GRADUATE ATTRIBUTES

1. **(KB) A knowledge base for Mathematics**: Demonstrated competence in university level Mathematics, fundamentals of Mathematics, and specialized Mathematics knowledge appropriate to the program.

2. **(PA) Problem analysis**: An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve Mathematical problems in order to reach substantiated conclusions

3. **(Inv.) Investigation**: An ability to conduct investigations of complex problems by methods that include appropriate analysis and interpretation of data and synthesis of information in order to reach valid conclusions.

4. **(Tools) Use of mathematical tools**: An ability to create, select, apply, adapt, and extend appropriate techniques, resources to a range of mathematical activities, from simple to complex, with an understanding of the associated limitations.

5. **(Team) Individual and teamwork**: An ability to work effectively as a member and leader in teams, preferably in a multi–disciplinary setting.

6. **(Comm.) Communication skills**: An ability to communicate mathematical concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and documentation, and to give and effectively respond to clear instructions.

7. **(Prof.) Professionalism**: An understanding of the roles and responsibilities of the professional Mathematician in society, especially the primary role of protection of the public and the public interest.

8. **(Ethics) Ethics and equity**: An ability to apply professional ethics, accountability, and equity.

9. **(LL) Life–long learning**: An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1	To gain knowledge in foundational areas of Mathematics
PEO 2	To communicate mathematics accurately, precisely and effectively
PEO 3	To develop mathematical thinking
PEO 4	To apply mathematical knowledge
PEO 5	To be able to solve mathematical problems using technology

PROGRAMME OUTCOMES (POs)

Postgraduate **M.Sc. Mathematics** is a **2 – year** degree programme with 4 semesters consisting of the following Programme Outcomes (POs). The students will be able to

PO 1	apply knowledge of mathematics to become competent professionals.
PO 2	identify and solve complex scientific problems using mathematical skills
PO 3	apply the mathematical concepts for the analysis and interpretational data
PO 4	enhance and adopt skills required for higher order employment or jobs through activities such as seminars, workshops and conferences.
PO 5	select, design and apply appropriate computational techniques to solve and models physical problems.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

On completion of **M.Sc. Mathematics Programme**, the students are expected to

PSO1	understand the mathematical concepts and applications in various fields.
PSO2	handle the advanced techniques in various fields to solve variety of problems related to real life problems.
PSO3	have necessary skills and expertise in the field of research and developments through seminars and dissertation.
PSO4	learn abstract algebraic structures and topological structures.
PSO5	learn methods of finding optimal solutions of physical and industrial problems.

M.Sc. MATHEMATICS – II YEAR
COURSE STRUCTURE – III SEMESTER

S. No	Subject Code	Subject Title	Hrs./ Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1.	21PMSC31	**Core – 9:** Field Theory and its Extension	6	3	25	75	100	5
2.	21PMSC32	**Core – 10:** Analysis – III	6	3	25	75	100	5
3.	21PMSC33	**Core – 11:** Functional Analysis – I	6	3	25	75	100	5
4.	21PMSC34	**Core – 12:** Statistics – I	6	3	25	75	100	5
5.	21PMSN31	**NME**: 1. Business Statistics	6	3	25	75	100	5
	21PMSN32	2. Mathematics For Competitive Examinations						
		Total	**30**					**25**

COURSE STRUCTURE – IV SEMESTER

S. No.	Sub. Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1.	21PMSC41	**Core – 13:** Complex Analysis	6	3	25	75	100	5
2.	21PMSC42	**Core – 14:** Number Theory	6	3	25	75	100	5
3.	21PMSC43	**Core – 15:** Operations Research	6	3	25	75	100	5
4.	21PMSC44	**Core – 16:** Statistics – II	6	3	25	75	100	5
5.	21PMSE41	**Elective:** 1. Advanced Topology	6	3	25	75	100	5
	21PMSE42	2. Functional Analysis – II						
		Total	**30**					**25**

COURSE STRUCTURE – III SEMESTER

S. No	Subject Code	Subject Title	Hrs./ Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1.	21PMSC31	**Core – 9:** Field Theory and its Extension	6	3	25	75	100	5
2.	21PMSC32	**Core – 10:** Analysis – III	6	3	25	75	100	5
3.	21PMSC33	**Core – 11:** Functional Analysis – I	6	3	25	75	100	5
4.	21PMSC34	**Core – 12:** Statistics – I	6	3	25	75	100	5
5.	21PMSN31	**NME**: 1. Business Statistics	6	3	25	75	100	5
	21PMSN32	2. Mathematics For Competitive Examinations						
		Total	**30**					**25**

CA – Class Assessment (Internal)

SE – Summative Examination

NME – Non –Major Elective

T – Theory

P – Practical

SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

M.Sc. MATHEMATICS – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21PMSC31	FIELD THEORY AND ITS EXTENSION	CORE – 9	6	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

NATURE OF COURSE	Employability	Skill Oriented	Entrepreneurship
	✓	✓	

COURSE DESCRIPTION:

The goal of this course is to help students learn the language of rigorous Mathematics. Students will learn how to read, understand, devise and communicate proofs of mathematical statements. A number of proof techniques (contrapositive, contradiction, and especially induction) will be emphasized. Topics to be discussed include Algebraic extensions. Finite extensions. Degree. Minimal polynomial. Adjoining roots of polynomials. Splitting field. Separable extensions. Fundamental Theorem of Galois Theory. Finite fields and their Galois groups.

