

Dr. N.G.P.ARTS AND SCIENCE COLLEGE (Autonomous)

REGULATIONS 2024-25 for Post Graduate Programme (Outcome Based Education model with Choice Based Credit System)

M.Sc. Degree

(For the students admitted during the academic year 2024-25)

Programme: M.Sc. Mathematics

Eligibility:

A candidate who has passed the Degree Examination in B.Sc. (Mathematics) or B.Sc. (Mathematics with Computer Applications) of Bharathiar University and as per the norms set by the Government of Tamil Nadu or an Examination accepted as equivalent thereto by the Academic Council, subject to such conditions as may be prescribed thereto are permitted to appear and qualify for the **Master of Science in Mathematics** Degree Examination of this College after a course of study of two academic years

Programme Educational Objectives:

The Curriculum is designed to attain the following learning goals which students shall accomplish by the time of their graduation:

1. To meet the demand for well trained Post Graduates in Mathematics with academic Excellence.
2. To demonstrate an understanding of the theoretical concepts and axiomatic underpinnings of Mathematics and an ability to construct proofs at the appropriate level.
3. To demonstrate competency in Mathematical modeling of complex phenomena, problem solving and decision making.
4. To demonstrate a level of proficiency in quantitative and computing skills sufficient to meet the growing demands of society upon modern education.

25)



PROGRAMME OUTCOMES:

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

PO Number	PO Statement
P01	Students will have knowledge, understanding and Mathematical thinking of the basic and advanced concepts, techniques from different topics
P02	They have a fundamental and advanced understanding of at least one Mathematical topic of their choice and able to solve problem related to the topic
P03	They can be able to communicate clearly in writing and orally the detailed technical arguments of complex Mathematical concepts
P04	The students develop problem solving skill and apply them independently to problems in pure and applied Mathematics
P05	They can develop the knowledge of formulating, analyzing and problem solving in core areas of the Mathematics including Analysis, Algebra and Statistics



PG Credit Distribution:

Part	Subjects	No. of Papers	Credit	Semester No.
III	Core	16-18	13 x 04 = 52 02 x 03 = 06 01 x 05 = 05	I - IV
	Elective	04	04 x 04 = 16	I - IV
	EDC	01	01 x 03 = 03	II
	Industrial Training	01	01 x 02 = 02	III
	Project Work	01	01 x 08 = 08	IV
TOTAL CREDITS			92	-



PG CURRICULUM

M.Sc. MATHEMATICS – AY 24-25

Course Code	Course Category	Course Name	L	T	P	Instruction Hours		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
						First Semester						
24MTP1CA	Core - I	Algebra	4	1	-	5	60	3	25	75	100	4
24MTP1CB	Core - II	Advanced Analysis	4	2	-	6	72	3	25	75	100	4
24MTP1CC	Core - III	Ordinary Differential Equations	4	1	-	5	60	3	25	75	100	4
24MTP1CD	Core - IV	Operations Research	4	1	-	5	60	3	25	75	100	4
24MTP1CE	Core - V	Advanced Statistics	3	2	-	5	60	3	25	75	100	3
24MTP1DA	DSE -I	Numerical Analysis	4	-	-	4	48	3	25	75	100	4
24MTP1DB		Commutative Algebra				4	48					
24MTP1DC		Mathematical Modeling				4	48					
Total						30	360				600	23



Course Code	Course Category	Course Name	L	T	P	Instruction Hours		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
Second Semester												
24MTP2CA	Core - VI	Complex Analysis	4	1	-	5	60	3	25	75	100	4
24MTP2CB	Core - VII	Topology	4	1	-	5	60	3	25	75	100	4
24MTP2CC	Core - VIII	Partial Differential Equations	4	1	-	5	60	3	25	75	100	4
24MTP2CM	Core -IX	Computational Mathematics	3	-	4	7	84	3	25	75	100	5
24DAP2EB	EDC	Foundations of Data Analytics	3	1	-	4	48	3	25	75	100	3
24MTP2DA	DSE -II	Wavelet Analysis	4	-	-	4	48	3	25	75	100	4
24MTP2DB		Information and Coding Theory				4	48					
24MTP2DC		Mathematical Finance				4	48					
Total						30	360				600	24




