DEPARTMENT OF MATHEMATICS

Programme: B. Sc. Mathematics

Vision

To be among the top ten centers of excellence in Mathematics at the national level through quality Mathematics education and research.

Mission

Department of Mathematics, through our enlightened management and committed faculty envisages to

- provide world-class education to the students of Mathematics
- give them a learning-centered environment
- ensure knowledge transfer
- instill research aptitude
- infuse ethical and cultural values
- transform our students into disciplined citizens in order to improve their quality of life.

Program Educational Objectives:

PEO1	The programme provides a strong foundation in breadth and depth of Mathematics and some specific areas of computer science which enables the student to pursue post-graduation in Mathematics, Applied Mathematics and computer applications.
PEO2	The programme also inculcate certain quantitative skills (self-confidence, leadership, decision making etc.) which would prepare students for managerial careers and transform the stakeholders into successful entrepreneurs.
PEO3	The practical and technical knowledge ensure significant and rewarding career opportunities in various service domains both National and Global level.
PEO4	The programme will stimulate logical and analytical reasoning that enables the students to crack competitive exams.
PEO5	With an interdisciplinary learning environment, the student develops necessary skills and values to handle diversified circumstances either individually or as a team.

Program Outcomes:

On successful completion of the B.Sc., Mathematics programme, Students can able to

PO1	**Communication skills:** Develop confidence, positive attitude and interest towards Mathematics through communication skills. (K1)
PO2	**Disciplinary knowledge:** understand and apply basic concepts of Mathematics, Statistics and Physics and their importance in the solution of some real-world problems. (K2)
PO3	**Critical thinking:** apply various Mathematical techniques within the domain and also extend to multi-disciplinary environment. (K3)
PO4	**Problem solving:** analyze and make critical observations of any situation with Mathematical approach and demonstrate ways to solve them logically with precision. (K4)
PO5	**Research related skills:** endorse independent learning of language papers and acquire sound knowledge to understand the basic branches of Mathematics and apply in research. (K3)
PO6	**Analytical reasoning:** have thorough grasp over the concepts which faster individual discipline, responsibility and commitment and ensure professional ethics. (K5)
PO7	**Self-directed learning:** formulate new problems and find the ideas to attain their solutions and develop the codes using C and C++ languages for simple problems. (K4)

Program Specific Outcomes:

PSO – 01	**Domain Knowledge:** provide advanced knowledge on topics in pure and applied Mathematics, empowering the students to pursue higher degrees at universities and reputed academic institutions like NBHM, NIT, IIT, IISC etc.
PSO – 02	**Employable Skills:** motivate and prepare students to clear civil service exams and to get employability in education, IT, Banking and insurance sectors and also to become successful entrepreneur.

Mapping

PEOs / POs \ PSOs	PEO1	PEO2	PEO3	PEO4	PEO5
PO1: Communication skills	H	H	H	M	H
PO2: Disciplinary knowledge	M	H	H	H	H
PO3: Critical thinking	H	H	H	H	H
PO4: Problem solving	H	H	H	H	M
PO5: Research related skills	H	M	H	M	H
PO6: Analytical reasoning	M	H	H	H	H
PO7: Self-directed learning	H	H	M	H	M
PSO1: Domain Knowledge	H	H	H	M	H
PSO2: Employable Skills	H	H	M	H	H

N.G.M College - Curriculum Development Cell
B. Sc. Mathematics Scheme of Examination For 2024 - 2025
Choice Based Credit System & OBES

For Part I and Part II in First & Second Semesters Only

SEMESTER – I

Part	Subject Code	Title of the Paper	Hrs. / Week		Hrs./ Sem.	Exam Hrs.	Maximum Marks		Total Marks	Credits
			L	P	T		Internal	External		
I	24UTL101 / 24UHN101 / 24UFR101	Tamil Paper(A) - I /	6	-		3	25	75	100	3
		Hindi Paper - I /		-						
		French Paper – I		-						
II	24UEN101	Communication Skills-I (Level I)	5	-		3	25	75	100	3
	24UEN102	Communication Skills-I (Level II)		-						
III	24UMS101	**CC I:** Classical Algebra	5	-		3	25	75	100	4
	24UMS102	**CC II:** Calculus	6	-		3	25	75	100	4
	24UMS1A1	**GE I - Allied I:** Mathematical Statistics-I	6	-		3	25	75	100	5
IV	24EVS101	**AECC I:** Environmental Studies	1	-		-	-	-	-	-
	24HEC101	Human Excellence - Personal Values & SKY Yoga Practice-I	1	-		2	20	30	50	1
V		Extension Activities (NSS, NCC, Sports and Games, etc.,)	-	-		-	-	-	-	-
EC		Online Course (Optional) (MOOC / NPTEL/SWAYAM)	-	-		-	-	-	-	Grade
Total			**30**			**17**	**145**	**405**	**550**	**20**

CC - Core Course, GE - Generic Elective, AECC - Ability Enhancement Compulsory Course

SEMESTER – II										
Part	**Subject Code**	**Title of the Paper**	**Hrs./ Week**		**Hrs ./Sem.**	**Exam Hrs.**	**Maximum Marks**		**Total Marks**	**Credits**
			L	**P**	**T**		**Internal**	**External**		
I	24UTL202 / 24UHN202 / 24UFR202	Tamil Paper(A) - II /	6	-		3	25	75	100	3
		Hindi Paper - II /		-						
		French Paper - II		-						
II	24UEN202	Communication Skills-II (Level I)	5	-		3	25	75	100	3
	24UEN203	Communication Skills-II (Level II)		-						
III	24UMS203	**CC III:** Trigonometry, Vector Calculus and Fourier Series	5	-		3	25	75	100	4
	24UMS204	**CC IV:** Analytical Geometry	5	-		3	25	75	100	4
	24UMS2A2	**GE II - Allied II:** Mathematical Statistics-II	6	-		3	25	75	100	5
IV	24UEL2S1	**SEC I: Naan Mudhalvan:** Professional Skills	2 (1+1*)			2		50	50	2
	24EVS201	**AECC I:** Environmental Studies	1	-		2	-	50	50	2
	24HEC202	Human Excellence - Family Values & SKY Yoga Practice- II	1	-		2	20	30	50	1
V		Extension Activities-Annexure I	-	-		-	-	-	-	-
EC	24CMM201	Manaiyiyal Mahathuvam - I	-	-		2	-	50	50	Grade
	24CUB201	Uzhavu Bharatham - I	-	-		2	-	50	50	Grade
		Online Course (Optional) (MOOC / NPTEL / SWAYAM)	-	-		-	-	-	-	Grade
Total			**30**			**25**	**145**	**505**	**650**	**24**
CC - Core Course, GE - Generic Elective, SEC - Skill Enhancement Course , AECC - Ability Enhancement Compulsory Course										

