A. Thangapandi Isaac	Modern Algebra	New Gamma Publishing House, 1990
2	M.L. Khanna	Modern Algebra	Jai Prakash Nath and Co, 1990

UNIT I : Sections – 2.4 to 2.7
UNIT II : Sections – 2.8 to 2.12,2.14
UNIT III : Section 3
UNIT IV : Sections – 3.4 to 3.6
UNIT V : Sections – 3.7 to 3.11

Note:

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

Pedagogy:

Chalk and Talk, Seminar, Group Discussion, Numerical Exercise

Course Designers:

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

	COURSE NAME ELECTIVE I	Category	L	T	P	Credit

COURSE CODE TH21E01	**NUMBER THEORY AND NUMERICAL METHODS WITH C**	**Theory**	**103**	**2**		**4**

Preamble

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

Prerequisite

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

Course Learning Outcomes

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

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

S- Strong; M-Medium; L-Low

Syllabus

SEMESTER V –ELECTIVE I

NUMBER THEORY AND NUMERICAL METHODS WITH C

Credits :4 **Hours:103**

Subject code: TH21E01

UNITI **21 hrs**

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

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

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

UNIT II **21 hrs**

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

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

UNIT III **21 hrs**

Solution of numerical, algebraic and transcendental equation : The bisection method – Method of false position – Newton Raphson method ,Geometrical interpretation of Newton's method ,Gauss elimination method – Gauss seidal iteration method – Gauss Jordan and Gauss Jacobi methods – Simple problems using C

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

UNIT IV **20 hrs**

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

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

UNIT V **20 hrs**

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

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

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

Text Books

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

Books for Reference

S.No	Author	Title of the book	Publishers
1.	Introduction to the theory of numbers	Ivan Niven and Herberts Zuckerman	Wiley Publishing House- Fifth edition Narosa 1991
2.	Elementry Number Theory	David M.Burton	McGraw-Hill Companies, New York, 2007, Sixth edition
3.	Numerical Methods in Science & Engineering	M.K.Venkataraman	National Publishing Company 1990 edition
4.	Numerical Methods for Scientific and Engineering Computations	M.K.Jain, S.R.K.Iyengar&R.K.Jain	New Age International Publishers, New Delhi, 2010

Note :

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

Pedagogy :

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

Course Designers:

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

COURSE	COURSE NAME	Category	L	T	P	Credit

CODE TH21E02	ELECTIVE II- GRAPH THEORY WITH OPEN MODELICA	Theory	103	2		4

Preamble

To introduce Graph theory concepts to solve the applied problems

Prerequisite

Knowledge of Blocks, Trees, Matrices and Partitions

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1.	Find solutions of Ramsey, Matroids, Graphical Partitions.	K1
CLO2.	Appreciate and use Konigsberg bridge problem, Menger's theorem, Hamiltonian Graphs, Eulerian Graphs.	K1
CLO3.	Calculate degrees cutpoints, no. of cycles, centres, centroids, connectivity, line connectivity.	K2
CLO4.	Recognize operations on graphs, characterization of trees, line graphs, properties of line graphs.	K2
CLO5.	Understand various Graphs relating extremal graphs, intersection graph cutpoint graphs, centres and centroids , Independent cycles and cocycles,connectivity and line-connectivity, graphical variations of menger's theorem, line graphs and Traversability, adjacency matrix, incidence matrix, cycle matrix	K3
CLO6.	Demonstrate knowledge of basic concepts such as variety of graphs, Blocks, Trees, Connectivity and line ,matroids, Matrices and Partitions	K3

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
CLO5.	S	S	S	S	S	S	S
CLO6.	S	S	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

SEMESTER V - ELECTIVE II
GRAPH THEORY WITH OPEN MODELICA

Credits 4 **Hours :103**

Subject Code:TH21E02

UNITI **21hrs**

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

UNITII **20hrs**

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

UNITIII **20hrs**

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

UNITIV **21hrs**

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

UNITV **20hrs**

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

Text Book :

S.No	Author	Title of the book	Publishers
1	Frank Harary	Graph theory	Narosa publishing house 10th reprint 2001
	https://www.openmodelica.org/		

Reference:

S.No	Author	Title of the book	Publishers
1	NarsingDeo	Graph Theory with Applications to energy and computer science	Prentice Hall of India Publication reprint (2004)

Unit I : Chapters 1 and 2
Unit II: Chapter 3
Unit III: Chapter 4
Unit IV: Chapter 5 and 13
Unit V: Chapter 6,7 and 8

Note

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.B. TamilSelvi, Associate Professor and Head, Department of Mathematics.
2. Ms.A. Karpagam, Associate Professor, Department of Mathematics.

SEMESTER V – Advanced Learners' Course

ASTRONOMY I

Credits : 5 **Hours :60**

Subject Code: TH16AC1

OBJECTIVE:

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

UNIT I:

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

UNIT II:

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

UNIT III:

Dip – twilight – geocentric parallax.

UNIT IV:

Refraction – Tangent formula – Cassini's formula

UNIT V:

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

Text Book:

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

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

Course Designers:

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

SEMESTER V -Advanced Learners' Course

FUZZY MATHEMATICS I

Credits :5 **Hours :60**
Subject Code : TH16AC2
OBJECTIVE
To introduce basic concepts of fuzzy mathematics and its applications.

UNIT I :

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

UNIT II :

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

UNIT III :

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

UNIT IV :

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

UNIT V :

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

Text Book:

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

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

Course Designers:

1. Dr.B.TamilSelvi, Associate Professor and Head, Department of Mathematics.
2. Dr. D. Sasikala, Assistant Professor, Department of Mathematics.

SEMESTER V – Advanced Learners' Course

TOPICS IN FLUID DYNAMICS I

Credits : 5 **Hours :60**

Subject Code : TH16AC3

OBJECTIVE

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

UNIT I:

Basic concepts: Types of fluid - properties.

UNIT II:

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

UNIT III:

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

UNIT IV:

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

UNIT V:

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

Text Book:

S.No	Author	Title of the book	Publishers
1	Shanthi Swarup	*Fluid dynamics*	Krishna Prakashan media (p) ltd, Meerut11th edition 2003,

UNIT I	:	Chapter 1	Sections 1.0 –1.1
UNIT II	:	Chapter 2	Sections 2.4 – 2.9, 2.14 – 2.15
UNIT III	:	Chapter 3	Sections 3.11, 3.3, 3.10
UNIT IV	:	Chapter 4	Sections 4.0 –4.5
UNIT V	:	Chapter 5	Sections 5.1 –5.7

Course Designers:

1. Dr.B.TamilSelvi, Associate Professor and Head, Department of Mathematics
2. Dr.R.Lakshmi, Assistant Professor, Department of Mathematics

COURSE CODE TH21C11	COMPLEX ANALYSIS WITH TABLEAU SEMESTER VI	CATEGORY	L	T	P	CREDIT
		Theory	88	2	-	5

Preamble

- Introduce students to the Complex Number System
- Equip students with necessary knowledge and skills to enable them handle mathematical operations, analyses and problems involving complex numbers.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the fundamental concepts of complex analysis.	K1
CLO2	Understand the significance of differentiability for complex functions and familiar with the Cauchy-Riemann equations;	K2
CLO3	Compute the Taylor and Laurent expansions of simple functions, determining the nature of the singularities and calculating residues;	K3
CLO4	Use Cauchy Residue Theorem to evaluate integrals.	K4

Mapping with Programme Learning Outcomes

CLOs/POs	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	S	M	S	S	S	S
CLO4	M	S	S	M	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

SEMESTER – VICORE PAPER -XI

COMPLEX ANALYSIS WITH TABLEAU

Credits : 5 Hours: 88

Subject Code : TH21C11

UNIT I **18 hrs**

Complex number system : Complex number system-Field of complex numbers-scalar multiplication of a complex number –Field of real numbers – Expression of (α,β) in the form of $\alpha+i\beta$ – Conjugation- Absolute value of a complex number –Inequalities in terms of moduli-Examples. Complex plane: Representation of complex number by points-nth roots of a complex number- Geometrical Addition-Angle between two rays-Equations of Straight lines and circles –Elementary transformation ; Infinity and extended complex plane-Stereographic projection-Fixed points-Problems ; Analytic Functions-Complex functions – Limit of a Function-Continuity of a function –Uniform continuity-Differentiability and analyticity of a function - Necessary condition for differentiability – Sufficient condition for differentiability - CR equations in polar coordinates - Complex function on a function of z and $\bar{z}$ - problems. Simple visualizations using Tableau

UNIT II **18hrs**

Bilinear Transformation –Special bilinear transformations- Circle and inverse points – Problems – Complex Integration : Simple rectifiable oriented curves -Integration of complex functions – Simple integrals using definition –Definite Integrals-Interior and Exterior of a closed curve-Simply connected region-Cauchy's fundamental theorem(statement only)-Integral along an arc joining two points - Cauchy's integral formula and formula for derivatives -Problems.