Course Code	Course Category	Course Name	L	T	P	Instruction Hours		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
Third Semester												
24MTP3CA	Core - X	Functional Analysis	4	1	-	5	60	3	25	75	100	4
24MTP3CB	Core - XI	Classical Mechanics	3	2	-	5	60	3	25	75	100	3
24MTP3CC	Core - XII	Stochastic Differential Equations	4	2	-	6	72	3	25	75	100	4
24MTP3CD	Core -XIII	Advanced Graph Theory	4	1	-	5	60	3	25	75	100	4
24MTP3CE	Core - XIV	Fluid Dynamics	4	1	-	5	60	3	25	75	100	4
24MTP3CT	IT	Industrial Training	-	-	-	-	-	-	40	60	100	2
24MTP3DA	DSE -III	Finite Element Theory	4	-	-	4	48	3	25	75	100	4
24MTP3DB		Algebraic Number Theory				4	48					
24MTP3DC		Actuarial Mathematics				4	48					
Total						30	360				700	25



Course Code	Course Category	Course Name	L	T	P	Instruction Hours		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
						Fourth Semester						
24MTP4CA	Core - XV	Mathematical Methods	4	1	-	5	60	3	25	75	100	4
24MTP4CB	Core - XVI	Distribution Theory	4	1	-	5	60	3	25	75	100	4
24MTP4CV	Core - XVII	Project	-	-	16	16	192	3	80	120	200	8
24MTP4DA	DSE -IV	Boundary Layer Theory	4	-	-	4	48	3	25	75	100	4
24MTP4DB		Lie Algebra				4	48					
24MTP4DC		Mathematical Ecology				4	48					
Total						30	360				500	20
												92


 BoS Chairman/HoD
 Department of Mathematics
 Dr. N. G. P. Arts and Science College
 Coimbatore - 641 048

 Dr.N.G.P Arts and Science College		
APPROVED		
BoS- 17 th 04.04.24	AC - 17 th 17.04.24	GB -



DISCIPLINE SPECIFIC ELECTIVE

Students shall select the desired course of their choice in the listed elective course during Semesters I to IV

Semester I (Elective I)

List of Elective Courses

S. No.	Course Code	Name of the Course
1.	24MTP1DA	Numerical Analysis
2.	24MTP1DB	Commutative Algebra
3.	24MTP1DC	Mathematical Modeling

Semester II (Elective II)

List of Elective Courses

S. No.	Course Code	Name of the Course
1.	24MTP2DA	Wavelet Analysis
2.	24MTP2DB	Information and Coding Theory
3.	24MTP2DC	Mathematical Finance

Semester III (Elective III)

List of Elective Courses

S. No.	Course Code	Name of the Course
1.	24MTP3DA	Finite Element Theory
2.	24MTP3DB	Algebraic Number Theory
3.	24MTP3DC	Actuarial Mathematics

Semester IV (Elective IV)

List of Elective Courses

S. No.	Course Code	Name of the Course
1.	24MTP4DA	Boundary Layer Theory
2.	24MTP4DB	Lie Algebra
3.	24MTP4DC	Mathematical Ecology

EXTRA CREDIT COURSES

Self-study paper offered by the Mathematics Department

S. No.	Course Code	Course Title
1.	24MTPSSA	Research Methodology, IPR and Entrepreneurship
2.	24MTPSSB	Mathematics of Bioinformatics



Semester - I
CORE - I : ALGEBRA

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24MTP1CA	ALGEBRA	CORE	48	12	-	4

Preamble	This course has been designed for students to learn and understand <ul style="list-style-type: none"> • elementary group theory and how to solve contemporary problems • elementary principles on certain algebraic structures • Sylow's theorems that describe the structure of certain finite groups 	
Prerequisite	Knowledge on understanding of numbers, ratios, proportions, the order of operations, equality, algebraic symbolism, algebraic equations and functions.	
Course Outcomes (COs)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	define the orbits and p-groups	K1
CO2	apply Sylow theory in the factorization of polynomials	K2
CO3	analyze the structure of finite fields	K3
CO4	explain the applications of automorphisms and isomorphism	K5
CO5	explain the applications of Galois theory	K5