SEMESTER – III										
Part	**Subject Code**	**Title of the Paper**	**Hrs./ Week**		**Hrs./ Sem.**	**Exam Hrs.**	**Maximum Marks**		**Total Marks**	**Credits**
			L	**P**	**T**		**Internal**	**External**		
I	24UTL303 / 24UHN303 / 24UFR303	Tamil Paper(A) - III /	5	-		3	25	75	100	3
		Hindi Paper - III /		-						
		French Paper - III		-						
II	24UEN303 24UEN304	Communication Skills-III (Level I)	6	-		3	25	75	100	3
		Communication Skills-III (Level II)		-						
III	24UMS305	**CC V:** Statics	4	-		3	25	75	100	4
	24UMS306	**CC VI:** Numerical Techniques	4	-		3	25	75	100	3
	24UMS3A3	**GE III- Allied III:** Physics for Mathematics I	5	3		3	25	75	100	4
IV	24UMS3N1 / 24UMS3N2	**Non Major Elective - I:** Quantitative Aptitude - I/ Astronomy –I	2	-		2	-	50	50	2
	24HEC303	Human Excellence - Professional Values & Ethics – SKY Yoga Practice-III	1	-		2	20	30	50	1
V		Extension Activities - Annexure I	-	-		-	-	-	-	-
EC	24CMM302	Manaiyiyal Mahathuvam - II	-	-		2	-	50	50	Grade
	24CUB302	Uzhavu Bharatham - II	-	-		2	-	50	50	Grade
Total			**27**	**3**		**23**	**145**	**455**	**600**	**20**
CC - Core Course, GE - Generic Elective										

SEMESTER – IV										
Part	**Subject Code**	**Title of the Paper**	**Hrs. / Week**		**Hrs./ Sem.**	**Exam Hrs.**	**Maximum Marks**		**Total Marks**	**Credits**
			L	**P**	**T**		**Internal**	**External**		
I	24UTL404 24UTL404 24UTL404	Tamil Paper(A) - IV / Hindi Paper - IV/ French Paper – IV	5	- - -		3	25	75	100	3
II	24UEN404 24UEN405	Communication Skills-IV (Level I) Communication Skills-IV (Level II)	6	- -		3	25	75	100	3
III	24UMS407	**CC VII :** Dynamics	4	-		3	25	75	100	4
	24UMS408	**CC VIII:** Programming in C	2	-		3	25	75	100	3
	24UMS409	**CC Lab I:** Programming lab in C	-	2		3	20	30	50	1
	24UMS4A4	**GE IV - Allied IV:** Physics for Mathematics II	5	-		3	25	75	100	4
	24UMS4A5	**GE Lab I:** Physics lab for Mathematics	-	3		3	40	60	100	2
IV	24UAP4S1	**SEC II: Naan Mudhalvan:** Quantitative Aptitude	2*			2	-	50	50	2
	24UMS4N3 / 24UMS4N4	**Non Major Elective - II:** Quantitative Aptitude- II/ Astronomy - II	2	-		2	-	50	50	2
	24HEC404	Human Excellence - Social Values & SKY Yoga Practice - IV	1	-		2	20	30	50	1
V		Extension Activities - Annexure I	-	-		-	-	50	50	1
EC	24CMM403	Manaiyiyal Mahathuvam - III	-	-		2	-	50	50	Grade
	24CUB403	Uzhavu Bharatham - III	-	-		2	-	50	50	Grade
Total			25	5		31	205	645	**850**	**26**
CC - Core Course, GE - Generic Elective, SEC - Skill Enhancement Course										

SEMESTER – V										
Part	**Subject Code**	**Title of the Paper**	**Hrs./ Week**		**Hrs./ Sem.**	**Exam Hrs.**	**Maximum Marks**		**Total Marks**	**Credits**
			L	**P**	**T**		**Internal**	**External**		
III	24UMS510	**CC IX:** Modern Algebra	6	-		3	25	75	100	5
	24UMS511	**CC X:** Real Analysis-I	6	-		3	25	75	100	4
	24UMS512	**CC XI: SEC III:** Operations Research	5	-		3	25	75	100	4
	24UMS513	**CC XII:** Complex Analysis	6	-		3	25	75	100	4
	24UMS5E1/ 24UMS5E2	**DSE I:** OOP with C++/ Artificial Intelligence and Machine Learning	4	-		3	25	75	100	3
	24UMS5E3	**DSE Lab I:** Programming lab in OOP with C++	-	2		3	20	30	50	1
	24UMS5AL	**ALC-I (Optional):** Advanced Operations Research - I - Self study	-	-		-	50	50	100	3*
IV	24HEC505	Human Excellence - National Values & SKY Yoga Practice - V	1	-	-		20	30	50	1
EC	24CSD501	Soft skills Development-I			-	-	-	-	-	Grade
Total			**28**	**2**		**18**	**165**	**435**	**600**	**22**
CC - Core Course, SEC – Skill Enhancement Course, DSE - Discipline Specific Elective, ALC - Advanced Learner Course										

SEMESTER – VI									
Part	**Subject Code**	**Title of the Paper**	**Hrs / Week**		**Hrs./ Sem.**	**Exam Hrs.**	**Maximum Marks**		**Total Marks**	**Credits**
			L	**P**	**T**		**Internal**	**External**		
III	24UMS614	**CC XIII:** Linear Algebra	6	-		3	25	75	100	5
	24UMS615	**CC XIV:** Real Analysis II	6	-		3	25	75	100	4
	24UMS616	**CC XV: SEC IV: Naan Mudhalvan:** Resource Management Technique	5	-		3	25	75	100	4
	24UMS6E4/ 24UMS6E5	**DSE II:** Theory of Numbers/ Fuzzy set Theory	6	-		3	25	75	100	5
	24UMS6E6/ 24UMS6E7	**DSE III:** Discrete Mathematics/ Graph Theory	6	-		3	25	75	100	5
	24UMS6P1	Project	-	-		-	-	100	100	4
	24UMS6AL	**ALC II (Optional):** Advanced Operations Research - II - Self Study	-	-		-	25	75	100	3*
IV	24HEC606	Human Excellence - Global Values & SKY Yoga Practice - VI	1	-	-	2	20	30	50	1
EC	24CSD602	Soft Skills Development-II	-	-		-	-	-	-	Grade
Total			**30**			**17**	**145**	**505**	**650**	**28**
Grand Total									**3900**	**140**
CC - Core Course, SEC – Skill Enhancement Course, DSE - Discipline Specific Elective, ALC - Advanced Learner Course										

*Extra Credits

One hour out of two hours specified for Naan Mudhalvan Skill Enhancement Course is to be handled out of working hours

Question Paper Pattern

(Based on Bloom's Taxonomy)

K1-Remember; **K2**- Understanding; **K3**- Apply; **K4**-Analyze; **K5**- Evaluate

1. Theory Examinations: 75 Marks (Part I, II, & III)

(i) Test- I & II, ESE:

Knowledge Level	Section	Marks	Description	Total
K1 & K2 (Q1 - 10)	A (Q1 – 5 MCQ) (Q6 – 10 Define / Short Answer / MCQ)	10 * 1 = 10	MCQ / Define	**75**
K3 (Q11-15)	B (Either or pattern)	5 * 5 = 25	Short Answers	
K4 & K5 (Q16 – 20)	C (Either or pattern)	5 * 8 = 40	Descriptive/ Detailed	

2. Theory Examinations: 38 Marks (3 Hours Examination) (Part III: If applicable)

Knowledge Level	Section	Marks	Description	Total
K1 & K2 (Q1 - 10)	A (Q 1 – 10 MCQ)	10 * 1 = 10	MCQ	**50 (Reduced to 38)**
K3 (Q11 – 15)	B (Either or pattern)	5 * 3 = 15	Short Answers	
K4 & K5 (Q16-20)	C (Either or pattern)	5 * 5 = 25	Descriptive/ Detailed	

3. Theory Examinations: 38 Marks (2 Hours Examination) (Part IV: If applicable)

Knowledge Level	Section	Marks	Description	Total
K1 & K2 (Q1-10)	A (Q1 – 5 MCQ) (Q6–10 Define / Short Answer)	10 * 1 = 10	MCQ / Define	**50 (Reduced to 38)**
K3, K4 & K5 (Q11-15)	B (Either or pattern)	5 * 8 = 40	Descriptive/ Detailed	