COURSE OBJECTIVES:

To develop skills and to acquire knowledge on some of the basic concepts in Extension Fields ,Algebraic Extensions, Splitting fields, Polynomials solvable by radicals. Also we discuss about Roots of Polynomials, Finite Fields and their related concepts, and we introduce Galois theory also.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	discuss Extension Fields and transcendence of e	Upto K5
CO 2	analyze Roots of the Polynomials and Construction by straight edge and compass	Upto K5
CO 3	explain more about roots and Elements of Galois theory	Upto K5
CO 4	provide information on Solvability by radicals, Galois groups over the rationals	Upto K5
CO 5	concentrate on finite fields	Upto K5

K1 – KNOWLEDGE (REMEMBERING), K2 – UNDERSTAND, K3 – APPLY
K4 – ANALYSE, K5 – EVALUATE

FIELD THEORY AND ITS EXTENSION

UNIT – I:

Chapter 5: Sections – 5.1, 5.2

Fields–Extension fields–problems– The Transcendence of e

UNIT – II:

Chapter 5: Sections – 5.3, 5.4

Roots of polynomials, construction with straightedge and compass

UNIT – III:

Chapter 5: Sections – 5.5, 5.6

More about roots, The elements of Galois theory

UNIT – IV:

Chapter 5: Sections – 5.7, 5.8

Solvability by Radicals, Galois Groups over the Radicals

UNIT – V:

Chapter 7: Sections – 7.1

Finite Fields

TEXT BOOK:

I. N. Herstein, *Topics in algebra*, Second Edition, Wiley Eastern Edition, New Delhi.2009.

DIGITAL TOOLS:

https://en.wikipedia.org/wiki/Field_extension
https://www.researchgate.net/publication/322364793_Field_Extension_by_Galois_Theory
https://www.coursera.org/lecture/galois/1–1–field–extensions–examples–G8z9R
https://www.google.com/search?q=Field+extension+problems+and+solutions&sa=X&ved=2ahUKEwjIuOe4r_nzAhVuwTgGHdfECHMQ1QJ6BAgTEAE
https://mdu.ac.in/UpFiles/UpPdfFiles/2021/Jun/4_06–28–2021_11–45–05_Theory of Field Extensions_(20MAT22C1).pdf

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	2	3	2	2
CO2	3	2	3	3	2
CO3	2	3	3	2	3
CO4	3	2	2	3	2
CO5	3	3	2	2	3

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE DESIGNER: Dr. V. RAMAMANI

SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

M.Sc. MATHEMATICS – SYLLABUS

(Under CBCS based on OBE) (with effect from 2021 – 2022)

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21PMSC32	ANALYSIS – III	CORE – 10	6	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

NATURE OF COURSE	Employability	✓	Skill Oriented	✓	Entrepreneurship	

COURSE DESCRIPTION:

Analysis – III in its various versions covers the concepts of Linear transformations and Differentiation, The Contraction principle and Inverse function theorem, Implicit function theorem and Rank theorem. The concepts of Projections, Determinants and Differentiation of integrals. Also the concepts of Lebesgue Outer measure, Measurable sets and functions and regularity and related theorems.

COURSE OBJECTIVES:

To introduce the concepts of functions of severable variables, Lebesgue measure on the real line and Lebesgue Integration.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	discuss the concepts of Linear transformations and contraction principle.	Upto K5
CO 2	study the implicit function, rank theorems and determinants.	Upto K5
CO 3	understand the concept of measure on the real line.	Upto K5
CO 4	study Regularity and measurable functions.	Upto K5
CO 5	study the integration of functions of a real variable.	Upto K5

K1 – KNOWLEDGE (REMEMBERING), K2 – UNDERSTAND, K3 – APPLY
K4 – ANALYSE, K5 – EVALUATE

ANALYSIS – III

UNIT – I:

Linear transformations – Differentiation – The Contraction principle – Inverse function theorem.

UNIT – II:

Implicit function theorem – Rank theorem – Projections – Determinants – Differentiation of integrals.

UNIT – III:

Measure on the real line – Lebesgue Outer measure – Measurable sets.

UNIT – IV:

Regularity – Measurable functions.