UNIT III **17hrs**

Zeros of a function – Related integral theorems: Cauchy's inequality - Liouville's theorem –Fundamental theorem of algebra – Maximum modulus theorem – Gauss' mean value theorem,Theorem on the mean of the values of a harmonic function on a circle – Problems- Simple visualizations using Tableau

UNIT IV **17hrs**

Taylor- Zeros of an Analytic function-Laurent's series-Cauchy product and division – Singular points –Isolated singularities-Removable singularities- pole-Essential singularity-Behaviour of a function at an isolated singularity- Determination of the nature of singularities- Nature of singularity at infinity-Problems.

UNIT V **18hrs**

Residue-calculation of residues-Real definite integrals: Integrals of type I $\int_0^{2\pi} f(\cos\theta,\sin\theta)d\theta$ type II $\int_{-\infty}^{\infty}\frac{P(x)}{Q(x)}dx$ evaluation – Problems – Meromorphicfunctions : Principle of argument – Rouche's theorem – Fundamental theorem of algebra – Function meromorphic in the extended plane – problems.

Text Book

S.No	Author	Title of the book	Publishers
1	P. Duraipandian, Kayalal Pachaiyappa	*Complex Analysis*	S.Chand & Company Pvt.Ltd,2014
	https://public.tableau.com/en-us/s/download		

Books for reference

S.No	Author	Title of the book	Publishers
1	Shanti Narayan	Theory of functions of a complex variable	S.Chand& company, 2010
2	J.N.Sharma	Functions of a complex variable	Krishna PrakashanMandir, 1980
3	P. Duraipandian, Laxmi Duraipandian and D.Muhilan	Complex Analysis	Emerald Publishers-revised edition 1994.

UNIT I : Chapter I, II, IV
UNIT II : Chapter VII Sec.7.1-7.3, Chapter VIII Sec 8.1-8.9
UNIT III : Chapter VIII Sec 8.10- 8.13
UNIT IV : Chapter IX
UNIT V : Chapter X, XI

Note

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

Pedagogy

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

Course Designers:

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

COURSE CODE TH21C12	LINEAR ALGEBRA WITH MAPLE APPLICATIONS SEMESTER VI	Category	L	T	P	Credit
		Theory	88	2	--	5

Preamble

- To understand the concepts of the algebraic properties of vectors, vector spaces and matrices.
- To understand the concept of transformations

Prerequisite

- Knowledge in matrices and transformations

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Learn the basics of matrices and vector spaces	K1
CLO2	Understanding of linear independence, span, and basis.	K2
CLO3	Compute the inner product of two vectors	K3
CLO4	Demonstrate the relationship between the operations on linear transformations and their corresponding matrices	K4

Mapping with Programme Learning Outcomes

CLOS/POS	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 VI– CORE PAPER XII
LINEAR ALGEBRA WITH MAPLE APPLICATIONS

Credits : 5 **Hours:88**

Subject Code : TH21C12

UNIT I **18hrs**

Rank of a matrix- General solution of a system- Matrix- Matrix product. Linear transformations: Functions, Mappings and Transformation- Domain, Co- domain, and Range- Injective and Surjective Mappings-Linear Transformations- Using Matrices to Define Linear Maps- Injective and Surjective Linear Transformations- Effects of Linear Transformations- Effects of Transformations on Geometrical Figures-Composition of two Linear Mappings- Application: Data Smoothing.

UNIT II **17hrs**

General Vector Spaces: Vector spaces- Theorems on Vector Spaces-Linearly Dependent Sets- Linear Mapping. Matrices: Symmetric Matrices- Skew- Symmetric Matrices- Linear Transformations. Matrix Inverses: Square Matrices- Elementary Matrices and LU Factorization-Computing an Inverse- Invertible Matrix Theorem-Mathematical Software.

UNIT III **18hrs**

Bases and Dimension: Basis for a Vector Space- Coordinate Vector-Isomorphism and Equivalence Relations- Finite Dimensional and Infinite-Dimensional Vector Spaces-Linear Transformation of a set-Dimensions of Various Subspaces-Caution. Eigen Values and Eigen Vectors: Introduction- Eigen Vectors and Eigen Values- Using Determinants in Finding Eigen values-Linear Transformations-Distinct Eigen Values-Bases of Eigen Vectors-Application: Powers of Matrix- Characteristic Equation and Characteristic Polynomial.

UNIT IV **17hrs**

Inner-Product Spaces: Inner-Product Spaces and their Properties-The Norm in an Inner- Product Space. Orthogonality: The Gram-Schmidt Process- UnNormalized Gram-Schmidt Algorithm- Modified Gram-Schmidt Process- Linear Least- Squares Solution- Gram Matrix-Distance from a Point to Hyper plane-Mathematical Software.

UNIT V **18hrs**

Hermitian Matrices and the Spectral Theorem: Hermitian Matrices and Self –Adjoint Mappings- Self -Adjoint Mapping- The Spectral Theorem- Unitary and Orthogonal Matrices-The Cayley- Hamilton Theorem-Quadratic Forms-Application: World Wide Web Searching-Mathematical Software. Matrix Factorizations and Block Matrices: LU Factorization- LL^T Factorization: Cholesky Factorization- LDL^T Factorization- Application: Linear Least-Squares Problem-Mathematical Software.

Text Books

S.No	Author	Title of the book	Publishers
1	Ward Cheney David Kincaid	Linear Algebra Theory and Applications	Jones and Bartlett India Pvt. Ltd. 1st Edition (2010)
	http://www.maplesoft.com/applications/		

Books for Reference

S.No	Author	Title of the book	Publishers
1.	R.J. Goult	*Applied linear Algebra*	Ellis Horwood Ltd, Publisher Chichester,1978

UNIT I **:** Chapter 1:Sections - 1.3 (Pg. No.: 80 to 88)
Chapter 2: Section- 2.3 (Pg. No.: 165 to 185)

UNIT II **:** Chapter 2: Section- 2.4 (Pg. No.: 198 to 214)
Chapter 3: Section- 3.1(Pg. No.: 240,241&243)
Section- 3.2(Pg. No.: 270,273 to 275, 277,283)

UNIT III **:** Chapter5: Section-5.2 (Pg. No.:387 to 410)
Chapter 6: Sections – 6.1(Pg. No. 460 to 471)

UNIT IV **:** Chapter 7: Sections-7.1, 7.2(Pg. No. 508 to 514,544 to 563).