4. Practical Examinations:

Paper	Maximum Marks	Marks for		Components for CIA		
		CIA	CEE	Tests	Observation Note	Record Note
Practical (Core / Elective)	50	20	30	10	05	05
Practical (Core / Elective)	75	30	45	20	05	05
Practical (Core / Elective)	100	40	60	30	05	05

5. Project:

Paper	Maximum Marks	Marks for		
		CIA	CEE	
			Evaluation	Viva-voce
Project	100	25	50	25
Project	150	40	75	35
Project	200	50	100	50

***** CIA – Continuous Internal Assessment & CEE – Comprehensive External Examinations

Components of Continuous Internal Assessment (CIA)

THEORY

Maximum Marks: 100; CIA Mark: 25; CEE Mark: 75;

Components		Calculation	CIA Total
Test 1	75	(75+75+15+10)/7	25
Test 2 / Model	75		
Assignment / Digital Assignment	15		
Others*	10		

*Others may include the following: Seminar / Socratic Seminars,Group Discussion, Role Play, APS, Class participation, Case Studies Presentation, Field Work, Field Survey, Term Paper, Workshop / Conference Participation, Presentation of Papers in Conferences, Quiz, Report / Content Writing, etc.

Maximum Marks: 50; CIA Mark: 12; CEE Mark: 38; (Part III: If applicable)

Components		Calculation	CIA Total
Test 1	50	(50+50+10+10)/10	12
Test 2 / Model	50		
Assignment / Digital Assignment	10		
Seminar	10		

PROJECT

Maximum Marks: 100; CIA Mark: 25; CEE Mark: 75;

Components		Calculation	CIA Total
Review I	5	5+5+5+10	25
Review II	5		
Review III	5		
Report Submission	10		

Maximum Marks: 200; CIA Mark: 50; CEE Mark: 150;

Components		Calculation	CIA Total
Review I	10	10+ 10+10+20	50
Review II	10		
Review III	10		
Report Submission	20		

** Components for 'Review' may include the following:*

Originality of Idea, Relevance to Current Trend, Candidate Involvement, and Presentation of Report for Commerce, Management & Social Work.

Synopsis, System Planning, Design, Coding, Input form, Output format, Preparation of Report & Submission for Computer Science cluster.

Continuous Internal Assessment for Project

For Science Stream

The Final year Science students should undergo a project work during (V/VI) semester

- The period of study is for 4 weeks.
- Project / Internship work has to be done in an industrial organization (or) work on any industrial problem outside the organization is allowed.
- Students are divided into groups and each group is guided by a Mentor.
- The group should not exceed four students, also interested student can undergo individually.
- A problem is chosen, objectives are framed, and data is collected, analyzed and documented in the form of a report / Project.
- Viva – Voce is conducted at the end of this semester, by an External Examiner and concerned

  Mentor (Internal Examiner).
- Project work constitutes 200 marks, out of which 50 is CIA and 150 is CEE Marks.

Mark Split UP

CIA	CEE	Total
50	150	200

S. No	Components for CIA	Marks
1	Review – I *	10
2	Review – II *	10
3	Review – III *	10
4	Rough Draft Submission / Report Submission	20
Total		**50**

*** Review I: -** Problem Analysis
*** Review II: -** Data collection & Design
*** Review III: -** Data Analysis

S. No	Components for CEE	Marks
1	Evaluation *	100
2	Viva-Voce	50
Total		**150**

* Evaluation includes Problem and Hypothesis, Experimental Design / Materials / Procedure, Variables / Controls / Sample Size, and Data Collection / Analysis.

STUDENT SEMINAR EVALUATION RUBRIC

Grading Scale:

A	B	C	D
8-10	5-7	3-4	0-2

CRITERIA	A - Excellent	B - Good	C - Average	D - Inadequate
Organization of presentation	Information presented as an interesting story in a logical, easy-to-follow sequence	Information presented in logical sequence; easy to follow	Most of the information is presented in sequence	Hard to follow; sequence of information jumpy
Knowledge of the subject & References	Demonstrated full knowledge; answered all questions with elaboration **&** Material sufficient for clear understanding **AND** exceptionally presented	At ease; answered all questions **but** failed to elaborate **&** Material sufficient for clear understanding **AND** effectively presented	At ease with information; answered most questions **&** Material sufficient for clear understanding **but** not clearly presented	Does not have a grasp of information; answered only rudimentary Questions **&** Material not clearly related to the topic **OR** background dominated seminar
Presentation Skills using ICT Tools	Uses graphics that explain and reinforce text and presentation	Uses graphics that explain the text and presentation	Uses graphics that relate to text and presentation	Uses graphics that rarely support text and presentation
Eye Contact	Refers to slides to make points; engaged with the audience	Refers to slides to make points; eye contact the majority of the time	Refers to slides to make points; occasional eye contact	Reads most slides; no or just occasional eye contact
Elocution – (Ability to speak English language)	Correct, precise pronunciation of all terms The voice is clear and steady; the audience can hear well at all times	Incorrectly pronounces a few terms Voice is clear with few fluctuations; the audience can hear well most of the time	Incorrectly pronounces some terms Voice fluctuates from low to clear; difficult to hear at times	Mumbles and/or Incorrectly pronounces some terms Voice is low; difficult to hear

WRITTEN ASSIGNMENT RUBRIC

Grading Scale:

A	B	C	D	F
13-15	10-12	7-9	4-6	0-3

CRITERION	A - Excellent	B - Good	C - Average	D - Below Average	F - Inadequate
Content & Focus	Hits on almost all content exceptionally clear	Hits on most key points and the writing is interesting	Hits in basic content and writing are understandable	Hits on a portion of content and/or digressions and errors	Completely off track or did not submit
Sentence Structure & Style	* Word choice is rich and varies * Writing style is consistently strong * Students own formal language	* Word choice is clear and reasonably precise * Writing language is appropriate to the topic * Words convey intended message	* Word choice is basic * Most writing language is appropriate to the topic * Informal language	* Word choice is vague * Writing language is not appropriate to the topic * Message is unclear	* Not Adequate
Sources	Sources are cited and are used critically	Sources are cited and some are used critically	Some sources are missing	Sources are not cited	Sources are not at all cited
Neatness	Typed; Clean; Neatly bound in a report cover; illustrations provided	Legible writing, well-formed characters; Clean and neatly bound in a report cover	Legible writing, some ill-formed letters, print too small or too large; papers stapled together	Illegible writing; loose pages	Same as below standard
Timeliness	Report on time	Report one class period late	Report two class periods late	Report more than one week late	Report more than 10 days late

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS101	**Title**	**Batch:**	2024 - 2027
		CLASSICAL ALGEBRA	**Semester:**	I
Lecture Hrs./Week or Practical Hrs./Week	5		**Credits:**	4

Course Objective

This course provides the learners a wide spectrum of basic mathematical concepts including summation of series, roots of an equation and matrices.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Apply the numerical methods for approximating the solution to problems of algebraic and transcendental equations.	K3
CO2	Apply the concepts of convergence and divergence of series using various tests like Cauchy's root test, D'Alembert's ratio test to solve problems.	K3
CO3	Solve problems related to Binomial, Exponential and Logarithmic series.	K4
CO4	Apply Newton's method of divisors and Horner's Method to analyze the nature of the roots.	K4
CO5	Diagonalize the matrix using Cayley-Hamilton theorem.	K3