UNIT – V:

Integration of functions of a real variable – Integration of Non–negative functions – the general integral(Theorems only) – Integration of series.

TEXT BOOKS:

1. *Principles of Mathematical Analysis* (3rd edition) by Walter Rudin – Mc–Graw–Hill International Editions – 1964.
2. *Measure Theory and Integration* (2nd Edition) by G. deBarra – New Age International Publishers – 1981.

REFERENCE BOOKS:

1. *Real Analysis* – 3rd Edition – H.L.Roydan – Prentice – Hall of India Pvt. Ltd, 1998
2. *Mathematical Analysis* – 2nd Edition – Tom M Apostol – Narosa Publishing House, 1985

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	2	2	2
CO2	3	2	1	3	2
CO3	1	3	3	2	3
CO4	3	2	2	3	2
CO5	3	3	2	2	3

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE DESIGNER: Prof. T. R. DINAKARAN

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21PMSC33	FUNCTIONAL ANALYSIS – I	CORE – 11	6	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

NATURE OF COURSE	Employability	Skill Oriented	Entrepreneurship
	✓	✓	

COURSE DESCRIPTION:

This course is designed to learn various principles of functional analysis

COURSE OBJECTIVES:

1. To gain the knowledge of continuous linear transformations
2. To prove open mapping theorem.
3. To define orthogonal complement.
4. To discuss about orthonormal sets.
5. To introduce self adjoint operators

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	learn about continuous linear transformations.	Upto K3
CO 2	prove open mapping theorems	Upto K3
CO 3	learn the properties of orthogonal complements	Upto K3
CO 4	discuss orthonormal sets and the adjoint of an operator	Upto K3
CO 5	learn self–adjoint operators and projections	Upto K3

K1 – KNOWLEDGE (REMEMBERING), K2 – UNDERSTAND, K3 – APPLY

FUNCTIONAL ANALYSIS – I

UNIT – I:

The definition and some examples – Continuous Linear Transformations – The Hahn Banach theorem.

UNIT – II:

The Open Mapping theorem – The conjugate of an operator.

UNIT – III:

The definition and some simple properties – Orthogonal complements

UNIT – IV:

Orthonormal sets – The adjoint of an operator

UNIT – V:

Self adjoint operators – Normal and unitary operators– Projections.

TEXT BOOK:

Introduction to Topology and modern analysis by G.F. Simmons – Tata Mc Graw Hill 2004.

UNIT – I Chapter 9 sec 46, 47, 48
UNIT – II Chapter 9 sec 50, 51
UNIT – III Chapter 10 sec 52,53
UNIT – IV Chapter 10 sec 54,56
UNIT – V Chapter 10 sec 57, 58, 59

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	3	3	2
CO2	3	3	2	3	2
CO3	3	3	2	3	2
CO4	3	3	3	2	2
CO5	2	2	2	2	2

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE DESIGNER: Prof. G. R. SHYAMALA

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21PMSC34	STATISTICS – I	CORE – 12	6	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

NATURE OF COURSE	Employability	Skill Oriented	Entrepreneurship
	✓	✓	

COURSE DESCRIPTION:

To understand the concept of random variables, Expectations, Chebyshev's Inequality and to identify and apply appropriate probability distributions to solve real life problems. Understand the Sampling theory, various distributions like beta, t, and F distributions to solve statistical problems.

COURSE OBJECTIVES:

To develop the students' ability to deal with numerical and quantitative approach and enable the use of statistical, graphical and algebraic techniques wherever relevant.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	understand the concept of random variables, Expectations of random variables and Chebyshev's Inequality.	**Upto K3**
CO 2	study the joint behavior of two random variables and their distributions and extend it to several random variables.	**Upto K3**
CO 3	identify and apply appropriate probability distributions to solve real life problems.	**Upto K3**
CO 4	understand the Sampling theory, Transformations f variables and use various distributions like beta, t, and F distributions to solve statistical problems.	**Upto K3**
CO 5	apply the concepts of convergence; understand central limit theorem and theorems on limiting distributions.	**Upto K3**

K1 – KNOWLEDGE (REMEMBERING), K2 – UNDERSTAND, K3 – APPLY

STATISTICS – I

UNIT – I:

Introduction, set theory, the probability set function, Conditional probability and independence, random variable of the discrete type, random variable of the continuous type, properties of the distribution function, expectation of a random variable, some special expectations, Chebyshev's inequality.

UNIT – II:

Distribution of two random variables, conditional distributions and expectations, the correlation coefficient, independent random variables, extension to several random variables.

UNIT – III:

The binomial and related distributions, The Poisson distribution, The gamma and Chi–square distributions, the normal distributions, the Bivariate normal distribution.

UNIT – IV:

Sampling theory, transformations of variables of the discrete type, transformations of variables of the continuous type, the Beta, t, F distributions

UNIT – V:

Extension of the change–of–variable technique, the moment generating function technique, the distribution of X and nS^2/σ^2, Expectations of functions of random variables and the Central limit theorem.