UNIT V **:** Chapter 8: Sections -8.1, 8.2 (Pg. No. 575to 595, 606 to 614,627 to 629)

Note

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

Pedagogy

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

Course Designers:

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

COURSE CODE TH21C13	OPERATIONS RESEARCH WITH TORA SEMESTER VI	CATEGORY	L	T	P	CREDIT
		Theory	103	2	-	5

Preamble

- To present students the elements and importance of Understanding the meaning, purpose, and tools of Operations Research
- To define and recognize the basic concepts of Operations Research.
- To enable the students to know the applications and the Limitations of Operations Research and simulation.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the characteristics of different types of decision-making environments and the appropriate decision making approaches and tools to be used in each type.	K1
CLO2	Identify and develop operational research models from the verbal description of the real system	K2
CLO3	Know how to use variables for formulating mathematical models in management science, industrial engineering and transportation science and in real life.	K3
CLO4	Develop a report that describes the model and the solving technique, analyse the results and propose recommendations in language understandable to the decision-making processes in Management Engineering	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 VI– CORE PAPER XIII
OPERATIONS RESEARCH WITH TORA

Credits : 5 **Hours:103**
Subject Code : TH21C13
UNIT I **20 hrs**

Operations Research –An overview - * Natures and features of OR* Linear Programming problem : Mathematical Formulation-graphical solution-Linear Programming: Simplex Method – Two - Phase method - Duality in Linear programming – Dual simplex method-problems using TORA

UNIT II **20 hrs**

Integer Programming: Gomory's All I.P.P method - * Construction of Gomory's constraints* Fractional Cut method – All integer - Transportation Problem – Finding an Initial Basic Feasible Solution - Test for optimality – Transportation Algorithm(Modi Method) - Assignment

UNIT III **21 hrs**

Dynamic Programming: Recursive Equation Approach- *Characteristics of Dynamic Programming*- Dynamic Programming Algorithm - Games and Strategies – Two- person Zero-Sum games- Maximin-Minimax Principle-Games Without Saddle Points-Mixed Strategies- Graphical Solution of 2 x n and m x 2 games-problems using TORA.

UNIT IV **21hrs**

Inventory Control: – Costs Associated with Inventories- Factors Affecting Inventory Control- Economic Order Quantity- Deterministics Inventory Problems with no Shortages - Queueing Theory- *Elements of a Queuing System*-Operating Characteristics of Queueing System-Probability Distribution –Classification of Queueing Models-Poisson Queueing Systems-problems using TORA.

UNIT V **21 hrs**

Network Scheduling By PERT / CPM. Distinction between PERT & CPM-problems using TORA.

Text Book

S. No	Author	Title of the book	Publishers
1	KantiSwarup ,P.K.Gupta and Man Mohan	*A Text Book of operations research*	Twelfth Thoroughly Revised Edition Published By sultan chand& sons, 2008
2	*https://sourceforge.net/directory/?q=tora+for+linear+programming*		

UNIT I : Chapter 1 –Sections 1.1 & 1.2
Chapter 2 –Sections 2.1 & 2.2
Chapter 3 –Sections 3.1 to 3.5,3.6
Chapter 4 -Sections 4.1 to 4.4
Chapter 5 – Section 5.1 , 5.2 & 5.9

UNIT II : Chapter 7-Sections 7.1 to 7.4 ,
Chapter 10-Sections 10.1 to 10.9, 10.10,10.12.
Chapter 11-Sections 11.1 to 11.3

UNIT III : Chapter 13-Sections 13.1 to 13.4
Chapter 17-Sections 17.1 to 17.6

UNIT IV : Chapter 19-Sections 19.1 to 19.6
Chapter 20-Sections 20.1 to 20.8(in 20.8 Model I , II, III, IV Only)

UNIT V : Chapter 21-Sections 21.1 to 21.7

Reference Books

S. No	Author	Titleofthe book	Publishers	Year ofPublication
1.	BillyE.Gillett	Introduction toOperationsResearch	Tata McGraw - Hill	2001

2	Kalavathy.S	OperationsResearch	Vikas publishinghouse	2008
3	KantiSwarupEtal	OperationsResearch	Sultan Chand &Sons	2009
4	ManmohanandGupta PK	OperationsResearch	Sultan Chand &Sons	2011
5	D.S.Cheema	OperationsResearch	LaxmiPublicatons	2010

Note

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

Pedagogy

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

Course Designers:

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

COURSE CODE TH21E03	ELECTIVE-MATHEMATICAL MODELLING WITH OPEN MODELICA SEMESTER VI	CATEGORY	L	T	P	CREDIT
		Theory	103	2	-	5

Preamble

- To understand how mathematical models are formulated, solved and interpreted
- To equip students with the basic mathematical modelling skills
- To use MATLAB effectively to solve problems involved in mathematical modeling

Prerequisite

- Knowledge on calculus, ordinary differential equations, matrices, linear algebra, basic knowledge of probability and computational skills

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand what is a mathematical model and to know the steps involved in a mathematical modeling process	K1
CLO2	State and explain the different classifications of mathematical models	K2
CLO3	Learn the essential features of a good model and to discuss the benefits of using a mathematical model	K3
CLO4	Understand the applications of mathematical modelling to solve problems in engineering, physical, biological, and social sciences	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; Low

Syllabus

SEMESTER VI – ELECTIVE III

MATHEMATICAL MODELLING WITH OPEN MODELICA

Credits: 5 **Hours: 103**

Subject Code : TH21E03

UNIT I 21hrs

Mathematical Modelling Need , Techniques, Classifications and Simple Illustrations : Simple Situations Requiring Mathematical Modelling – The Technique of Mathematical Modelling – Classification of Mathematical Models – Some Characteristics of Mathematical Models – Mathematical Modelling Through Geometry – Mathematical Modeling Through Algebra-

Mathematical Modeling Through Trigonometry - Mathematical Modeling Through Calculus – Limitations of Mathematical Modelling-solving problems using open Modelica.

UNIT II 21hrs

Mathematical Modeling Through ODE of First order: Mathematical Modeling Through Differential Equations – Linear Growth and Decay Models – Non – Linear Growth and Decay Models – Compartment Models – Mathematical Modelling in Dynamics Through Ordinary Differential Equations of First Order – Mathematical Modelling of Geometrical Problems Through Ordinary Differential Equations of First Order-solving problems using open Modelica.

UNIT III 21hrs

Mathematical Modelling Through Systems of ODE of First Order: Mathematical Modelling in Population Dynamics – Mathematical Modelling of Epidemics Through Systems of Ordinary Differential Equations of First Order – Compartment Models Through Systems ODE of First Order – Mathematical Modelling in Economics Through Systems of ODE of First Order – Mathematical Modelling in Dynamics Through Systems of ODE of First Order-solving problems using open Modelica.

UNIT IV 20hrs

Mathematical Modelling Through Systems of ODE of Second Order: Mathematical Modelling of Planetary Motions – Mathematical Modelling of Circular Motion and Motion of Satellites – Mathematical Modelling Through Linear Differential Equations of Second Order-solving problems using open Modelica.

UNIT V 20hrs

Mathematical Modelling Through Systems of PDE of Second Order: Situations Giving Rise to PDE Models – Mass- Balance Equations: First Method of Getting PDE Models – Momentum – Balance Equations: The Second Method of Obtaining PDE Models – Variational Principles: Third Method of Obtaining PDE Models – Model of Traffic Flow on a Highway-solving problems using open Modelica.

Text book

S.No	Author	Title of the book	Publishers
1	J.N.Kapur	Mathematical modelling	New Age International(P) Ltd,Publishers,New Delhi.
2	*https://www.openmodelica.org/*		

Reference Books

S.No	Author	Title of the book	Publishers
1	F.R.Hiordano.,M.D.Weir. and W.P.Fox.,	A First Course in Mathematical Modelling	3rd edition, vikas publishing house. 2003
2	Clive L.Dym.,	PrinciplesofMathematical Modelling	Second edition , Academic press, Burlington,2006

Unit I Chapter 1 Sections – 1.1 – 1.9
Unit II Chapter 2 Sections – 2.1 -2.6
Unit III Chapter 3 Sections – 3.1 – 3.6
Unit IV Chapter 4 Sections – 4.1 – 4.3
Unit V Chapter 6 Sections – 6.1 -6.4,6.6

Note

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

Pedagogy

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

Course Designers:

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

COURSE CODE TH21E04	ELECTIVE IV DISCRETE MATHEMATICS SEMESTER VI	Category	L	T	P	Credit
		Theory	103	2	-	5

Preamble

- To introduce the basic Mathematics which is applicable for Computer Science.

Prerequisite

- Knowledge in basic concepts of Mathematics and logical reasoning

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand and Application of Mathematical logic and definitions and well formed formula. Apply the understanding of Tautology Equality relations	K1
CLO2	Reason logically and understand relations, Diagraph and lattice.	K2
CLO3	Apply algebraic concepts in coding theory using group codes	K3
CLO4	Understand use of groups and codes in Encoding Decoding	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 VI – Elective IV
DISCRETE MATHEMATICS

Credits: 5 **Hours: 103**
Subject Code : TH21E04

UNIT I: **20hrs**

Logic : IF – Statement – Connectives –Atomic and compound statements- Well formed formulas – Truth tables – Tautology – Tautological implications and equivalence – Replacement process.