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	M	M	H	H	M	H	H
CO2	H	H	H	H	H	H	M	H	H
CO3	H	H	H	H	H	H	M	H	H
CO4	H	H	H	H	H	H	M	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**The solution of Numerical Algebraic and Transcendental Equations**: Introduction - The Bisection method - The iteration method - The method of false position (RegulaFalsi Method) - Newton Raphson method. **Text Book 1: Chapter 3: Sections: 1 - 5.**	15
Unit II	**Binomial theorem:** Application of Binomial theorem to summation of series. **Exponential and logarithmic series:**The Exponential theorem – Summation - The logarithmic series - Modification of the Logarithmic series - Series which can be summed up by the logarithmic series. **Summation of series:** Application of partial fractions. **Text Book 2: Chapter 3: Section: 10.** **Chapter 4: Sections: 2.3, 3.1, 5- 7,9, 9.1 (No derivations).** **Chapter 5: Sections: 2.1, 3.1, 3.2.**	15
Unit III	**Theory of equations:**Symmetric function of roots- Newton's Theorem on the sum of powers of the roots – To increase or decrease the roots of a given equation by a given quantity – Form of the quotient and remainder when a polynomial is divided by a binomial – *Removal of terms (Self study).* **Text Book 2: Chapter 6:Sections: 12, 14 17-19.**	15
Unit IV	**Theory of equations**: Multiple roots – Strum's theorem – Solutions of numerical equations – Newton's method of divisors – Horner's Method. **Text Book 2: Chapter 6: Sections: 26, 27, 28.1-28.3, 29.4, 30**.	15
Unit V	**Fundamental Concepts:** Nilpotent – Idempotent – Unitary – Orthogonal Matrices – Related Problems. **Characteristic roots and Characteristic vectors**: The Characteristic equation of transformation-Properties of the Eigen vectors - Cayley-Hamilton theorem (statement only)-Diagonalization of a Matrix. **Text Book 3: Chapter 1.** **Text Book 3: Chapter 4.**	15
	Total Contact Hrs.	**75**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Books:

1. Venkataraman M. K, *Numerical Methods in Science and Engineering*, The National Publishing Company, Madras, 2009.
2. Manicavachagompillay T. K, Natarajan T. and Ganapathy K. S, *Algebra Volume I*, S.

Viswanathan Pvt. Ltd,First edition, 2010.
3. Kandasamy P. and Thilagavathi K, *Mathematics for B. Sc. Branch - I, Volume II*, First Edition, 2004.

Books for Reference:

1. Ray M. and Sharma H. S, *A text book of Higher Algebra,* S. Chand & Company, 1988
2. Thakur B. R, Sinha H. C, Agarwal B. L. and Johri V. B,*A text book of Algebra,* Ram Prasad & sons, 1970.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.youtube.com/watch?v=BydVprh9NgQ
2. https://youtu.be/a05NS7dpbNM

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Dr. V. INTHUMATHI Mrs. A. GNANASOUNDARI Signature	Name: Dr. V. INTHUMATHI Signature	Name:K. SRINIVASAN Signature	Name:K.SRINIVASAN Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS102	**Title**	**Batch:**	2024 - 2027
		CALCULUS	**Semester:**	I
Lecture Hrs./Week or Practical Hrs./Week	6		**Credits:**	4

Course Objective

This paper enables the students to gain the ability to solve the problems related to multiple integrals, Beta and Gamma functions. It also provides the basic knowledge about Laplace transforms and use it to solve the differential equations.

Course Outcomes (CO)

On successful completion of this core paper, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recall the methods of solving ordinary differential equations.	K1
CO2	Solve the linear differential equations with constant and variable coefficients.	K3
CO3	Compute area and volume of the solids using multiple integrals	K3
CO4	Analyze and apply the concepts of Laplace Transform, inverse Laplace Transform to solve linear ordinary differential equations with constant coefficients.	K4
CO5	Expose differential equation as a powerful tool in solving problems in Physical and Social sciences.	K3

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	M	M	M	M	H	H	M	H	H
CO2	H	H	H	H	H	H	M	H	H
CO3	H	H	H	H	H	H	M	H	H
CO4	H	H	H	H	H	H	M	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	Curvature – Radius of curvature – Envelops. **Text Book 1: Chapter 10: Sections: 1, 2.1-2.3.** Linear differential equations with constant coefficients: Differential equation of higher order- The operators D and D^{-1} – Particular integral - Special methods of finding particular integral - Linear equations with variable coefficients – To find the particular integral – Special method of evaluating the P.I. when X is of the form x^m. **Text Book 3: Chapter 2: Sections: 1 - 4 & 8.**	18
Unit II	Partial Differential Equations: Derivation of partial differential equations by elimination of arbitrary constants and by arbitrary functions - Standard types of first order equations Type III, (Type IV - Self study) - Lagrange's equation **Text Book 3: Chapter 4: Sections: 1 – 2 & 5-6.**	18
Unit III	Multiple Integrals: Definition of double integral - Evaluation of the double integral - Double integral in polar co-ordinates - Triple integrals – Applications of multiple integrals (problems only) **Text Book 2: Chapter 5: Sections: 1 - 5.**	18
Unit IV	Change of Variables: Jacobians - Two important results regarding Jacobians - Change of variable in the case of two variables - Change of variable in the case of three variables - Transformation from Cartesian to polar co-ordinates - Transformation from Cartesian to spherical polar co-ordinates. Beta and Gamma Functions: Definitions - Convergence of Gamma functions - Properties of Beta functions - Relation between Beta and Gamma functions - Examples - Applications of Gamma functions to multiple integrals. **Text Book 2 : Chapter 6** **Chapter 7: Sections 2 - 6.**	18
Unit V	The Laplace Transforms: Definitions - Transform of f(t), e^{at}, cos at, sin at and tn when n is an integer - Using Laplace transforms to evaluate integreals - Inverse Laplace transforms (Self study)- Finding the Laplace transforms of functions to get the inverse transforms of functions--Laplace transforms to solve ordinary differential equation with constant coefficients. **Text Book 3: Chapter 5: Sections 1,2,4 - 8.**	18
	Total Contact Hrs.	**90**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Books:

1. Narayanan S. and ManicavachagomPillay T.K, Calculus Volume – I, S. Viswanathan(Publishers and Printers), 2010.
2. Narayanan S. and ManicavachagomPillay T.K, Calculus Volume – II, S. Viswanathan(Publishers and Printers), 2010.
3. Narayanan S. and ManicavachagomPillay T. K, Calculus Volume – III, S. Viswanathan(Publishers and Printers), 2010.

Books for Reference:

1. Dass H. K., Advanced Engineering MathematicsS. Chand and Company Ltd, Sixteenth Edition, New Delhi, 2006.
2. Kandasamy P. and Thilagavathi K., Allied Mathematics (Volume-II), S. Chand and company Ltd, New Delhi, 2004.
3. Kandasamy P. and Thilagavathi K., Allied Mathematics (Volume-III), S. Chand and company Ltd, New Delhi, 2004

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. http://www.math.odu.edu/~jhh/Volume-2.PDF
2. https://nptel.ac.in/courses/111/105/111105122/
3. https://nptel.ac.in/courses/111/107/111107108/

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Dr. N. SELVANAYAKI  Signature	Name: Dr. V. INTHUMATHI  Signature	Name:K. SRINIVASAN  Signature	Name: K. SRINIVASAN  Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS1A1	**Title**	**Batch:**	2024 - 2027
		MATHEMATICAL STATISTICS- I	**Semester:**	I
Lecture Hrs./Week or Practical Hrs./Week	6		**Credits:**	5

Course Objectives

The aim of this course is to introduce the concept of discrete and continuous random variables, probability functions, expectations, moment generating functions and some discrete and continuous distributions and should have developed skills to apply them to various real life situations.