TEXT BOOK:

R.V. Hogg and A.T. Craig (2002), *Introduction to Mathematical Statistics*, 5th edition, Pearson Education, Asia.

Unit–1 Chapter–1 Section 1.1 to 1.10
Unit–2 Chapter–2 Section 2.1 to 2.5
Unit–3 Chapter–3 Section 3.1 to 3.5
Unit–4 Chapter–4 Section 4.1 to 4.4
Unit–5 Chapter–4 Section 4.5 to 4.8 and 5.3

Mapping of CO and PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	2	3	2
CO2	2	2	2	2	2
CO3	2	2	3	2	2
CO4	2	2	3	2	2
CO5	2	2	2	2	3

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE DESIGNER: Prof. K. N. GANESH BABU

Passed in the BOS Meeting held on 19/03/2022 Signature of the Chairman

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21PMSN31	BUSINESS STATISTICS	NME – 1	6	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

NATURE OF COURSE	Employability		Skill Oriented	✓	Entrepreneurship	

COURSE DESCRIPTION:

This course is designed to learn Statistics for non–mathematics students.

COURSE OBJECTIVES:

To enable the students to understand the concepts of central tendencies, standard deviation, skewness, correlation and different methods of index numbers and solve problems .

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	understand Mean, Median, Mode and their merits and demerits. .	Upto K5
CO 2	gain knowledge about Skewness, Quartile Deviation, Standard Deviation.	Upto K5
CO 3	understand Coefficient of Variation, Pearson and Bowley coefficient of skewness.	Upto K5
CO 4	understand Correlation and Rank Correlation .	Upto K5
CO 5	gain knowledge about Index Numbers and different methods of finding index numbers.	Upto K5

K1 – KNOWLEDGE (REMEMBERING), K2 – UNDERSTAND, K3 – APPLY
K4 – ANALYSE, K5 – EVALUATE

BUSINESS STATISTICS

UNIT – I:

Measures of Central tendency – Definition – Mean – Median – Mode – Their merits and demerits – Weighted Arithmetic Mean.

UNIT – II:

Measures of dispersion and skewness – Range – Quartile deviation – Standard deviation.

UNIT – III:

Coefficient of variation – Pearson and Bowley coefficient of skewness.

UNIT – IV:

Scatter diagram – Pearson's coefficient of correlation – Rank correlation.

UNIT – V:

Index numbers – Meaning and uses – Methods of construction – Laspeyer's Method, Paasche's Method, Fisher's ideal index.

TEXT BOOK:

Elements of Statistical Methods by S.P. GUPTA, Publishers: Sultan Chand and sons, 16th edition (2005).

REFERENCE BOOK:

Fundamentals of Mathematical Statistics by S. C. Gupta and V. K. Kapoor.
Publishers: Sultan Chand and sons, 11th edition (2006).
UNIT – I: Chapter 7, Pages 158 – 198
UNIT – II & UNIT III: Chapters 8 and 9, pages 249 – 277, 315 – 326
UNIT – IV: Chapter 10, pages 371 – 425
UNIT – V: Chapter 12, pages 460 – 475

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	2	1	2	2
CO2	2	2	2	1	1
CO3	2	2	1	2	1
CO4	2	2	1	2	3
CO5	1	2	2	3	2

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE DESIGNER: Prof. C. K. SIVAKUMAR

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21PMSN32	MATHEMATICS FOR COMPETITIVE EXAMINATIONS	NME – 2	6	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

NATURE OF COURSE	Employability	Skill Oriented	Entrepreneurship
	✓	✓	

COURSE DESCRIPTION:

This course is designed to enhance the problem solving skills in the areas of Quantitative Aptitude which will enable the students to achieve in campus placements and competitive examinations. Also this is used to improve the logical thinking and mathematical ability of the students

COURSE OBJECTIVES:

1. To apply the knowledge of L.C.M and H.C.F to context based questions.
2. To understand the concepts of averages, word problems that deal with the ages of people currently, in the past or in the future.
3. To calculate profit and loss, to work with simple ratios and percentage.
4. To solve problems involving investments, Simple Interest and Compound Interest formula.
5. Understand the relationship between time, speed, distance, work through a variety of activities.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	find L.C.M & H.C.F, convert between decimals & fractions and applying BODMAS rule.	Upto K5
CO 2	solve the age based problems and average based problems.	Upto K5
CO 3	analyse relation between cost price & selling price, gain or loss.	Upto K5
CO 4	analyse problems on interest, amount, principal & rate of interest, difference between Simple Interest & Compound Interest.	Upto K5
CO 5	solve problems related to time, work and distance .	Upto K5