Mapping with Program Outcomes:					
COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓		✓	✓	✓
CO2				✓	✓
CO3		✓		✓	
CO4		✓	✓		
CO5	✓	✓	✓		✓



Syllabus

Unit	Content	Hours	E-Contents / Resources
I	Direct Products: External direct products - internal direct products. group action on a set - fixed sets and isotropy subgroups – orbits - application on G-sets to counting: p-groups - Sylow theorems.	12	Text Book
II	Applications of the Sylow Theory and Rings of Polynomials: Applications to p-groups and the class equation - further applications. rings of polynomials: polynomials in an indeterminate - evaluation homomorphisms - division algorithm in $F[x]$ - irreducible polynomials – ideal structure in $F[x]$ - uniqueness of factorization in $F[x]$.	11	Reference Book
III	Introduction to Extension Fields: Extension fields - algebraic and transcendental elements - irreducible polynomial for α over F - simple extensions - Algebraic extensions: finite extensions – algebraically closed and algebraic closures.	13	Text Book
IV	Automorphisms of Fields: Basic isomorphism of algebraic field theory - automorphisms and fixed fields - Frobenius automorphism - isomorphism extension theorem: extension theorem - splitting fields	14	Text Book
V	Separable Extensions and Galois Theory: Multiplicity of zeros of a polynomial - separable extensions- perfect fields - normal extensions - the main theorem - Galois group over finite fields - illustrations of Galois theory: symmetric functions.	10	Text Book & You Tube Videos
	Total	60	



Text Book	1.	Fraleigh J.B, 2003,"A First Course in Abstract Algebra", Third Edition, Narosa Publishing House, New Delhi.
Reference Books	1.	Herstein I.N, 2007, "Topics in Algebra", Second Edition, Narosa Publishing House, New Delhi.
	2.	Artin M, 1991, "Algebra", Prentice-Hall of India, New Delhi.
	3.	Fraleigh J.B, 2014,"A First Course in Abstract Algebra", Seventh Edition, Pearson Education Limited, London.
	4.	Anderson M and Feil T, 2014, "A First Course in Abstract Algebra Rings, Groups, and Fields", Third Edition, Chapman and Hall/CRC, London.

Journal and Magazines	https://www.sciencedirect.com/journal/journal-of-algebra
E-Resources and Website	https://www.uou.ac.in/lecturenotes/science/MSCMT-19/unit%201.pdf

Learning Method	Chalk and Talk/Assignment/Seminar
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Focus of the Course	Skill Development/Employability
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Semester - I
CORE – II : ADVANCED ANALYSIS

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24MTP1CB	ADVANCED ANALYSIS	CORE	48	24	-	4

Preamble	This course has been designed for students to learn and understand <ul style="list-style-type: none"> • the concept of Riemann Stieltjes integral • the inverse and Implicit function theorems • about the concept of Lebesgue measure and Lebesgue integral 	
Prerequisite	Knowledge on basic Mathematics	
Course Outcomes (COs)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	identify the Riemann Stieltjes Integral of various real functions	K1
CO2	describe the properties of various forms of Uniform convergence and continuity	K2
CO3	discuss the concept behind contraction principle of a function	K3
CO4	demonstrate the Lebesgue measure and its properties	K4
CO5	apply the properties of The Lebesgue integral to the bounded functions	K5

Mapping with Program Outcomes:					
COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓		✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓		✓	
CO5	✓	✓		✓	