UNIT II **21hrs**

Normal forms: Normal forms – Principal normal forms – Theory of inference – open statements – quantifiers – theory of inference for Predicate calculus – Statements involving more than one quantifiers.

UNIT III **20 hrs**

Coding theory : Introduction – Hamming distance – Encoding a message – Group codes – procedure for generating group codes – Decoding and error correction – An example of simple error correcting code.

UNIT IV **21 hrs**

Automata and Languages : Finite Automata – Definition – representation – acceptability of a string by a FA – Languages accepted by a FA – Equivalence of a FA and NFA – Procedure of finding a FA equivalent to a given NFA.

UNIT V: **21hrs**

Push down Automata : Push down automata – definition – description – properties of move relation – acceptance by a PDA – equivalence of two types of a acceptance by PDA – context free languages and PDA –turing machines

Text Books

S.No	Author	Title of the book	Publishers
1	Dr. M.K. Venkataraman, Dr. N. Sridharan and N. Chandrasekaran	Discrete Mathematics	First edition Reprint 2003, The National Publishing company, Chennai
	UNIT I : Chapter 9 Sections 9.1-9.9 UNIT II : Chapter 9 Sections 9.11-9.18 UNIT III : Chapter 8 Sections 8.1 – 8.8 UNIT IV : Chapter 12 Sections 12.1-12.10 UNIT V : Chapter 12 Sections 12.23-12.30		

Books for Reference

S.No	Author	Title of the book	Publishers
1	T.Veerarajan	Discrete Mathematics with Graph Theory and Combinatorics	Tata mcgraw-Hill publishing company Limited, 2008
2	Kenneth H. Rosen	Discrete Mathematics and its Applications	Mc.Graw Hill, 2002.
3	J.P.Tremblay and R.P.Manohar	Discrete mathematical Structures with Applications to Computer Science	McGraw Hill Publishing Company, Edition 1997, Reprint 2010
4	Narsing Deo	Graph Theory with applications to Engineering and Computer science	Prentice-Hall of India pvt. Ltd.,New Delhi, 2004
5	Bernard Kolman, Robert C. Busby, Sharon Culter Ross, Nadeen-ur-Rehman	Discrete Mathematical Structures	Pearson Education,5th edition,2004

Note

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

Pedagogy

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

Course Designers:

1. Dr. S.Aiswarya, Associate Professor and Head, Department of Mathematics
2. Dr. D. Sasikala, Assistant Professor, Department of Mathematics.

SEMESTER VI – Advanced Learners' Course
ASTRONOMY II

Credits 5 **Hours:60**

Subject Code: TH16AC4

OBJECTIVE

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

UNIT I

Time : Equation of time – seasons – calendar – conversionof time.

UNIT II

Annual parallax – abberation.

UNIT III

Precession – Nutation.

UNIT IV

The moon – eclipses.

UNIT V

Planetary phenomena – The Stellar Universe.

Text Book:

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

Unit I Chapter 7 Headings 166 – 189
Unit II Chapter 9 Headings 190, 195 – 203
Unit III Chapter 10 Headings 204 – 214
Unit IV Chapter 12, 13 Headings 229 – 284
Unit V Chapter 14, 18 Headings 285 – 304, 341 – 359

Course Designers:

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

SEMESTER VI– Advanced Learners' Course
FUZZY MATHEMATICS II

Credits : 5 **Hours : 60**

Subject Code: TH16AC5

UNIT I

Fuzzy Relation Equations Sup-i compositions of Fuzzy relations-Inf – ωi compositions of Fuzzy relations-Fuzzy relation equations based on sup – i and inf – ωi compositions.

UNIT II

Solution method – Approximate solutions – The use of neural networks.

UNIT III

Possibility theory - Fuzzymeasures – Evidence theory – Possibility theory –Fuzzy sets and possibility theory.

UNIT IV

Fuzzy logicx – Fuzzy propositions – Fuzzy quantifiers – Inference from conditional Fuzzy propositions – Inference from conditional and qualified propositions.

UNIT V

Uncertainty based information- Informationand uncertainty – Non specificity of crisp sets and Fuzzy sets – Fuzziness of Fuzzy sets – Uncertainty in evidence theory.

Text Book:

1.	George J Klir/Bo Yuan.,	Fuzzy sets and Fuzzy logic Theory and applications	Prentice Hall of India, Fourth printing June 2001

Unit I	Chapter 6	Sections 6.4, 6.5
Unit II	Chapter 6	Sections 6.6, 6.7
Unit III	Chapter 7	Sections 7.1 – 7.4
Unit IV	Chapter 8	Sections 8.3, 8.4, 8.6, 8.7
Unit V	Chapter 9	Sections 9.1 - 9.5

Course Designers:

1. Dr. C.R.Parvathy, Associate Professor and Head, Department of Mathematics
2. Dr. D. Sasikala, Assistant Professor, Department of Mathematics.

SEMESTER VI– Advanced Learners' Course

TOPICS IN FLUID DYNAMICS II

Credits : 5 **Hours: 60**

Subject Code: TH16AC6

OBJECTIVE

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

UNIT I

Motion in two dimensions: images, image of a source with regard to a plane – image of a doublet with regard to a plane, circle theorem, image of source with regard to a circle – image of doublet with regard to a circle

UNIT II

General motion of cylinder in two dimensions – motion of a circular cylinder in a uniform stream - Blasius theorem – equation of motion of a circulur cylinder with circulation

UNIT III

The aerofoil – Joukowski transformation – Kutta joukowski theorem – d' Alemberts' paradox

UNIT IV

Vortex motion : Vortex line – properties of the vortex – strength of a vortex – rectilinear vortex – velocity component – center of vortices – a case of a two vortex filament – stream function when the strength of the vortex filaments are equal – vortex pair – vortex doublet – vortex inside an infinite circular cylinder

UNIT V

Navier stokes theorem – equation of motion of a viscous fluid – equation of energy – dissipation of energy – vorticity and circulation in viscous fluids – diffusion of vorticity – the equation of state

Text Book:

1	**Shanthi Swarup**	Fluid dynamics	Krishna Prakashan media (p) ltd, Meerut11th edition 2003,

UNIT I	:	Chapter 1	Sections 5.8-5.13
UNIT II	:	Chapter 2	Sections 5.17 –5.18, 5.22,5.24
UNIT III	:	Chapter 3	Sections 5.34 – 5.37
UNIT IV	:	Chapter 4	Sections 6.0 – 6.10
UNIT V	:	Chapter 5	Sections 9.13 ,9.15-9.19

Course Designers:

1. Dr. C.R. Parvathy, Associate Professor and Head, Department of Mathematics
2. Dr. R.Lakshmi, Assistant Professor, Department of Mathematics

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

Preamble

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

Course Learning Outcomes

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

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

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1	S	S	S	S	S	S	S
CLO2	S	S	S	S	S	S	S
CLO3	S	S	S	S	S	S	S
CLO4	S	S	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

DATA VISUALIZATION AND TABLEAU

Credits: 3 **Hours: 41**

Subject code: TH21SB03

UNIT I : 9 Hrs

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

UNIT II: **9 Hrs**

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

UNIT III: **9 Hrs**

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

UNIT IV **7 Hrs**

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

UNIT V **7 Hrs**

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

Text Books:

S.No.	Author Name	Title of the Book	Publishers
1.	DT Editorial Services	Big Data Black Book Unit I: Chapter 26, Page.No. 715-731	Dreamtech Press
2.	Molly Monsey, Paul Sochan	Tableau for Dummies Unit II: Chapter 1,3 Page.No. 7-14, 35-42. Unit III: Chapter 5,6, Page.No.67-96 Unit IV: Chapter 7, Page.No. 99-115 Unit V: Chapter 8, Page.No.119-141	Wiley India Pvt. Ltd.