K1 – KNOWLEDGE (REMEMBERING), K2 – UNDERSTAND, K3 – APPLY
K4 – ANALYSE, K5 – EVALUATE

MATHEMATICS FOR COMPETITIVE EXAMINATIONS

UNIT – I:

H.C.F and L.C.M of numbers – Decimal Fractions – Simplifications (examples only)

UNIT – II:

Averages – Problems on numbers –Problems on Ages. (examples only)

UNIT – III:

Percentage – Profit or Loss – Ratio and Proportion (examples only)

UNIT – IV:

Simple Interest – Compound Interest – Allegation of Mixture (examples only)

UNIT – V:

Calendar – Odd one out & Series – Time & Work – Time & Distance. (examples only)

TEXT BOOK:

Quantitative Aptitude by R. S Agarwal, S.Chand & Co, Publications, Reprint 2009.

DIGITAL TOOLS:

https://youtu.be/57TrYW72Tgg

https://youtu.be/_cW7_BUDYcw

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2			1
CO2	3	2	1		2
CO3	3	1	2		2
CO4	1	3	2	1	2
CO5	1	3	2	2	1

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE DESIGNER: Dr. S. K. KANCHANA

COURSE STRUCTURE – IV SEMESTER

S. No.	Sub. Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1.	21PMSC41	**Core – 13:** Complex Analysis	6	3	25	75	100	5
2.	21PMSC42	**Core – 14:** Number Theory	6	3	25	75	100	5
3.	21PMSC43	**Core – 15:** Operations Research	6	3	25	75	100	5
4.	21PMSC44	**Core – 16:** Statistics – II	6	3	25	75	100	5
5.	21PMSE41	**Elective:** 1. Advanced Topology	6	3	25	75	100	5
	21PMSE42	2. Functional Analysis – II						
		Total	**30**					**25**

CA – Class Assessment (Internal)

SE – Summative Examination

NME – Non –Major Elective

T – Theory

P – Practical

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21PMSC41	COMPLEX ANALYSIS	CORE – 13	6	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	25	75	100

NATURE OF COURSE	Employability	Skill Oriented	Entrepreneurship
	✓	✓	

COURSE DESCRIPTION:

Topics to be discussed include the algebra of complex numbers – the geometrical representation of complex numbers. Introduction to the concept of analytic function – Elementary theory of power series – The exponential and trigonometric series – Conformality – linear transformations – elementary conformal mappings – Fundamental theorems – Cauchy's integral formula – local properties of analytic functions. The general form of Cauchy's theorem – the calculus of residues.

COURSE OBJECTIVES:

To discuss main concepts of complex analysis, explain the definition and concepts of analytic function and power series, define the conformality concept and elementary conformal mappings, to prove fundamental theorems and Cauchy's integral formula, to find the residues and to explain general from of Cauchy's theorem.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	calculate the absolute values of the complex numbers and Inequalities and Identities.	UptoK5
CO 2	explain the concepts of power series and trigonometric series and analytic function.	Upto K5
CO 3	identify the various types of transformations and to explain the conformality concepts	UptoK5
CO 4	prove the cauchy's integral formula and to do the problems based on the formula.	UptoK5
CO 5	explain the general form of cauchy's theorem and to find residues.	Upto K5

K1 – KNOWLEDGE (REMEMBERING), K2 – UNDERSTAND, K3 – APPLY
K4 – ANALYSE, K5 – EVALUATE

COMPLEX ANALYSIS

UNIT – I:

The algebra of complex numbers – the geometrical representation of complex numbers.

UNIT – II:

Introduction to the concept of analytic function – Elementary theory of power series – The exponential and trigonometric series.

UNIT – III:

Conformality – liner transformations – elementary conformal mappings.

UNIT – IV:

Fundamental theorems – Cauchy's integral formula – local properties of analytic functions.

UNIT – V:

The general form of Cauchy's theorem – the Calculus of residues.

TEXT BOOK:

Complex Analysis by L. V. Ahlfors III edition Megraw Hill, ISE.1981.

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	2	2	2	
CO2	3	2	2	3	2	
CO3	2	3	3	2	3	
CO4	3	2	2	3	2	
CO5	2	3	2	2	3	

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE DESIGNER: Prof. M. N. SAROJA

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21PMSC42	NUMBER THEORY	CORE – 14	6	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	25	75	100

NATURE OF COURSE	Employability	✓	Skill Oriented	✓	Entrepreneurship	

COURSE DESCRIPTION:

This course is designed to make the students understand the concepts of Number Theory.