Syllabus

Unit	Content	Hours	E-Contents / Resources
I	Riemann Stieltjes Integral: Definition and existence of the integral – properties of the integral – integration and differentiation – integration of vector valued function – rectifiable curves.	15	Text Book 1
II	Sequences and Series of Functions: Uniform convergence and continuity – uniform convergence and integration - uniform convergence and differentiation – equicontinuous families of functions – the Stone Weierstrass theorem.	14	Text Book 1
III	Functions of Several Variables: Linear transformation – contraction principle – inverse function theorem – implicit function theorem.	14	Text Book 1
IV	Lebesgue Measure: Outer measure – measurable sets and Lebesgue measure – measurable functions – Littlewood's theorem.	14	Text Book 2
V	Lebesgue Integral: The Lebesgue integral of bounded functions over a set of finite measure – integral of a non – negative function – general Lebesgue integral.	15	Text Book 2
	Total	72	



Text Book	1.	Walter Rudin, 1976, "Principles of Mathematical Analysis", McGraw Hill, New York. [Unit I & II : Chapter 6 & 7. Unit III: Chapter 9 (Pages 204 to 227)]
	2.	Roydon H.L., 1988, "Real Analysis", Third Edition, Macmillan, New York. [Unit IV: Chapter 3 (except Section – 4) , Unit V: Chapter 4 (Sections 2, 3 & 4 only)]
Reference Books	1.	Bartle R. G., 1976, "Elements of Real Analysis", Second Edition, John Wily and Sons, New York.
	2.	Mainak Mukherjee, 2015, "A course in Real Analysis", Narosa publishing house, New Delhi.
	3.	Tom M Apostol, 2002, "Mathematical Analysis", Narosa Publishing House Pvt Ltd., Second Edition, New Delhi.
	4.	Somasundaram D and Choudhary B, 2015, "A first course in Mathematical Analysis", Narosa Publishing House, New Delhi.

Journal and Magazines	https://www.worldscientific.com/worldscinet/bms
E-Resources and Website	https://mathcs.org/analysis/reals/integ/measures.html https://archive.nptel.ac.in/courses/111/106/111106153/ https://onlinecourses.nptel.ac.in/noc22_ma43/preview

Learning Method	Chalk and Talk/Assignment/Seminar
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Focus of the Course	Skill Development/Employability
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Semester - I
CORE - III : ORDINARY DIFFERENTIAL EQUATIONS

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24MTP1CC	ORDINARY DIFFERENTIAL EQUATIONS	CORE	48	12	-	4

Preamble	This course has been designed for students to learn and understand <ul style="list-style-type: none"> • the first order and second order ordinary differential equations • the usages of power series method to solve differential equations • the homogenous and non-homogenous order ordinary differential equations 	
Prerequisite	Knowledge on Ordinary Differential Equations and its applications	
Course Outcomes (COs)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	define Legendre and Bessel equations	K2
CO2	describe the concept of fundamental matrix of system	K3
CO3	apply Lipschitz condition in mathematical problems	K3
CO4	inspect the existence and uniqueness of solutions	K4
CO5	analyze the solution using oscillatory theorems	K5

Mapping with Program Outcomes:					
COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓		✓	✓
CO2		✓	✓		
CO3	✓	✓		✓	
CO4			✓		
CO5	✓	✓		✓	✓



Syllabus

Unit	Content	Hours	E-Contents / Resources
	Solutions in power series:		
I	Introduction - second order linear equations with ordinary points - Legendre equation and Legendre polynomials - second order equation with regular singular point - properties of Bessel functions	12	Text Book
	System of Linear differential equations:		
II	System of first order equations - model for ARMS competition between two nations - existence and uniqueness theorem - fundamental matrix.	11	Text Book & NPTEL
	Non-homogeneous linear system:		
III	Non-homogeneous linear systems - linear system with constant coefficients - linear systems with periodic coefficients.	10	Text Book
	Existence and uniqueness of solutions:		
IV	Preliminaries - successive approximations - Picard's theorem - some examples - continuation and dependence on initial conditions - existence of solutions in the large - existence and uniqueness of solutions of system.	13	Reference Book
	Oscillations of second order equations:		
V	Fundamental results - Sturm's comparison theorem - elementary linear oscillations - comparison theorem of Hille - Winter - oscillations of $x'' + a(t)x = 0$	14	Text Book & You Tube Videos
	Total	60	



Text Book	1.	Deo S.G, Lakshmikandham V and Raghavendra V, 2007, "Text book of Ordinary Differential Equations", Second Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi.
Reference Books	1.	Reid W.T, 1971, "Ordinary Differential Equations", John Wiley & sons, New York.
	2.	Coddington E.A and Levinson N, 2006, "Theory of Ordinary Differential Equations", Tata McGraw-Hill Publishing Company Limited, New Delhi.
	3.	Tesch I.G., 2012, "Ordinary Differential Equations and Dynamics Systems", American Mathematical Society, Providence.
	4.	Coddington E A, 2006, "An introduction to Ordinary Differential Equations", PHI Private Limited, New Delhi.