Course Outcomes (CO)

On successful completion of this core paper, the students will be able to

CO Number	CO Statement	Knowledge level
CO1	Understand the concepts of random variables and probability distributions in two dimensional space.	K2
CO2	Compute expected value and variance of discrete and continuousrandomvariables.	K3
CO3	Understand and analyze the discrete distributions such as Binomial and Poisson distributions.	K4
CO4	Analyze the continuous distributions such as normal, beta, gamma, exponential and rectangular distributions	K4
CO5	Use statistical tool effectively to analyze real life problems and to be an efficient statistician.	K4

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	H	M	H	M	H	H
CO2	H	H	H	H	H	H	M	H	H
CO3	H	H	H	H	H	H	H	H	H
CO4	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Random Variables and Distribution Functions:** Introduction- Two Dimensional or Joint Probability Mass Function - Two Dimensional Distribution function - Marginal Distribution functions - Joint Density function - Marginal Density Function - The conditional Distribution Function and Conditional Probability Density function - Simple problems. **Chapter 5: Sections: 5.1, 5.5, 5.5.1 - 5.5.5.** **Mathematical Expectation:** Introduction - Mathematical Expectation or Expected value of Random variable – Expected value of function of a Random variable - Properties of Expectation. **Chapter 6: Sections: 6.1-6.4.**	18
Unit II	**Mathematical Expectation:** Properties of Variance - Covariance – Variance of a linear combination of Random variables - Moments of Bivariate Probability Distributions - Conditional Expectation and Conditional Variance - Simple problems. **Chapter 6: Sections: 6.5, 6.6, 6.6.1, 6.8, 6.9.** **Moment Generating Functions**: Moment Generating Functions - Properties of Moment Generating Functions – Uniqueness Theorem of Moment Generating Functions - Cumulants - *Properties of Cumulants (Self study)* - Simple problems. **Chapter 7: Sections: 7.1, 7.1.2, 7.1.3, 7.2, 7.2.1.**	18
Unit III	**Moment Generating Functions**: *Characteristic Function (Self study)* - Properties of Characteristics Function - Chebychev's inequality - Simple problems. **Chapter 7: Sections: 7.3, 7.3.1, 7.5.** **Special Discrete Probability Distributions:** Binomial distribution - Moments of Binomial Distribution - Recurrence Relation for the Moments of Binomial Distribution - Moment Generating function of Binomial Distribution - Additive property of Binomial Distribution- Simple problems. Poisson distribution - Moments of Poisson distribution - Recurrence relation of Moments of the Poisson distribution - Moment Generating function of Poisson Distribution - Characteristics Function of the Poisson distribution – Cumulants of the Poisson distribution- Additive or reproductive property of independent Poisson variates - Simple problems. **Chapter 8: Sections: 8.4, 8.4.1, 8.4.2, 8.4.6, 8.4.7, 8.5, 8.5.2, 8.5.4- 8.5.8**	18
Unit IV	**Special Continuous Probability Distributions:** Normal distribution- Chief Characteristics of the Normal Distribution - M.G.F. of Normal distribution - C.G.F. of Normal distribution - Moments of Normal Distribution - A linear combination of independent normal variates - Simple problems. Rectangular distribution - Moments of Rectangular distribution - MGF of Rectangular distribution - Characteristic function of Rectangular distribution - Mean Deviation about Mean -Simple problems. **Chapter 9: Sections: 9.2, 9.2.2, 9.2.5, 9.2.6, 9.2.7, 9.2.8, 9. 3-9.3.4.**	18

Unit V	**Special Continuous Probability Distributions:** Gamma Distribution - M.G.F. of Gamma distribution - C.G.F. of Gamma distribution - Additive property of Gamma Distribution - Beta distributions of first kind - Constants of Beta distributions of first kind - Beta distributions of second kind - Constants of Beta distributions of second kind - Exponential distribution - M.G.F. of Exponential distribution - Simple problems. **Chapter 9: Sections: 9.5-9.5.3, 9.6, 9.6.1, 9.7, 9.7.1, 9.8, 9.8.1.**	18
	Total Contact Hrs.	**90**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Gupta S. C. and Kapoor V. K., *Fundamentals of Mathematical Statistics, Eleventh Edition* S.Chand& Sons, 2009.

Books for Reference:

1. Hogg R.V. and Craigh A. G., *Introduction to Mathematical Statistics,* Pearson Education publications, 2004.
2. Veerarajan T., *Fundamentals of Mathematical Statistics,* Yes Dee Publishing Pvt.Ltd, 2017.
3. Vital P. R., *Mathematical Statistics,* Margham publications, 2004.

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Dr. M. MAHESWARI M.Mallesh Signature	Name: Dr. V. INTHUMATHI V. Inthumathi Signature	Name:K. SRINIVASAN  Signature	Name: K. SRINIVASAN  Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
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Curriculum Development Cell (CDC)
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Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UCY	**ProgrammeTitle :**	B.Sc., Chemistry	
Course Code:	24UCY1A1	**Title**	**Batch :**	2024- 2027
		MATHEMATICS FOR CHEMISTRY-I	**Semester**	I
Hrs/Week	6		**Credits :**	4

Course Objective

This course provides a platform to understand the fundamental concepts of Matrices, Theory of Equations, Summation of series and some Special functions.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Acquire knowledge about different types of matrices and finding characteristic roots and vectors of a matrix.	K2
CO2	Analyze the relation between roots and coefficients of the polynomial equations.	K3
CO3	Know the concept of Binomial, Exponential, Logarithmic series and their application to summation of series.	K2
CO4	Apply the numerical methods for approximating the solution to problems of algebraic linear equations.	K4
CO5	Solve the problems related to Beta and Gamma functions.	K3

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	M	M	H	H	M	H	H
CO2	H	H	H	H	H	H	M	H	H
CO3	H	H	H	H	H	H	M	H	H
CO4	H	H	H	H	H	H	M	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Matrices:** Symmetric and Skew Symmetric matrices - Hermitian and Skew - Hermitian matrices - Orthogonal and unitary matrices - Characteristic Equation of a matrix – Characteristic vectors of a matrix - Cayley-Hamilton's theorem (without proof) - Simple Problems. **Text Book 1: Chapter 5** **(Page No. 5.8 - 5.24 and 5.50 - 5.75)**	18
Unit II	**Theory of Equations:**Fundamental theorem in the theory of Equations - Relation between the roots and co-efficient of an Equation - Imaginary and Irrational roots. **Text Book 1: Chapter 6: Sections: 1- 4** **(Page No. 6.1 - 6.26)** Reciprocal Equation - Diminishing the roots of an Equation - Removal of term - Simple Problems. **Text Book 1: Chapter 6 : Sections: 6, 9, 10** **(Page No.6.30 - 6.37 and 6.49 - 6.56)**	18
Unit III	**Binomial Series:**Summation of Binomial Series - Exponential series - Logarithmic series - Simple Problems. **Text Book 1: Chapter 2: Sections: 3 (Page No. 2.4 - 2.21)** **Chapter 3 Sections: 1, 2 (Page No. 3.1 - 3.23)** **Chapter 4 (Page No. 4.1 - 4.21)**	18
Unit IV	**Solution of Simultaneous Linear Algebraic Equations – Direct Methods:** Introduction - Gauss Elimination Method – Gauss Jordan Elimination Method - Inversion of a matrix using Gauss Elimination Method **Text Book 2: Chapter 4: Sections: 4.1 – 4.3**	18
Unit V	Beta, Gamma Functions - Simple Problems. **Text Book 1: Chapter 30 (Page No.30.1 - 30.31)**	18
	Total Contact Hrs.	**90**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

1. Dr. Vittal P. R,*Allied Mathematics*, Fourth Edition, Margham Publications, Chennai, 2010.
2. Kandasamy P, Thilagavathy K and Gunavathi K, Numerical Methods, S. Chand company Ltd, 2012.