Books for Reference

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

Course Designers:

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

Allied Courses Offered to other Programs

For the Students Admitted During the Year 2021 -2022

Allied Courses Offered to other Programs
For the Students Admitted During the Year 2021 -2022

Semester I

B.SC (CS), B.SC (CS with Cognitive Systems), BCA, B.SC (IT)- Semester I & B.SC (FPM)-

Semester III– Allied – Numerical and Statistical Techniques (TH21A03)

B. Com – Semester III &B.COM (CA, E-COM, FS, A & F) - Semester I

- Allied – Mathematics for Commerce – (TH21A07)

B. Com (BA) – Semester I – Allied - Statistics I (TH21A15)

BBA, BBA (IB & RM), BBA (BPM) – Allied - Mathematics for Management I (TH21A02)

B.SC CS (AI) - Allied - Linear Algebra(TH21A25)

Semester II

B.SC (CS), B.SC (CS with Cognitive Systems), BCA, B.SC (IT) - Semester II & B.SC (FPM) -

Semester IV - Allied - Discrete Mathematics (TH21A06)

B. Com –Semester IV & B.COM (CA, E-COM, FS, A & F) - Semester II

Allied – Statistics for Commerce – (TH21A08)

B. Com (BA) – Semester II – Allied - Statistics II (TH21A16)

BBA, BBA (IB & RM), BBA (BPM) – Allied - Mathematics for Management II (TH21A24)

B.SC CS (AI) - Allied – Statistics For Computer Science-I (TH21A26)

Semester III

B.SC (CS), B.SC (CS with Cognitive Systems), BCA, B.SC (IT) - Allied – Optimization

Techniques (TH21A13)

B.Sc (Biotechnology) – Allied – Statistics for Biotechnology (TH21A28)

Semester IV

B.Sc (Biotechnology) – Allied – Advanced Statistics for Biotechnology (TH21A30)

COURSE CODE TH21A03	COURSE NAME ALLIED - NUMERICAL AND STATISTICAL TECHNIQUES SEMESTER I	CATEGORY	L	T	P	CREDIT
		Theory	86	4	-	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	Interpret results from the application of standard statistical and numerical methods.	K2
CLO3	Understand the concepts of Numerical differentiation and Theoretical distributions	K3
CLO4	Applying numerical and statistical methods to solve complex problem.	K3
CLO5	Analyse and evaluate the accuracy of common numerical and statistical methods.	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
CLO5	S	M	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

SEMESTER I / II

Numerical and Statistical Techniques

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

Credits:5 **Hours:86**

Subject Code:TH21A03

Unit I **17 Hrs**

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

Unit II **16 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 **17Hrs**

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 2007

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

MOOC learning

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

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

Lecture 02 Gaussian elimination with partial pivoting

Lecture 04 Jacobi and Gauss Seidel methods

Lecture 20 Newton's Forward Difference & Newton's Backward Difference

Lecture 34 Simpsons 1/3rd rule and 3/8 rule

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

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

Lecture 12 Probability

Lecture 13 Rules of probability

Lecture 19 Binomial distribution

Lecture 20 Poisson distribution

Note

Question paper setters to confine to the above text books only

Pedagogy

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

Course Designers

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

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

COURSE CODE TH21A07	COURSE NAME- ALLIED MATHEMATICS FOR COMMERCE SEMESTER I	CATEGORY	L	T	P	CREDIT
		Theory	86	4	-	5

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Recollect about several diverse examples of mathematics not in secondary school mathematics, problems using mathematics in unfamiliar settings, and explain why mathematical thinking is valuable in daily life based on the series and Mathematics of Finance.	K1
CLO2	Engage in analysing, solving, and computing real-world applications on the limits of Algebraic functions and simple differentiation	K2
CLO3	Apply the abilities to describe the concepts of simple integration and its application in business. Solve problems in a range of mathematical applications using the integral.	K2
CLO4	Understand and formulate Linear Programming models for service and manufacturing systems, and apply operations research techniques and algorithms to solve these LP problems and transportation problems	K3
CLO5	Categories: simple models like assignment problems, travelling salesman to improve decision –making and develop critical thinking and objective analysis of decision problems.	K4

Mapping with Programme Learning Outcomes

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	M	S	M
CLO2	M	S	M	S	S
CLO3	M	S	S	M	S
CLO4	S	M	M	S	S
CLO5	M	S	M	S	M

S- Strong; M-Medium; L-Low

Syllabus

SEMESTER I / III

ALLIED - MATHEMATICS FOR COMMERCE

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

Credits: 5 **Hours: 86**

Subject Code: TH21A07

Unit I **17 Hrs**

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

Unit II **17 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 **17Hrs**

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, K. Ganesan	Operations research	A.R. Publications, 3rd Edition	2005
	UNIT IV: Chapter 2 Section: 2.1 -2.8, Chapter - 3 : Section: 3.1.1 -3.1.4 ,			

	Chapter 5 - Section :5.1 UNIT V: Chapter 6 section 6.1,6.2,6.3,6.4,6.5,6.6, 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 TH21A15	COURSE NAME ALLIED STATISTICS I SEMESTER I	CATEGORY	L	T	P	CREDIT
		Theory	86	4	-	5

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.	K3
CLO5	Analyse and evaluate the accuracy of common statistical methods.	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
CLO5	S	S	S	M	S

S- Strong; M-Medium; L-Low

Syllabus

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

Credits: 5 **Hours: 86**
Subject Code: TH21A15

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 **17 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 **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 or graphic method - Method of semi averages - Moving average method - Measurement of seasonal variations - Method of simple averages only - Ratio-to-trend Method - Ratio-to - moving average method - Link relative method.

UNIT V **17 Hrs**

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

Text book

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

Reference Books

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

Digital Demonstration using Excel

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

- Graphs and charts

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

- Measures of central tendency, Measures of dispersion

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

- Regression

MOOC learning

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

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

- Lecture 35 - Analysis of Time Series

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

- Index numbers

Note

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

Pedagogy

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

Course Designers

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

COURSE CODE TH21A02	COURSE NAME ALLIED -MATHEMATICS FOR MANAGEMENT I SEMESTER I	CATEGORY	L	T	P	CREDIT
		THEORY	86	4	-	5

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

CLO Number	CLO Statement	Knowledge Level
CLO1	This will exhibit fundamental mathematical concepts and analysis of real-world problems to non-Mathematician	K1
CLO2	Apply mathematical results to find solutions in the real life like annuities and sampling theory	K2
CLO3	This will exhibit fundamental mathematical concepts and analysis of real-world problems to non-Mathematician	K2
CLO4	Develop the ability to formulate precise mathematical statements and essential skills that are progressively developed throughout the curriculum.	K3
CLO5	Connection between the key objectives main subject-specific areas and courses are indicated.	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
CLO5	S	S	S	M	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:5 **Hours 86**

Subject Code:TH21A02

UNIT I **17 hrs**

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

UNIT II **17 hrs**

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

UNIT III **17 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 **17 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 **18 hrs**

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

Text Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	P.R. Vittal	Business Mathematics and Statistics	Margham Publishers	2002
	UNIT I: Ch-6 & 7 **UNIT II**: Ch-8,9,10,11			
2.	P.A. Navnitham	Business Mathematics And Statistics	Jai Publishers	2003
	UNIT I : Vol I Ch-4 sections :1,2,3,4,5,6,7,9,10 **UNIT III** : Vol II Ch-1-6 **UNIT IV** : Vol II Ch-7, 8. Ch-12: (pg 503-521) **UNIT V** : Vol II Ch-14 (pg no:579-601) Ch- 10 (444-471)			

Reference Books

S.No.	Author	Title of Book	Publishers	Year of publication
1	S.P .Gupta	Statistical Method	Sultan Chand Publications	2002
2	Sundaresan, Jayaselan	An Introduction To Business Mathematics	Sultan Chand & Sons	2003