Journal and Magazines	https://www.worldscientific.com/worldscinet/bms
E-Resources and Website	https://www.sciencedirect.com/topics/mathematics/system-of-ordinary-differential-equations

Learning Method	Chalk and Talk/Assignment/Seminar
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Focus of the Course	Skill Development/Employability
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Semester - I
CORE - IV: OPERATIONS RESEARCH

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24MTP1CD	OPERATIONS RESEARCH	CORE	48	12	-	4

Preamble	<p>This course has been designed for students to learn and understand</p> <ul style="list-style-type: none"> • the dynamic, integer programming and decision analysis • concept of queueing and inventory • how to solve the queueing models
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Prerequisite Knowledge on basic Mathematics

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	illustrate the characteristics of dynamic programming problem	K2
CO2	derive importance of integer programming	K5
CO3	explain the concept of Markov chain and Markov process in decision making	K3
CO4	analyze the behavior of various queueing models	K4
CO5	analyze the applications of inventory	K4

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓		✓		
CO2		✓			✓
CO3	✓			✓	
CO4			✓		✓
CO5	✓	✓			✓



Syllabus

Unit	Content	Hours	E-Contents / Resources
I	Dynamic Programming: Prototype example for dynamic programming - characteristics of dynamic programming problems - deterministic dynamic programming.	12	Text Book
II	Integer Programming: Prototype example - some BIP applications - innovative uses of binary variables in model formulation - some formulation examples - some perspectives on solving integer programming problems.	12	Text Book
III	Decision Analysis: Prototype example - decision making without experimentation - decision making with experimentation - decision trees, Markov chains: Stochastic processes - Markov chains.	12	Text Book
IV	Queueing Theory: Prototype example - basic structure - examples of real queueing systems - role of the exponential distribution – birth and death process - queueing models based on birth and death process.	12	Text Book
V	Inventory Theory: Examples - components - deterministic continuous and periodic review model - deterministic multiechelon inventory model for supply chain management.	12	Text Book/ You Tube Videos
	Total	60	



Text Book	1.	Frederick S. Hillier and Gerald J. Lieberman, 2010, "Introduction to Operations Research", Ninth Edition, McGraw-Hill Companies, New Delhi..
Reference Books	1.	Taha H.A, 2006, "Operations Research: An Introduction", Eighth Edition, Prentice-Hall of India Private Limited, New Delhi.
	2.	Kandiswarup, Gupta P.K and Man Mohan, 1998, "Operations Research", S. Chand & Sons Education Publications, New Delhi.
	3.	Ravindran, Phillips D.T and Solberg J.J, 2005, "Operations Research- Principles and Practice", John Wiley & Sons, New Jersey.
	4.	Hillier F and Lieberman G, 2010, "Introduction to Operations Research", Ninth Edition, McGraw-Hill Professional, New Delhi..

Journal and Magazines	https://www.worldscientific.com/worldscinet/bms
E-Resources and Website	https://nptel.ac.in

Learning Method	Chalk and Talk/Assignment/Seminar
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Focus of the Course	Skill Development/Employability
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Semester - I
CORE - V: ADVANCED STATISTICS

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	22MTP1CE	Advanced Statistics	CORE	36	24	-	3

Preamble	This course has been designed for students to learn and understand <ul style="list-style-type: none"> • the procedure of finding estimation • the methods of testing hypothesis under various conditions • the importance of linear regression models
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Prerequisite	Knowledge on Basic Mathematics
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Course Outcomes (COs)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	define the point estimation	K1
CO2	identity the confidence intervals for population variance and population parameters	K2
CO3	explain the procedures for hypothesis testing	K3
CO4	analyze the linear regression models and method of solving it variance	K4
CO5	apply various types of non-parametric test to validate hypothesis	K5