Books for Reference :

Frank Ayres, *Shaum's outline of theory and problem of matrices.*

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.youtube.com/watch?v=xyAuNHPsq-g
2. https://www.youtube.com/watch?v=JoyvDWZ0aMY

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Dr. V. INTHUMATHI Signature	Name: Dr. V. INTHUMATHI Signature	Name:K. SRINIVASAN Signature	Name: K. SRINIVASAN Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UPS	**Programme Title:**	B.Sc., Physics	
Course Code:	24UPS1A1	**Title**	**Batch :**	2024 - 2027
		MATHEMATICS FOR PHYSICS – I	**Semester**	I
Hrs/Week	6		**Credits :**	4

Course Objective

This course provides a platform to understand the fundamental concepts of Matrices, Theory of Equations, Summation of series and some Special functions.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Acquire knowledge about different types of matrices and finding characteristic roots and vectors of a matrix.	K2
CO2	Analyze the relation between roots and coefficients of the polynomial equations.	K3
CO3	Know the concept of Binomial, Exponential, Logarithmic series and their application to summation of series.	K2
CO4	Apply the numerical methods for approximating the solution to problems of algebraic linear equations.	K4
CO5	Solve the problems related to Beta and Gamma functions.	K3

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	M	M	H	H	M	H	H
CO2	H	H	H	H	H	H	M	H	H
CO3	H	H	H	H	H	H	M	H	H
CO4	H	H	H	H	H	H	M	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Matrices:** Symmetric and Skew Symmetric matrices - Hermitian and Skew - Hermitian matrices - Orthogonal and unitary matrices - Characteristic Equation of a matrix – Characteristic vectors of a matrix - Cayley-Hamilton's theorem (without proof) - Simple Problems. **Text Book 1: Chapter 5** **(Page No. 5.8 - 5.24 and 5.50 - 5.75)**	18
Unit II	**Theory of Equations:**Fundamental theorem in the theory of Equations - Relation between the roots and co-efficient of an Equation - Imaginary and Irrational roots. **Text Book 1: Chapter 6: Sections: 1- 4** **(Page No. 6.1 - 6.26)** Reciprocal Equation - Diminishing the roots of an Equation - Removal of term - Simple Problems. **Text Book 1: Chapter 6 : Sections: 6, 9, 10** **(Page No.6.30 - 6.37 and 6.49 - 6.56)**	18
Unit III	**Binomial Series:**Summation of Binomial Series - Exponential series - Logarithmic series - Simple Problems. **Text Book 1: Chapter 2: Sections: 3 (Page No. 2.4 - 2.21)** **Chapter 3 Sections: 1, 2 (Page No. 3.1 - 3.23)** **Chapter 4 (Page No. 4.1 - 4.21)**	18
Unit IV	**Solution of Simultaneous Linear Algebraic Equations – Direct Methods:** Introduction - Gauss Elimination Method – Gauss Jordan Elimination Method - Inversion of a matrix using Gauss Elimination Method **Text Book 2: Chapter 4: Sections: 4.1 – 4.3**	18
Unit V	Beta, Gamma Functions - Simple Problems. **Text Book 1: Chapter 30 (Page No.30.1 - 30.31)**	18
	Total Contact Hrs.	**90**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

1. Dr. Vittal P. R,*Allied Mathematics,* Fourth Edition, Margham Publications, Chennai, 2010.
2. Kandasamy P, Thilagavathy K and Gunavathi K, Numerical Methods, S. Chand company Ltd, 2012.

Books for Reference :

Frank Ayres*, Shaum's outline of theory and problem of matrices.*

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1. https://www.youtube.com/watch?v=xyAuNHPsq-g
2. https://www.youtube.com/watch?v=JoyvDWZ0aMY

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Dr. V. INTHUMATHI Signature	Name: Dr. V. INTHUMATHI Signature	Name:K. SRINIVASAN Signature	Name: K. SRINIVASAN Signature

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Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS203	**Title**	**Batch:**	2024 - 2027
		TRIGONOMETRY, VECTORCALCULUS AND FOURIER SERIES	**Semester:**	II
Lecture Hrs./Week or Practical Hrs./Week	5		**Credits:**	4

Course Objective

This paper enables the students to provide basic knowledge of trigonometry, vector calculus and Fourier series.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Recall the basic concepts of vector analysis, trigonometry, differentiation and integration.	K1
CO2	Apply the differential operator to solve vector differential equations.	K3
CO3	Solve the multiple integrals by applying Gauss divergence theorem, Stoke's theorem and Green's theorem.	K3
CO4	Compute the expansion of trigonometric function as multiple of θ and a series of powers of θ.	K3
CO5	Find Fourier series expansion for odd and even functions of a given period and can apply to solve problems in mathematical physics.	K3

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	M	M	M	H	M	M	H	H
CO2	H	M	H	H	H	H	M	H	H
CO3	H	H	H	H	H	H	M	H	H
CO4	H	H	H	H	H	H	M	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	Expansions and Inverse circular functions: Expansions of $\cos^n \theta$ and $\sin^n \theta$ - Expansions of $\cos n\theta$ and $\sin n\theta$ - Power series for sin x and cos x – Related problems. **Text Book 1: Chapter 4: Sections: 1-3.** Circular and Hyperbolic Functions: Exponential function - Circular functions - hyperbolic functions - Relations between circular and hyperbolic functions- Related problems. **Text Book 1: Chapter 6: Sections: 6.1 – 6.4.**	15
Unit II	**Convergency and Divergency of Series:** Some general theorems concerning infinite series – Series of positive terms – Comparison tests – Cauchy's condensation test – D'Alembert's Ratio test – Cauchy's Root test –Raabe's test. **Text Book 2: Chapter 2: Sections: 11-20**.	15
Unit III	Fourier Series: Definition - Finding Fourier co-efficient for given periodic functions with period 2π and $2l$ - Even and odd functions - Half range series. **Text Book 3: Chapter 6: Sections: 1 – 6.1.**	15
Unit IV	Vector differentiation: Gradient, Curl and Divergence- Scalar and vector point functions - Level surface - Gradient of a scalar point function - Directional derivative of a scalar point function - Theorems (statement only) - Equations of tangent plane and normal line to a level surface (Self study) - Divergence and curl of a vector point function - Solenoidal vector - Irrotational vector - Vector identities. **Text Book 4: Chapter 1.**	15
Unit V	Vector integration: Line integral - Theorems on line integrals - Surface and Volume integrals - Gauss Divergence theorem - Stoke's theorem - Green's theorem in plane. (Statement only and relevant problems). **Text Book 4: Chapter 2.**	15
	Total Contact Hrs.	**75**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Books:

1. Duraipandian P., LaxmiDuraipandian and Jayamalaparamasivan, Trigonometry, Emerald Publishers, 1999.

2. Manicavachagompillay T. K, Natarajan T. and Ganapathy K. S, *Algebra Volume I*, S. Viswanathan Pvt. Ltd,First edition, 2010.
3. Narayanan S., ManicavachagomPillay T. K., Calculus Volume III, Viswanathan S (Publishers and Printers), 2010.
4. Vittal P. R. and Malini V., Vector Analysis, Margham Publication, 1997.