MOOC learning

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

Prof Shalabh, Department of Mathematics, IIT Kanpur

Lecture 14Airthmetic mean

Lecture 15 Median

Lecture 16 Quartiles

Lecture 17 Mode Geometric mean

Lecture 20 Mean and standard deviation

Lecture 21 coefficient of variation

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

Prof G. Srinivasan,Department of Mathematics, IIT Madras

Lecture 1: Introduction to probability and statistics

Lecture 2: Types of data

Lecture 4: Data and diagram

Note

Question paper setters to confine to the above text books only

Pedagogy

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

Course Designers

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

COURSE CODE TH21A25	COURSE NAME ALLIED - LINEAR ALGEBRA SEMESTER I	CATEGORY	L	T	P	CREDIT
		Theory	86	4	-	5

Preamble

- To present students the Basic concepts of linear algebra.
- 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	Develop the use of matrix algebra techniques which is needed by engineers for practical applications	K1
CLO2	Apply the tools of vector spaces to decompose complex matrices into	K2
CLO3	Recognize and use basic properties of subspaces and vector spaces	K3
CLO4	Understand the concept of real and complex inner product spaces and their applications in constructing approximations and orthogonal projections	K3
CLO5	Compute Eigen values and Eigen vectors and use them to diagonalizable matrices and simplify representation of line at transformations	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
CLO5	S	M	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

B.SC CS(AI)
LINEAR ALGEBRA

UNIT I **(17 hrs)**

Linear Equations and Matrices : Systems of Linear Equations, Gaussian Elimination , Vector Arithmetic , Arithmetic of Matrices, Matrix Algebra , The Transpose and Inverse of a Matrix , Types of Solutions , The Inverse Matrix Method

UNIT II **(17 hrs)**

Euclidean Space: Properties of Vectors, Further Properties of Vectors, Linear Independence, Basis and Spanning Set

(17 hrs)

UNIT III

General Vector Spaces: Introduction to General Vector Spaces, Subspace of a Vector Space, Linear Independence and Basis, Dimension

UNIT IV **(17 hrs)**

Inner Product Spaces: Introduction to Inner Product Spaces, Inequalities and Orthogonality, Orthonormal Bases, Orthogonal Matrices

UNIT V **(18 hrs)**

Eigen values and Eigenvectors: Determinant of a Matrix, Introduction to Eigen values and Eigenvectors , Properties of Eigen values and Eigenvectors, Diagonalization, Diagonalization of Symmetric Matrices

Text Book

S. No	Author	Title of the book	Publishers	Year of Publication
1.	Kuldeep Singh	Linear Algebra Step by Step	Oxford University Press	2014
	Unit I : Chapter I Unit II: Chapter II Unit-III : Chapter III 3.1-3.4 Unit-IV: Chapter IV Unit-V: Chapter VI - 6.1, Chapter VII -7.1-7.4			

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	Gilbert Strang	Introduction to Linear Algebra	Wellesley-Cambridge Press	2016(5th Edition)
2.	David C. Lay, Steven R. Lay, Judi J. McDonald.	Linear Algebra and Its Applications,	earson Education	(2014)
3.	David C. Lay.Steven R.Lay. JudJ.McDonald	Linear Algebra and Its Applications,	Pearson	2014 5th Edition,

Note

Question paper setters to confine to the above text books only

MOOC learning

https://nptel.ac.in/courses/111/106/111106051/#

Lecture 1: Systems of Linear Equations, Gaussian Elimination
Lecture 2: Introduction to General Vector Spaces, Subspace of a Vector Space
Lecture 3: Linear Independence, Basis and Spanning Set
Lecture 9: Introduction to Inner Product Spaces, Inequalities and Orthogonality
Lecture 6: Introduction to Eigenvalues and Eigenvectors, Properties of Eigenvalues and Eigenvectors, Diagonalization, Diagonalization of Symmetric Matrices

Pedagogy

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

Course Designers

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

COURSE CODE TH21A06	COURSE NAME ALLIED DISCRETE MATHEMATICS SEMESTER II	CATEGORY	L	T	P	CREDIT
		Theory	86	4	-	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	K3
CLO5	Analyze if a given graph is simple or a multigraph, directed or undirected, cyclic or acyclic, and determine the connectivity of a graph	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
CLO5	S	S	S	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 86**

Subject Code :TH21A06

Unit I **17 Hrs**

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 **17 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 TH21A08	COURSE NAME ALLIED STATISTICS FOR COMMERCE SEMESTER II	CATEGORY	L	T	P	CREDIT
		Theory	86	4	-	5

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.	K2
CLO4	To measure progress toward quality improvement and public health *goals*.	K3
CLO5	Hypothesize various advanced statistical techniques for exploring practical situations.	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
CLO5	S	S	S	M	S

S- Strong; M-Medium; L-Low

Syllabus

SEMESTER II/IV

Allied - Statistics for Commerce

COMMON TO B.COM(Aided & SF) - SEMESTER IV AND B.COM (CA, E-COM, FS, A&F) - SEMESTER II

Credits 5 **Hours 86**

Subject Code : TH21A08

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 **17 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	ultan Chand & Sons	2007
3.	P.N.ARORA SUMEET ARORA , S.ARORA	Comprehensive Statistical Methods	ultan Chand & Sons	2008

MOOC learning

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

Note

Question paper setters to confine to the above text books only

Pedagogy

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

Course Designers

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

COURSE CODE TH21A16	COURSE NAME ALLIED STATISTICS II SEMESTER II	CATEGORY	L	T	P	CREDIT
		ALLIED	86	4	-	5

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.	K3
CLO5	Interpret and evaluate results correctly in experimental design and draw reasonable 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
CLO5	S	S	M	S	S

S- Strong; M-Medium; L-Low

Syllabus

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

Credits: 5 **Total Hours: 86**
Subject Code: TH21A16

Unit I **17 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 **17Hrs**

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
.	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	2002

			publishers.	
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 TH21A24	COURSE NAME MATHEMATICS FOR MANAGEMENT II SEMESTER II	CATEGORY	L	T	P	CREDIT
		Theory	86	4	-	5

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,K2
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,K3
CLO3	Formulate and solve the transportation problems using both manual methods and interpret the solutions.	K3,K4
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.	K3
CLO5	Discuss the powerful coordinating tool for planning, scheduling and controlling of projects and minimization of total project cost and time.	K3,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
CLO5	S	S	S	M	S

S- Strong; M-Medium; L-Low

Syllabus

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

Credits 5 **Hours 86**

Subject Code:TH21A24

UNIT I **17 Hrs**

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

UNIT II **17 Hrs**

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

UNIT III **17 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 **17 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 **19 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 Subramaniam, K.Ganesan	Operations research	A.R.Publications, 3rd Edition	2005
	UNIT I: Chapter 1 sections 1.1 - 1.9 UNIT II: Chapter 2 sections 2.1- 2.8 Chapter 3 sections 3.1.1 - 3.1.4. UNIT III: Chapter 5 sections 5.1 – 5.5 Chapter 6 sections 6.1 - 6.9 UNIT IV :Chapter 13 sections13.1 – 13.7 UNIT V : Chapter 8 sections 8.1-8.7			

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	S.Kalavathy	Operations Research	Vikas publishing house	2008
2	D.S.Cheema	Operations Research	LaxmiPublications	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 TH21A26	COURSE NAME ALLIED – STATISTICS FOR COMPUTER SCIENCE I SEMESTER II	CATEGORY	L	T	P	CREDIT
		Theory	86	4	-	5

Preamble

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

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Demonstrate the basic concepts of statistics	K1
CLO2	Identify the methods for different measures of central tendency, dispersion	K2
CLO3	Indicate the strength and direction of a *linear* relationship between two variables, *regression and time series.*	K3
CLO4	Demonstrate advanced understanding of the concepts of time series	K3
CLO5	Construct simple price, quantity, and value indexes.	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
CLO5	S	M	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

BSC CS(AI)
STATISTICS FOR COMPUTER SCIENCE I

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. 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 **17 hrs**

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

UNIT IV **17 hrs**

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

UNIT V **17 hrs**

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

Text Book

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

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	P.N.Arora SumeetArora, S.Arora	Comprehensive Statistical Methods	ultan Chand & Sons	2008
2.	David Lane,	Introduction to Statistics	)avid 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	ultan Chand & Sons Publications	2001