COURSE OBJECTIVES:

1) To define various types of numbers, GCD and arithmetic functions.
2) To explain various functions like Liouville's function, divisor function.
3) To make the students acquire knowledge about congruence, residue and the related theorems like Euler Fermat, Lagrange's theorem.
4) To help the students study the Chinese remainder theorem and its applications, quadratic residue, Legender symbol.
5) To discuss on quadratic reciprocity law, Jacobi symbol, Guass Lemma.
6) To enable the students acquire the knowledge of number theory.
7) To enable the students understand the concepts of prime numbers, various functions like Mobius, Euler Totient, arithmetic Liouville, Bell Series etc., Congruence, Jacobi symbols, quadratic reciprocity law.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	apply Euclidean algorithm, to find gcd of two or more numbers.	**Upto K3**
CO 2	find Bell series, power series	**Upto K3**
CO 3	employ congruence and Lagrange's theorem	**Upto K3**
CO 4	employ simultaneous linear congruence, quadratic residue and to evaluate $(-1\|p)$ and $(2\|p)$	**Upto K3**
CO 5	apply reciprocity laws and Jacobi symbols	**Upto K3**

K1 – KNOWLEDGE (REMEMBERING), K2 – UNDERSTAND, K3 – APPLY

NUMBER THEORY

UNIT – I:

Introduction – Divisibility – G.C.D , Prime number – The fundamental theorem of arithmetic – The series of reciprocals of the prime – The Euclidean algorithm – G.C.D of more than 2 numbers – The Mobius function – Euler Totient, connecting relation Product formula – The Dirichlet product of arithmetic function, Dirichlet inverse and the Mobius inversion formula.

UNIT – II:

The Mangold function, the multiplicative function and Dirichlet multiplication, the inverse of a completely multiplicative functions. Liouville's function – The divisor function, Generalized convolutions, formula power series, The bell series of an arithmetic function, bell series and Dirichlet multiplication, derivatives of arithmetic functions, the Selbergidentity – Big on notation – Euler's summation formula – some elementary asymptotic formula.

UNIT – III:

Definition and basic properties of congruence – residue classes and complete residue system – linear congruence reduced residues system and Euler Fermat's theorem – polynomial congruence modulo p – Lagrange's theorem – application of Lagrange's theorem.

UNIT – IV:

Simultaneous linear congruence – Chinese remainder theorem, Application of Chinese remainder theorem – polynomial congruence with, prime power moduli – The principal of cross classification – decomposition property of reduced residue system, quadratic residue, Legender's symbols and its properties – Evaluation of (–1/p) and (2/p) – Gauss lemma.

UNIT – V:

The quadratic reciprocity law, application of reciprocity laws – Jacobi symbol, gauss sums and quadratic reciprocity law.

TEXT BOOK

Introduction to Analytic Number Theory – Tom M. Apostol (III Edition)
(Narosa Publications 1991).

Chapters – 1, 2, 3, 5 and 9.

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3				
CO2		2			
CO3			3		
CO4				3	
CO5					3

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE DESIGNER: Prof. N. H. SARAVANAN

Passed in the BOS Meeting held on 19/03/2022 **Signature of the Chairman**

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21PMSC43	OPERATIONS RESEARCH	CORE – 15	6	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	25	75	100

NATURE OF COURSE	Employability	Skill Oriented	Entrepreneurship
	✓	✓	

COURSE DESCRIPTION:

This course is designed to make the students understand the concepts of PERT, CPM and Non LPP problems.

COURSE OBJECTIVES:

Formulating the shortest route and determining optimal solution, Constructing the project network, Analysing pure birth model, pure death model and poisson queuing model, Determining maxima and minima points for unconstrained and constrained functions, Solving non LPP using various methods.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	find shortest route using various algorithms	Upto K5
CO 2	find critical path and determining floats	Upto K5
CO 3	develop mathematical and modeling skills required to evaluate queuing systems.	Upto K5
CO 4	use Jacobian and Lagrangean methods for problems with equality constraints, KKT conditions for problems with inequality constraints.	Upto K5
CO 5	solve unconstrained problems using Direct search method and Gradient method..	Upto K5

K1 – KNOWLEDGE (REMEMBERING), K2 – UNDERSTAND, K3 – APPLY
K4 – ANALYSE, K5 – EVALUATE

OPERATIONS RESEARCH

UNIT – I:

Scope of Network applications – Definitions – Minimal spanning tree algorithm – Shortest route problems using cyclic and acyclic algorithms, Dijkstra method only – Maximal flow model (Algorithm only).

UNIT – II:

CPM and PERT Network representation – critical path computations – Determination of floats – Total float and free float – PERT Networks.

UNIT – III:

Why study queues? – Elements of queuing models – Role of exponential distribution – Pure birth and death models – Generalised Poisson queuing models – steady state measures of performance – Specialized Poisson queue – (M / M / 1) :
(GD / ∞ / ∞) – (M / M / 1) : (GD / N / ∞) .

UNIT – IV:

Classical optimization theory – Unconstrained problems – Necessary and sufficient conditions – Newton Raphson method – Constrained problems – Equality constraints by Jacobian method – Lagrangean method and Kharush Kuhn Tucker (KKT) conditions. (Simple problems only)

UNIT – V:

Non – linear programming – Unconstrained algorithms – Direct search method – Gradient method – Constrained algorithm – Geometric programming – Quadratic programming model.