Books for Reference:

1. Gupta R., Vector Calculus, Firewall Media, 2005.
2. Narayanan S. and Manicavachagompillay T. K., Trigonometry, Viswanathan S (Publishers and Printers), 2012.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://nptel.ac.in/courses/111/105/111105122/
2. http://www.math.odu.edu/~jhh/Volume-2.PDF
3. https://www.whitman.edu/mathematics/calculus_online/chapter16.html
4. https://nptel.ac.in/courses/111/107/111107108/

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Dr. V. INTHUMATHI Signature	Name: Dr. V. INTHUMATHI Signature	Name:K. SRINIVASAN Signature	Name: K. SRINIVASAN Signature

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Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS204	**Title**	**Batch:**	2024- 2027
		ANALYTICAL GEOMETRY	**Semester:**	II
Lecture Hrs./Week or Practical Hrs./Week	5		**Credits:**	4

Course Objective

This paper enables the student to gain fundamental ideas about co-ordinate geometry and gives clear knowledge about regular geometrical aspects and their properties in two and three dimensions.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Recollect the basic properties of circle, sphere, parabola and hyperbola and can able to gain a deep knowledge in it.	K1
CO2	Understand the ideas about the relation between polar and cartesian co-ordinates of geometric figures in solving simple problems.	K2
CO3	Compute the equations of a chord to a circle and common tangents to a circle.	K3
CO4	Solve problems relating to right circular cone, enveloping cone and general quadric cone.	K3
CO5	Apply in real life problems in physics, engineering and computer graphics.	K3

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	H	H	H	H	H	H
CO2	H	H	H	H	H	M	H	H	H
CO3	H	H	H	H	M	M	H	H	H
CO4	H	H	H	H	M	M	H	H	H
CO5	H	H	H	H	M	M	M	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	Circle - *Common tangents to two circles (self study).* **Text book 1: Chapter 4: Sections: 4.10 – 4.14.** Parabola **Text book 1: Chapter 6: Sections: 6.5-6.7.** Ellipse **Text book 1: Chapter 7: Sections: 7.6-7.8.** Hyperbola - *Some properties of the asymptotes(self study).* **Text book 1: Chapter 8: Sections: 8.4-8.6.**	15
Unit II	Polar Equations **Text book 1: Chapter 9: Sections: 9.1 – 9.15.**	15
Unit III	Sphere **Text book 2: Chapter 4: Sections: 4.1- 4.8.**	15
Unit IV	Cone, Cylinder and Central quadrics **Text book 2: Chapter 5: Sections: 5.1 – 5.7.**	15
Unit V	Cone, Cylinder and Central quadrics **Text book 2: Chapter 5: Sections: 5.8 – 5.13**	15
	Total Contact Hrs.	**75**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Books:

1. ManicavachagomPillai T. K, Natarajan T, *A text book of Analytical Geometry part-I two dimensions*, S. Viswanathan printers & publishers Pvt. Ltd, 2018.
2. ManicavachagomPillai T. K, Natarajan T, *A text book of Analytical Geometry part-I three dimensions*, S. Viswanathan printers & publishers, Pvt. Ltd, 2019.

Books for Reference:

1. Duraipandian P., LaxmiDuraipandian, Muhilan D, *Analytical Geometry 2 dimensional*, Emerald publishers, 2000.
2. Duraipandian P., LaxmiDuraipandian, Muhilan D, *Analytical Geometry 3 dimensional*, Emerald publishers, 2000.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.youtube.com/watch?v=TpTA-xW2oq4
2. https://www.youtube.com/watch?v=cStx9_eWD5Y
3. https://www.youtube.com/watch?v=a2mt2L0e06Y

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Dr. N. SELVANAYAKI  Signature	Name: Dr. V. INTHUMATHI  Signature	Name:K. SRINIVASAN  Signature	Name: K. SRINIVASAN  Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS2A2	**Title**	**Batch:**	2024 - 2027
		MATHEMATICAL STATISTICS – II	**Semester:**	II
Lecture Hrs./Week or Practical Hrs./Week	6		**Credits:**	5

Course Objective

The objective of this paper is to introduce the concepts about correlation, regression, sample theory, sampling distributions and theory of estimation.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basics of regression line and the principles of least squares.	K2
CO2	Apply the concept of correlation and rank correlation in real life situations.	K3
CO3	Analyze the concepts of sampling techniques and procedure for testing of hypothesis for large samples.	K4
CO4	Apply chi square, t and F distributions for testing of attributes as well apply the Cramer Rao- inequality for estimation.	K3
CO5	Find good estimators for an unknown parameter using estimation theory	K3

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	M	H	H	H	H	H
CO2	H	H	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H	H	H
CO4	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Correlation:** Introduction – Meaning of correlation – Scatter diagram - Karl Pearson's coefficient of Correlation - Limits for Correlation Coefficient - Calculation of the Correlation Coefficient for a Bivariate Frequency Distribution - Rank Correlation - Spearmen's Rank Correlation Coefficient - problems only (no derivations). **Chapter 10: Sections: 10.1, 10.2, 10.3, 10.4, 10.4.1, 10.5, 10.7, 10.7.1.** **Linear Regression:** Introduction – Linear Regression - Regression Coefficients – Properties of Regression Coefficients- *Angle between two Lines of Regression (Self study)* – Simple Problems. **Chapter 11: Sections: 11.1, 11.2, 11.2.1, 11.2.2, 11.2.3.**	18
Unit II	**Large Sample Theory:** Introduction – Types of sampling – Purposive sampling –Random Sampling – simple sampling – Stratified sampling - Parameter and Statistic – Sampling Distribution of a Statistic - Standard Error - Tests of Significance - Null and alternative Hypothesis - Errors in sampling - Critical Region and Level of Significance - One-tailed and Two-tailed tests - Critical Values or Significant Values - Procedure for Testing of Hypothesis - Tests of Significance for Large Samples - Sampling of Attributes - Test of significance for Single Proportion - Test of significance for Difference of Proportions - Simple Problems. **Chapter 14 : Sections: 14.1, 14.2, 14.2.1, 14.2.2, 14.2.3, 14.2.4, 14.3, 14.3.1, 14.3.2, 14.4, 14.4.1-14.4.5, 14.5, 14.6, 14.7, 14.7.1, 14.7.2.**	18
Unit III	**Large Sample Theory:** Sampling of Variables - Test of significance for Single Mean – *Test of significance for Difference of Means (Self study)*- Simple Problems. **Chapter: 14 : Sections: 14.8, 14.8.3, 14.8.4.** **Chi – square (χ^2) Distribution:** Applications of Chi- square Distribution - Inferences about a Population Variance - Goodness of Fit Test - Test of Independence of Attributes-- Contingency Tables - Simple Problems. **Chapter 15: Sections: 15.6, 15.6.1, 15.6.2, 15.6.3.**	18
Unit IV	**t, F and z Distributions:** Applications of t-Distribution - t-test for Single Mean - t-test for Difference of Means - t-test for Testing the Significance of an Observed Sample Correlation Coefficient - Applications of F-Distribution - F-test for Equality of Two Population Variances - Simple Problems. **Chapter 16: Sections: 16.3, 16.3.1, 16.3.2, 16.3.4, 16.6, 16.6.1.**	18
Unit V	**Theory of Estimation:** Introduction - Characteristic of estimators – Unbiasedness –Consistency – Efficient estimators – Sufficiency – Cramer-Rao inequality – Simple problems – Methods of estimation – Method of maximum likelihood estimation – Properties of maximum Likelihood Estimators – Method of moments - Simple Problems. **Chapter 17: Sections: 17.1, 17.2, 17.2.1, 17.2.2, 17.2.3, 17.2.4, 17.3, 17.6, 17.6.1, 17.6.3.**	18
	Total Contact Hrs.	**90**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Gupta S. C and Kapoor V. K., Fundamentals of Mathematical Statistics, Eleventh edition, S. Chand & Sons, New Delhi,2009.