Mapping with Program Outcomes:					
COs / POs	PO1	PO2	PO3	PO4	PO5
CO1		✓		✓	
CO2	✓			✓	
CO3	✓	✓			✓
CO4			✓	✓	
CO5	✓	✓			✓



Syllabus

Unit	Content	Hours	E-Contents / Resources
I	Point Estimation: Introduction - method of moments and maximum likelihood - some desirable properties of point estimators - other desirable properties.	12	Text Book
II	Interval Estimation: Introduction – large sample confidence intervals: one sample case - small sample confidence intervals for μ -A confidence interval for the population variance - confidence interval concerning two population parameters.	12	Reference Book
III	Hypothesis Testing: Introduction – Neyman – Pearson - likelihood ratio test – hypotheses for a single parameter - testing of hypotheses for two samples - Chi-Square tests for count data.	12	Text Book
IV	Linear Regression Models: Introduction – simple linear regression model - inferences on the least square estimators - predicting a particular value.	12	Text Book
V	Non-parametric Tests: Introduction – nonparametric confidence interval - nonparametric hypothesis tests for one sample - nonparametric hypothesis tests for two independent samples - nonparametric hypothesis tests for $k \geq 2$ sample.	12	Text Book/ You Tube Videos
	Total	60	



Text Book	1.	Kandethody M. Ramachandran, Chris P and Tsokos, 2009, "Mathematical Statistics with Applications", Elsevier, Haryana.
Reference Books	1.	Irwin Miller and Marylees Miller, John E. Freund's, 2007, "Mathematical Statistics with Applications", Seventh Edition, Prentices-Hall India Pvt Ltd, New Delhi.
	2.	Hogg and Craig, 2003 "Introduction to Mathematical Statistics", Pearson Education, New Delhi.
	3.	J.M. Kapur and H.C. Saxena, 2001, "Mathematical Statistics", S. Chand & Co, New Delhi.
	4.	Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying E. Ye, 2018, Probability and Statistics, Pearson Education, South Asia.

Journal and Magazines	www.isaacpub.org/AboutThisJournal.aspx?ids=2
E-Resources and Website	https://www.lkouniv.ac.in/site/writereaddata/siteContent/202004160626023624Rajiv_Saksena_Advance_Statistical_Inference.pdf

Learning Method	Chalk and Talk/Assignment/Seminar
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Focus of the Course	Skill Development/Employability
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Semester - I
DSE 1: NUMERICAL ANALYSIS

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24MTP1DA	NUMERICAL ANALYSIS	DSE	48	-	-	4

Preamble	This course has been designed for students to learn and understand <ul style="list-style-type: none"> • the method of solving nonlinear equations • analyze the solution of ordinary differential equations • analyze the convergence of various methods 	
Prerequisite	Knowledge on basic Mathematics	
Course Outcomes (COs)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	apply the numerical method to solve nonlinear equations	K2
CO2	categorize the system of equations and solve by appropriate method	K3
CO3	examine the solution got by applying various of numerical differentiation and integration methods	K3
CO4	apply the Taylor's method to differential equations	K4
CO5	analyze the nature of solution of one and two dimensional partial differential equations	K5

Mapping with Program Outcomes:					
COs / POs	PO1	PO2	PO3	PO4	PO5
CO1					
CO2	✓				
CO3	✓				
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓



Syllabus

Unit	Content	Hours	E-Contents / Resources
I	Nonlinear Equations: Interval halving (Bisection) revisited - linear interpolation methods - Newton's method -fixed-point iteration: $x = g(x)$ method - multiple roots -nonlinear systems.	10	Text Book
II	Solving System of Equations: Matrices and vectors - elimination methods - the inverse of a matrix and matrix pathology - iterative methods - parallel processing.	10	Text Book
III	Numerical Differentiation and Integration: Numerical integration - Trapezoidal Rule - Simpson's rules - Fourier series and Fourier transforms - adaptive integration - gaussian quadrature - multiple integrals - applications of cubic splines.	10	Text Book
IV	Numerical Solution of Ordinary Differential Equations and Optimization: Taylor-Series Method - Euler method and its modifications - Runge-Kutta methods - multistep methods - higher-order equations and systems. Optimization: Finding the minimum of $y = f(x)$ - minimizing a function of several variables-linear programming.	09	Text Book
V	Numerical Solutions of Partial-Differential Equations: Elliptic equations - parabolic equations - hyperbolic equations - finite elements for ordinary and partial differential equations.	09	Text Book
	Total	48	



Text Book	1.	Gerald C. F. and Wheatley P. O., 1999, "Applied Numerical Analysis", 7 th Edition, Pearson Education, New York.
Reference Books	1.	Smith. G. D., 1985, "Numerical Solution of Partial Differential Equations – Finite Difference Methods", Oxford University Press, Oxford.
	2.	Jain M. K., Iyengar S. R. K. and Jain R. K., 1993, "Numerical Methods for Scientific and Engineering Computation", 3 rd Edition, Wiley Eastern Ltd, Noida.
	3.	Marghitu D. B. and Dupac M., 2012, "Advanced Dynamics: Analytical and Numerical Calculations with MATLAB", Springer, New York.
	4.	Samuel Conte D. and Boor C. D., 1983, "Elementary Numerical Analysis", McGraw-Hill International Edition, New Delhi.

Journal and Magazines	https://www.sciencedirect.com/journal/applied-numerical-mathematics ,
E-Resources and Website	https://www.math.wsu.edu/math/kcooper/M448/resources.php , https://nptel.ac.in

Learning Method	Chalk and Talk/Assignment/Seminar
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Focus of the Course	Skill Development/Employability
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Semester - I
DSE I: COMMUTATIVE ALGEBRA

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24MTP1DB	COMMUTATIVE ALGEBRA	DSE	48	-	-	4

Preamble	This course has been designed for students to learn and understand <ul style="list-style-type: none"> • the concepts of ideals and modules through examples • the properties to decompose the Noetherian and Artin rings. • the importance of dimension theory of rings and modules 	
Prerequisite	Knowledge on Modern Algebra	
Course Outcomes (COs)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	define new modules using operations like tensor product and other operations	K1
CO2	discuss the construction of field	K2
CO3	demonstrate the concept of integral dependence of extension ring and chain conditions of modules.	K3
CO4	analyze the importance of discrete valuation of rings and dedekind domains	K4
CO5	summarize the various forms of dimension theory and its influence in local rings	K5

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓		✓	✓	✓
CO3	✓	✓		✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓		✓	✓



Syllabus

Unit	Content	Hours	E-Contents / Resources
I	<p>Rings and Ideals:</p> <p>Rings and ring homomorphisms - ideals - quotient rings - zero divisors, nilpotent elements, units - prime ideal and maximal ideals - nilradical and Jacobson radical - operations on ideals - extension and contraction.</p> <p>Modules: modules and module homomorphisms - submodule and quotient module - operations on submodules - finitely generated module.</p>	09	Text Book
II	<p>Rings, modules of fractions and primary decomposition:</p> <p>Local properties - extended and contracted ideals in rings of fractions - primary decomposition.</p>	09	Reference Book
III	<p>Integral dependence and valuations:</p> <p>Integral dependence - the going up theorem - Integrally closed integral domains - the going down theorem - valuation rings - Chain conditions.</p>	09	Text Book
IV	<p>Noetherian rings, artin rings, Discrete valuation rings and Dedekind domains:</p> <p>Primary decomposition in Noetherian rings - artin rings - structure theorem for artin rings - discrete valuation rings - dedekind domains - fractional ideals.</p>	09	Text Book /NPTEL
V	<p>Completions and Dimension Theory:</p> <p>Topologies and completions - filtrations - graded rings and modules - the associated graded ring - Hilbert functions - dimension theory of Noetherian local rings - regular local rings - transcendental dimension.</p>	12	Text Book /You Tube Videos
	Total	48	



Text Book	1.	Atiyah-Macdonald, 1994, "Commutative Algebra", Westview Press, London.
Reference Books	1.	Zariski and Samuel, 1991, "Commutative Algebra I, II", Springer, New York.
	2.	Eisenbud, 1995, "Commutative Algebra with a View Towards Algebraic Geometry", Springer, New York.
	3.	Bourbaki, 1989, "Commutative Algebra", Springer, New York.
	4.	Herstein I N, 2000, "Topics in Algebra", Second Edition, John Wiley and Sons, New Jersey.