TEXT BOOK:

An Introduction to Operations Research,– 6th edition by H. A. TAHA.

UNIT – I : Chapter 6– Section 6.1 to 6.4, 6.4.2, 6.5,6.5.2.
UNIT – II : Chapter 6 – Section 6.7, 6.7.1, 6.7.2 &6.7.3.
UNIT – III : Chapter 17 – Section 17.1 to17.3, 17.3.1, 17.4, 17.4.1, 17.4.2, 17.5, 17.6, 17.6.1, 17.6.2.
UNIT – IV : Chapter 20 – Section 20.1, 20.2, 20.2.1, 20.2.2, 20.3, 20.3.1, example problems20.3.1 & 20.3.2 only. Lagrangean method– eg. 20.3.4 & 20.3.5 only. KKT conditions eg. 20.3.7.
UNIT – V : Chapter 21 – Section 21.1, 21.1.1, 21.1.2, 21.2, 21.2.2, 21.2.3. (simple problems only)

DIGITAL TOOLS:

https://en.m.wikipedia.org/wiki/Program_evaluation_and_review_technique
https://en.m.wikipedia.org/wiki/Birth%E2%80%93death_process

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	2	1	2
CO2	3	3	1	2	3
CO3	2	2	2	1	2
CO4	1	3	3	1	3
CO5	1	3	2	2	1

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE DESIGNER: Dr. S. K. KANCHANA

Passed in the BOS Meeting held on 19/03/2022 **Signature of the Chairman**

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21PMSC44	STATISTICS – II	CORE – 16	6	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	25	75	100

NATURE OF COURSE	Employability	Skill Oriented	Entrepreneurship
	✓	✓	

COURSE DESCRIPTION:

This course is designed for the students to learn Statistics at an advanced level and to solve problems in this course.

COURSE OBJECTIVES:

To enable the students to understand the concepts of estimators, confidence intervals, sufficient statistic, test of equality of means and to gain knowledge about Fisher Information, Rao–Cramer Inequality, Likelihood ratio tests and Sequential Probability Ratio Tests, Distribution of Quadratic Forms and to apply the knowledge gained in solving problems

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	understand the concept of point estimation, confidence intervals and applies chi–squared tests to test the hypotheses.	**Upto K5**
CO 2	gain knowledge about sufficient statistic, completeness and unique	**Upto K5**
CO 3	understand Fisher Information and Rao–Cramer Inequality	**Upto K5**
CO 4	analyze Best Tests, Likelihood Ratio Tests and Sequential Probability Ratio Tests and applies to statistical hypotheses.	**Upto K5**
CO 5	gain knowledge about distribution of quadratic forms, test of equality of means and understands the related concepts	**Upto K5**

K1 – KNOWLEDGE (REMEMBERING), K2 – UNDERSTAND, K3 – APPLY
K4 – ANALYSE, K5 – EVALUATE

STATISTICS – II

UNIT – I:

Point estimation, confidence intervals for means, confidence intervals for Differences of means, Tests of Statistical Hypotheses, Chi–squared tests.

UNIT – II:

Measures of quality of estimators, A sufficient statistic for a parameter, Properties of a sufficient statistic, completeness and uniqueness. The exponential class of Probability density functions. Functions of a parameter, the case of several parameters.

UNIT –III:

Fisher information and the Rao–Cramer inequality, Limiting Distribution of maximum likelihood estimators.

UNIT – IV:

Certain best tests, uniformly most powerful tests, Likelihood ratio tests, the sequential probability ratio test.

UNIT – V:

Distributions of certain quadratic Forms, A test of the equality of several means, Noncentral chi–square and non central F.

TEXT BOOK:

Introduction to Mathematical Statistics, V Edition, by R.V.Hogg and A.T.Craig, Pearson Education, Asia, 2002.

REFERENCE BOOK:

Elements of Statistical Methods by S.P.Gupta, Publishers : Sultan Chand and Sons, 16th edition (2005)

UNIT – I : (Relevant sections in chapter 6).
UNIT – II : (Relevant sections in chapter 7)
UNIT – III : (Relevant sections in chapter 8)
UNIT – IV : (Relevant sections in chapter 9)
UNIT – V : (Relevant sections in chapter 10)

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	1	3	3
CO2	3	3	2	2	1
CO3	2	3	3	1	2
CO4	2	3	3	3	1
CO5	3	3	2	2	3

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE DESIGNER: Prof. C. K. SIVAKUMAR

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21PMSE41	ADVANCED TOPOLOGY	ELECTIVE	6	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	25	75	100

NATURE OF COURSE	Employability	Skill Oriented	Entrepreneurship
	✓	✓	

COURSE DESCRIPTION:

This Course gives a solid background for studies in topology, and develop geometrical ideas and algebraic methods. The course supports studies in related subjects in algebra and geometry. Topics that can be discussed include, The Tychnoff Theorem, Complete Metric Spaces, The Smirnov Metrization Theorem , and many others.