Note

Question paper setters to confine to the above text books only

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

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

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

Lecture 1: Regression analysis

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

Module 1: Lecture 39: Regression Analysis and Correlation

https://www.youtube.com/watch?v=zlZaOnBbpUg
(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. Mrs.R.Meenambigai, Assistant Professor, Department of Mathematics

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
TH21A13	ALLIED–OPTIMIZATION TECHNIQUES SEMESTER III	Allied	86	4	-	5

Preamble

- To introduce the fundamental concepts of Optimization Techniques
- To make the learners aware of the importance of optimizations in real scenarios
- To learn about the managerial concepts like decision making, optimization etc.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the basic concepts and application of operation research in various fields.	K1
CLO2	Understanding various concepts such as LPP, assignment, transportation, travelling salesman, networking etc through algorithms and problems.	K2
CLO3	Applying the importance, value of Operations Research and its mathematical modeling for solving practical problems occurring in real world	K3
CLO4	Analyzing different situations in the industrial/ business scenario involving limited resources and finding the optimal solution within constraints.	K4

Mapping with Programme Learning Outcomes

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

S-Strong; M-Medium; L-Low

Syllabus

COMMON TO B.Sc (CS/IT), B.Sc (CS with Cognitive systems) & BCA

ALLIED–OPTIMIZATION TECHNIQUES

UNIT I **16 hrs**

Linear programming: Introduction-Mathematical formulation of the problem- Graphical solution –**General LPP – Canonical & standard forms of LPP** - Simplex method- Big- M method.

UNIT II **17 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 salesman.

UNIT III **18 hrs**

Game theory: Concept of pure and mixed strategies - **Solving 2 x 2 matrix with** and without saddle point- Graphical method for 2x n – m x 2 games - Matrix oddment method. Dominance property.

UNIT IV **18 hrs**

Queuing theory: **Problems from single server, finite** and infinite population. (Derivations not included). Sequencing Problems: Problems with N Jobs through 2 Machines - Problems with N Jobs through 3 Machines.

UNIT V **17 hrs**

Network scheduling by PERT / CPM: Introduction – **basic terminologies - rules for constructing a project network**-critical path method–floats –PERT-Cost considerations in PERT and CPM Crashing.

Text Book

S. No	Author	Title of the book	Publishers	Year of Publication
1.	V.Sunderesan, K.S.Ganapathy Subramaniam, K.Ganesan	Operations research	A.R.Publications, 3rd Edition	2005
	UNIT I: Chapter 2 session 2.1-2.8, Chapter-3 :session: 3.1.1 -3.1.4,3.2,3.2.1 UNIT II: Chapter 5 session 5.1 -5.5, Chapter-6 :session 6.1-6.9 UNIT III: Chapter 13 session 13.1-13.5, 13.7. UNIT IV: Chapter 11 section11.1– 11.6(exclude 11.5) Chapter14 section14.1-14.4 UNITV: Chapter 8 session 8.1 -8.8			

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	Billy E.Gillett	Introduction to Operations Research	Tata McGraw - Hill	2001
2	Kalavathy.S	Operations Research	Vikas publishing house	2008
3	Kanti Swarup Etal	Operations Research	Sultan Chand & Sons	2009
4	Manmohan and Gupta PK	Operations Research	Sultan Chand & Sons	2011
5	D.S.Cheema	Operations Research	Laxmi Publicatons	2010

MOOC learning

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

(Lectures by Prof. Kusum Deep, IIT Roorkee)

- Graphical Method for LPP

Simplex Method

- Big M Method
- Transportation Problem
- Assignment Problem
- Processing n Jobs on Two Machines
- Processing n Jobs through Three Machines
- Two Person Zero-Sum Game
- Solution of Mixed Strategy Games

E- Content

1) Standard and Canonical form: https://www.youtube.com/watch?v=-1jpfY0zA7s
2) Transportation problems: https://www.youtube.com/watch?v=ItOuvM2KmD4
3) Game theory: https://www.youtube.com/watch?v=fSuqTgnCVRg
4) Queuing theory: https://www.youtube.com/watch?v=xGkpXk-AnWU
5) Networking: https://www.youtube.com/watch?v=KG5b0xZ_Ba8

Pedagogy:

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

Course Designers:

2. Dr. R. Sakthikala, Assistant Professor, Department of Mathematics.
3. Mrs. M. Mohanapriya, Assistant Professor, Department of Mathematics.

COURSE CODE TH21A28	COURSE NAME ALLIED STATISTICS FOR BIOTECHNOLOGY SEMESTER III	CATEGORY	L	T	P	CREDIT
		ALLIED	86	4	-	5

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	Outlining the basics of statistics	K1
CLO2	Understand the formulas and solving problems.	K2
CLO3	Apply the concepts to solve statistical problems	K3
CLO4	Analyze and evaluate the accuracy of common Statistical methods or model in terms of excel.	K4

Mapping with Programme Learning Outcomes

COS/POS	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 III

STATISTICS FOR BIOTECHNOLOGY

Credit : 5 **Total Hrs: 86**
Subject Code: TH21A28

Unit I (17Hrs)

Functions of Statistics - Scope and Limitations. Classification & Tabulation of data - **Diagrammatic and Graphical Presentation of data.**

Diagrammatic representation of Data – Using Excel

Unit II (17Hrs)

Measures of Central tendency - Arithmetic Mean, Median, Mode, Geometric mean and Harmonic mean.

Problems Using Excel

Unit III (17 Hrs)

Measures of dispersion: Range, Quartile deviation, mean deviation, standard deviation, and coefficient of variation. Simple problems related to above mentioned concepts using Excel.

Unit IV (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.

Problems Using Excel

Unit V (17 Hrs)

Regression Analysis-introduction-uses-Regression lines-Regression Equations Simple linear regression model and coefficients of regression.

Problems Using Excel

Text Book

S. No	Author	Title of the book	Publishers	Year of Publication
1.	S P Gupta	Statistical Methods **Unit I:C**hapter 1 pgNo 11-20, Chapter5 pgNo 92-109, Chapter 6 pg No. 128-145,146-153,165-176 **Unit II:**Chapter 7 pg No.179-204,211-218,222-225,232-235 **Unit III**:Chapter 8 Pg No. 275-302 **Unit IV:**Chapter 9 & 10 Pg No. 340-342,390-416 **Unit V:** Chapter 11 Pg No.451-458	Sultan Chand & Sons publishers	2004

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

MOOC learning

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

E - Content

Diagrammatic and Graphical Method: https://www.youtube.com/watch?v=cOuUsZ9yNyk
Measures of Central tendency:https://youtu.be/XrGM0OANzaE
Standard Deviation :https://youtu.be/O48XEfedSWs
https://youtu.be/1VBjTw3A56M
https://youtu.be/IEVHpXn-5dU
Quartile Deviation :https://youtu.be/C1gjdiCxQ2s
Mean Deviation :https://youtu.be/5TJ52gAjzOI
Range :https://youtu.be/7gRphRBstB0
Correlation :https://youtu.be/ai0ao7h0BWY
https://youtu.be/CW8KthnL988
https://youtu.be/Xg0BJBwM2eQ
https://youtu.be/iJcO1ZzX-Qo
https://youtu.be/F_2GIheAbtI
Regression :https://youtu.be/i9zsF-JoYK0
https://youtu.be/xcUhf0Jqlek
https://youtu.be/pT8M17HUh8c

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. Dr. C. R. Parvathy, Associate Professor, Department of Mathematics
2. Mrs. S. Deepa, Assistant Professor, Department of Mathematics

COURSE CODE TH21A30	COURSE NAME ALLIED - ADVANCED STATISTICS FOR BIOTECHNOLOGY SEMESTER IV	CATEGORY	L	T	P	CREDIT
		THEORY	86	4	-	5

Preamble

- To present students the Statistical concepts in analysing, interpreting terms of theory and practical.
- To enable the students to find the practical applications to a real-Life problem in various research fields using EXCEL.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Outlining the Statistics Concepts	K1
CLO2	Understand the formulas and solving problems.	K2
CLO3	Apply the concepts to solve statistical problems	K3
CLO4	Analyze and evaluate the accuracy of common Statistical methods or model in terms of excel.	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 IV
ADVANCED STATISTICS FOR BIOTECHNOLOGY

Credit : 5 **Total Hrs: 86**
Subject Code: TH21A30

UNIT I **18Hrs**

Tests of Hypothesis-Introduction—Procedure-Two Types of errors in testing of Hypothesis-Two-tailed and one-tailed tests of Hypothesis-Tests of significance for large Samples-Difference between small and large samples- Two tailed test for difference between the means of two samples-standard error of the difference between two standard deviations.