Journal and Magazines	https://www.worldscientific.com/worldscinet/bms
E-Resources and Website	https://nptel.ac.in

Learning Method	Chalk and Talk/Assignment/Seminar
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Focus of the Course	Skill Development/Employability
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Semester - I
DSE I: MATHEMATICAL MODELING

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24MTP1DC	Mathematical Modeling	DSE	48	-	-	4

Preamble	This course has been designed for students to learn and understand <ul style="list-style-type: none"> • the deterministic states and analysis of models • the stochastic analysis of models • various evolution of models 	
Prerequisite	Knowledge on Basic Mathematics	
Course Outcomes (COs)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	describe the optimal power and exponential models	K2
CO2	discuss the dimensional analysis and similarity	K2
CO3	apply the concept of probability density function to define stochastic states	K3
CO4	analyze the properties of various forms of changes using modeling	K4
CO5	develop the models for situations involving evolution theory	K5

Mapping with Program Outcomes:					
COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		
CO2	✓		✓		
CO3		✓		✓	
CO4			✓	✓	
CO5		✓		✓	✓



Syllabus

Unit	Content	Hours	E-Contents / Resources
I	Deterministic Analysis of Observations: Data transformations: Linear model – polynomial models – population modeling – global warming modeling - model errors – optimal linear models – optimal quadratic models – optimal power and exponential models.	9	Text Book
II	Deterministic States: Dimensional analysis and similarity - applications of low-complexity – applications of medium complexity- time measurement - applications of high-complexity.	10	Text Book & Reference Book
III	Stochastic States: Probability density functions – models for probability density functions – data analysis – real distribution.	9	Text Book
IV	Deterministic and stochastic Changes: Linear changes - linear changes with delays - nonlinear changes - linear stochastic changes - diffusion - Brownian motion - population dynamics.	10	Text Book
V	Deterministic and Stochastic Evolution: Heat and Mass Transfer: Balance – Newton's laws of motion: oscillations – population ecology: growth and self-limitation – oscillations and collapse - PDF evolution equations - Solutions to the Fokker Plank equation.	10	Text Book & You Tube Videos
	Total	48	




Text Book	1.	Stefen Heinz, 2011, "Mathematical Modeling", Springer-Verlag, New York.
Reference Books	1.	Kapur J.N., 1998, "Mathematical Modeling", New Age International (P) Limited, New Delhi.
	2.	Crossand and Mosercadini A.O, 1976, "The Art of Mathematical Modeling", Ellis Harwood and John Wiley, New York.
	3.	Sarah. P.Otto and Troy Day, 2000, "A Biologist guide to Mathematical Modeling in Ecology and Evolution", Princeton University Press, Princeton.
	4.	Frank. R.Glordance, Maurice D. Weir and William P.Fox, 2003, "A First course in Mathematical Modeling", Thomson Learning, London.

Journal and Magazines	https://www.sciencedirect.com/journal/applied-mathematical-modelling
E-Resources and Website	https://en.wikipedia.org/wiki/Mathematical_model#:~:text=A%20mathematical%20model%20is%20an,model%20is%20termed%20mathematical%20modeling.

Learning Method	Chalk and Talk/Assignment/Seminar
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Focus of the Course	Skill Development/Employability
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 BoS Chairman/HoD
 Department of Mathematics
 Dr. N. G. P. Arts and Science College
 Coimbatore – 641 048

 Dr.N.G.P. Arts and Science College		
APPROVED		
BoS- 17 th 04.04.2024	AC - 17 th 07.04.2024	GB -