COURSE OBJECTIVE:

To enable the students understand the advance concepts in Topology

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO 1	discuss The Tychnoff Theorem – The Stone – Cech Compactification – Local Finiteness	Upto K5
CO 2	analyze The Nagata –Smirnov Theorem –Para Compactness –The Smirnov Metrization Theorem	Upto K5
CO 3	explain Complete Metric Spaces – A Space Filling Curve	Upto K5
CO 4	provide information on Compactness in Metric Spaces – Pointwise and Compact Convergences –Ascoli's Theorem	Upto K5
CO 5	concentrate on Baire Spaces – A nowhere differentiable function	Upto K5

K1 – KNOWLEDGE (REMEMBERING), K2 – UNDERSTAND, K3 – APPLY
K4 – ANALYSE, K5 – EVALUATE

ADVANCED TOPOLOGY

UNIT I:

The Tychnoff Theorem – The Stone – Cech Compactification – Local Finiteness

UNIT II:

The Nagata – Smirnov Theorem – Para Compactness – The Smirnov Metrization Theorem

UNIT III:

Complete Metric Spaces – A Space Filling Curve

UNIT IV:

Compactness in Metric Spaces – Pointwise and Compact Convergences – Ascoli's Theorem

UNIT V:

Baire Spaces – A nowhere differentiable function

TEXT BOOK:
Topology by J. R. Munkres (second edition) – June 2002

Unit I :	**Chapter 5:**	**Sections 6, 37, 38 & 39**
Unit II:	**Chapter 6:**	**Sections 40, 41, 42**
Unit III:	**Chapter 7:**	**Sections 43, 44**
Unit IV:	**Chapter 7:**	**Sections 45, 46, 47**
Unit V:	**Chapter 8:**	**Sections 48, 49**

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	3	2	2
CO2	3	2	3	2	2
CO3	2	3	3	2	3
CO4	3	2	2	3	2
CO5	3	3	3	2	2

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE DESIGNER: Dr. V. RAMAMANI

Passed in the BOS Meeting held on 19/03/2022 **Signature of the Chairman**

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21PMSE42	FUNCTIONAL ANALYSIS – II	ELECTIVE	6	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	25	75	100

NATURE OF COURSE	Employability	✓	Skill Oriented	✓	Entrepreneurship	

COURSE DESCRIPTION:

This course is designed to explain various concepts, Basic definitions and Applications in Functional Analysis.

COURSE OBJECTIVES:

To make the students understand the advance concepts in functional analysis.

COURSE OUTCOMES (COs):

After completing this course the students are able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	understand the basic Knowledge of Matrices, Determinants, Spectrum of an operators, Simple Theorem	Upto K3
CO 2	apply the definition of Regular and Singular elements and Basic Theorems	Upto K3
CO 3	apply the formula for spectral radius and simple theorem	Upto K3
CO 4	discuss Gelfand mapping concepts and applications of various theorems	Upto K3
CO 5	apply the basic definitions and study the Gelfand Neuman theorem	Upto K3

K1 – KNOWLEDGE (REMEMBERING), K2 – UNDERSTAND, K3 – APPLY

FUNCTIONAL ANALYSIS – II

UNIT – I:

Matrices–Determinants and Spectrum of an operator–The Spectral Theorem.

UNIT – II:

The definition and some examples–Regular and Singular Elements–Topological divisors Zero.

UNIT – III:

The Spectrum–The Formula for the Spectral Radius.

UNIT – IV:

The Gelfand mapping – Applications of the formula
$r(x)=\lim \| X^n \|^{1/n}$.

UNIT – V:

Involution in Banach Algebras – The Gelfand Neuman Theorem**.**

TEXT BOOK:

Introduction to Topology and Modern Analysis by G.F. Simmons Tata Mc Graw Hill–2004

UNIT–1	**Chapter–11**	**Sections 60,61,62**
UNIT–2	**Chapter–12**	**Sections 64,65,66**
UNIT–3	**Chapter–12**	**Sections 67,68**
UNIT–4	**Chapter–13**	**Sections 70,71**
UNIT–5	**Chapter–13**	**Sections 72,73**

Mapping of CO and PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**2**	**2**	**2**	**2**	**3**
CO2	**2**	**2**	**3**	**2**	**2**
CO3	**2**	**2**	**2**	**3**	**2**
CO4	**3**	**2**	**2**	**2**	**2**
CO5	**2**	**2**	**3**	**2**	**3**

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE DESIGNER: Prof. K. N. GANESH BABU