UNIT II **17Hrs**

Tests of significance for small samples-student's t-Distribution properties of t-distribution- the t-table.Chi-square test and goodness of fit.

UNIT III **17Hrs**

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

UNIT IV **17Hrs**

Experimental Design- Introduction-Randomized Block Design-Latin squares-Randomized blocks Vs Latin Squares-Latin cubes.

UNIT- V **17Hrs**

Statistical Quality Control-introduction-control charts-types of control charts-setting up a control procedure- $\bar{X}$ **Chart- R chart**.

Text Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	S P Gupta	Statistical Methods **Unit I: Chapter** 3 Pg No. (906-913) (925-923) **Unit II:** Chapter3&4 Pg No. (934-937) (978-985) **Unit III**:Chapter 5 Pg No. (1030-1043) **Unit IV:**Chapter 6 Pg No. (1067-1077) **Unit V:** Chapter 7 Pg No.1079-1092	Sultan Chand & Sons publishers	2019

Books for Reference

S. No	Author	Title of the book	Publishers	Year of Publication
1	V.K.Kapoor	Fundamentals of Mathematical Statistics	Sultan Chand & Sons	2004
2.	V.K.Kapoor	Fundamentals of Applied Statistics	Sultan Chand & Sons	2007

MOOC learning

Chi-Square and F Distribution - Statistics Using Excel Succinctly Ebook (syncfusion.com)

- Chi-Square Distribution

Analysis of Variance - Statistics Using Excel Succinctly Ebook (syncfusion.com)

- ANOVA

Student's t Distribution - Statistics Using Excel Succinctly Ebook (syncfusion.com)

- Student -t Distribution

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

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

COURSE CODE	COURSE NAME	Category	L	T	P	Credit
AM21C13	LIFE CONTINGENCIES I	THEORY	73	2	-	4

Premable

- To formulate the students to understand the basic concept of life table and insurance.
- To provide students with an understanding of the mathematical concepts and techniques that is used to model and value cash flows contingent on survival and death.

Course Learning Outcomes

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

CLO No.	CLO Statement	Knowledge Level
CLO1	Recall the concepts of life table, assurances & annuities.	K1
CLO2	Understand the life table functions and express the probabilities in Terms of life table functions for Assurance and Annuity contracts.	K2
CLO3	Apply the fundamental techniques used to value cash flows involving death, survival and other similar contingent events	K3
CLO4	Analyze calculations relating to assurances, annuities and with-profit policies	K4

Mapping with Programme Learning Outcomes

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

S-Strong, M-Medium, L-Low

Syllabus

SEMESTER VI

LIFE CONTINGENCIES I

UNIT I (15Hrs)

Life table – *Constructing a Life table* - Life time random variable - Life table functions at non-integer ages - Evaluating probabilities without use of the life table - *Select mortality*- Constructing select and ultimate life tables

UNIT II (14Hrs)

Life Assurance contracts - *Types of Insurance Contracts*. Discrete Assurance Contracts: Introduction- Present value random variable, Expected present value and Variance of the present value random variable of Whole life assurance contracts, *Term assurance contracts*, Pure endowment contracts, Endowment assurance contracts , Deferred assurance benefits.

UNIT III **(15Hrs)**

Continuous Assurance Contracts: Introduction- Benefits payable immediately on death: Present value random variable, Expected present value and Variance of *Whole life assurance*, Term assurance, Endowment assurance. *Claims acceleration approximation*- further Approximation - Evaluating means and variances using select mortality- Evaluating assurance benefits.

UNIT IV **(15 Hrs)**

Life annuity contracts- Present value random variable, Expected present value, Variance ofthe present value random variable of *Whole life annuities* (arrears and advance), Temporary annuities (arrears and advance), *Deferred annuities*, Deferred annuities-due, Guaranteed annuities (arrears and advance) , Continuous annuities, Evaluating means and variances using select mortality- Evaluating annuity benefits. *Expected present values of annuities payable *m* times each year*- Expected present values under a constant force of mortality

UNIT V **(14 Hrs)**

Variable payments- *Payments varying at a constant compound rate*- Payments varying by a constant monetary amount: Whole life assurance- Term assurance- Endowment assurance- *Decreasing term assurance*- Increasing assurances payable immediately on death- Whole life annuity payable annually in arrears- Whole life annuity payable annually in advance- Temporary annuities- Annuities payable continuously. Conventional with-profits contracts- (*Types of bonus)*

***Self Study**

Text Books

S.No.	Author/s	Title of the book	Publishers	Year of publication
1.	IFOA	CM 1 Actuarial Mathematics	The Actuarial Education Company on behalf of the Institute and Faculty of Actuaries	2019
	Chapters : 3 (Pg.No: 13-17), 15, 16, 17,18,19			

Reference Books:

S.No.	Author/s	Title of the book	Year of publication
1.	Bowers, Newton Let al.	Actuarial Mathematics	2015 2nd ed
2.	Neill, Alistair. – Heinemann	Life contingencies	2010

Links:

Unit I:

- https://medcraveonline.com/BBIJ/a-review-of-life-table-construction.html
- https://www.youtube.com/watch?v=JHvVub5XS-E
- https://www.youtube.com/watch?v=WfmmAIJhD7o
- https://www.measureevaluation.org/resources/training/online-courses-and-resources/non-certificate- courses-and-mini-tutorials/multiple-decrement-life-tables/lesson-3.html
- https://youtu.be/LASUBO6deK4
- https://www.insuranceopedia.com/definition/4130/select-mortality-table
- https://www.youtube.com/watch?v=wB2uKJ2LPWg

Unit II:

https://www.geeksforgeeks.org/life-insurance-meaning-elements-and-types-of-life-insurance- policies/

- https://www.bartleby.com/subject/business/finance/concepts/types-of-insurance-contract
- https://www.youtube.com/watch?v=q_UvBu5qZEM
- https://www.youtube.com/watch?v=KveGvuUr5jQ

Unit III:

- https://webspace.maths.qmul.ac.uk/b.khoruzhenko/asnotes16.pdf
- https://youtu.be/YY88PIinYy8
- https://users.stat.ufl.edu/~rrandles/sta4930/4930lectures/chapter4/chapter4R.pdf

Unit IV:

- https://www.youtube.com/watch?v=SqvXJ5TL1gY

- https://youtu.be/nUCFjW3LpaE
- https://www.youtube.com/watch?v=CEaMMyH4Aos
- https://www.investopedia.com/terms/d/deferredannuity.asp
- https://www.youtube.com/watch?v=EitRc63EHac
- https://www.youtube.com/watch?v=TZSkOzvE4l0

Unit V:

- https://youtu.be/0d91j_4fbgY
- https://www.investopedia.com/terms/d/decreasing_term_life.asp
- https://youtu.be/rsCwQ0Tu8bM
- https://www.insurancedekho.com/life-insurance/news/types-of-bonuses-in-life-insurance-9777
- https://www.policybachat.com/articles/bonus-in-life-insurance

Skill Components:

- Develop formulae for the means and variances of the payments under various assurance and annuity contracts.
- Understand and use the relations between assurance and annuity factors using equation of value, and their select and continuous equivalents.
- Illustrate the procedure of conventional with-profits contracts, in which profits are distributed by the use of regular reversionary bonuses, and by terminal bonuses.
- Examine mathematical techniques used to model and value cashflows which are contingent on mortality risks.

Pedagogy

Chalk and talk, Group Discussion, PPT, Seminar, Quiz, Assignment.

Course Designers:

1. Ms.M.Harini,Asst.Professor
2. Dr..D.Sreemathi, Asst.Professor