Books for Reference:

1. Hogg R. V and Craigh A. G., Introduction to Mathematical Statistics, Pearson Education publications, 2004.
2. Veerarajan T., Fundamentals of Mathematical Statistics, Yes Dee PublishingPvt.Ltd., 2017.
3. Vital P. R., *Mathematical Statistics*,Margham publications, 2004.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. http://www.khanacademy.com
2. https://nptel.ac.in/courses/111/105/111105124/
3. https://nptel.ac.in/courses/111/105/111105090/

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Dr. M. MAHESWARI M. Mahesw Signature	Name: Dr. V. INTHUMATHI V. Inthumathi Signature	Name:K. SRINIVASAN Signature	Name: K. SRINIVASAN Signature

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NGM College (Autonomous
POLLACHI - 642 001.

Programme Code:	UCY	**ProgrammeTitle :**	B.Sc. Chemistry	
Course Code:	24UCY2A2	**Title**	**Batch :**	2024-2027
		MATHEMATICS FOR CHEMISTRY-II	**Semester**	II
Hrs/Week	6		**Credits :**	4

Course Objective

This paper enables the students to acquire the ability in solving problems in hyperbolic functions, Laplace and Inverse Laplace transforms and vector calculus.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of circular functions and hyperbolic functions.	K2
CO2	Apply Laplace transform for solving differential equations.	K3
CO3	Apply the concepts of Gradient, Curl and Divergence in computing vector differentiation problems.	K3
CO4	Compute problems on line integral, surface integral and volume integral.	K4
CO5	Solve the multiple integrals by applying Gauss divergence theorem and Green's theorem.	K4

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	H	M	H	H	H	H
CO2	H	M	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H	H	H
CO4	H	M	H	H	H	H	M	H	H
CO5	H	H	H	H	M	M	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Hyperbolic functions**: Relations between circular and hyperbolic functions - Addition formula for hyperbolic functions - Problems. **Chapter 14: Sections: 1-9** **(Pg. No. : 14.31 to14.37 and 14.40 to 14.55)** **Laplace Transform**: Definition - Laplace transform of elementary function - Linear Property – Shifting Property - Change of scale property - Laplace transform of derivatives - Laplace transform of integrals - Multiplication by t - problems. **Chapter 27: Sections:1,2** **(Pg. No. : 27.1 to 27.20)**	18
Unit II	**Inverse Laplace Transform**: Inverse Laplace Transform of some functions-Properties of Inverse Laplace Transform-Problems-Solving Differential Equations using Laplace Transform-Problems. **Chapter 27: Sections:4, 5** **(Pg. No. : 27.23 to 27.62)**	18
Unit III	**Vector Differentiation**: Gradient, Curl and Divergence – Problems-Divergence and Curl of a Vector point function-Problems-Vector Identities-Problems. **Chapter 28** **(Pg. No.: 6 to 53)**	18
Unit IV	**Vector Integration:**Line Integral - Surface Integral - Volume Integral - Simple Problems. **Chapter 29** **(Pg. No. : 59 to 88)**	18
Unit V	**Vector Integration:**Gauss Divergence Theorem(without proof) -Green's theorem (without proof) - Simple Problems. **Chapter 29** **(Pg. No.: 94 to 107 and 129 to 141)**	18
	Total Contact Hrs.	**90**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Vittal P. R,*Allied Mathematics*, Fourth Edition, Margham Publications, Chennai, 2010.

Books for Reference:

1. Murray R. Spiegel, *Shaum's outline of theory and problem of vector analysis*
2. Murray R. Spiegel, *Shaum's outline of theory and problem of Laplace Transform.*

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.youtube.com/watch?v=Pq-tUQzeSRw
2. https://www.youtube.com/watch?v=M0H1UJbn-V4

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Dr. V. INTHUMATHI Signature	Name: Dr. V. INTHUMATHI Signature	Name:K. SRINIVASAN Signature	Name: K. SRINIVASAN Signature

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NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UCY	**Programme Title:**	B.Sc. Chemistry	
Course Code:	24UCY2A3	**Title**	**Batch:**	2024 - 2027
		Programming Lab for Chemistry using MATLAB	**Semester:**	II
Lecture Hrs./Week or Practical Hrs./Week	2		**Credits:**	2

Course Objective

This course ensures a practical knowledge for computing the sub matrices from the existing matrix and finding the derivative of polynomials.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Create a matrix using MATLAB	K3
CO2	Calculateeigen values and eigen vectors of the matrix using MATLAB.	K5
CO3	Solve a system of linear equations using MATLAB	K4
CO4	Calculate the first and second derivative of a polynomial using MATLAB	K5
CO5	Find the integral of a function using MATLAB	K3

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	H	M	H	M	M	H
CO2	H	H	H	H	M	H	H	M	H
CO3	H	H	H	H	M	H	H	M	H
CO4	H	H	H	H	M	H	H	M	H
CO5	H	H	H	H	M	H	H	M	H

H - HIGH; M - MEDIUM; L - LOW.

List of programs:

1. Program for creating a matrix 5×4

2. Program for finding the characteristic equation of the 3×3 matrix
3. Program to illustrate the row vector problem in a given matrix $\begin{bmatrix} 6 & 43 & 2 & 11 & 87 \\ 12 & 6 & 34 & 0 & 5 \\ 34 & 18 & 7 & 41 & 9 \end{bmatrix}$
4. Program to illustrate the column vector problem in a given matrix $\begin{bmatrix} 2 & 4 & 6 & 8 & 10 \\ 3 & 6 & 9 & 12 & 15 \\ 7 & 14 & 21 & 28 & 35 \end{bmatrix}$
5. Program to illustrate the creation of sub matrix from a given 4×7 matrix
6. Program to finding the eigen values of the 3×3 matrix
7. Program to check the matrix 3×3 is symmetric or skew symmetric
8. Program to solve the system of linear equations $\begin{aligned} 4x - 2y + 6z &= 8 \\ 2x + 8y + 2z &= 4 \\ 6x + 10y + 3z &= 0 \end{aligned}$

9. Program to create a 6×6 matrix in which the middle rows and the middle two columns are 1's and the rest are zeros.
10. The following were the daily maximum temperature (in °F) in Washington In during the month of April, 2002: 58 73 73 53 50 48 56 73 66 69 63 74 82 91 93 89 91 80 59 69 56 64 63 66 64 74 63 69, (data from the U.S. National Organic and Atmospheric Administrations). Use relational and logical operations determine the following:
    A) The number of days the temperature was above 75°
    B) The number of days the temperature was between 65° and 80°
    C) The days of the month that the temperature was between 50° and 60°
11. A worker is paid according to his hourly wage up to 40 hours, and 50% more for overtime. Write a program in a script file that calculates the pay to a worker. The programs ask the user to enter the number of hours and the hourly wage. The program the displays the pay.
12. A vector is given by V=[5,17,-3,8,0,-1,12,15,20,-6,6,4,-7,16]. Write a program as a script file that doubles the elements that are positive and are divisible by 3 and/or 5, and raise to the power of 3 the elements that are negative but greater than -5.
13. For the polynomial $f(x) = x^5 - 12.1x^4 + 40.59x^3 - 17.015x^2 - 71.95x + 35.88$
    a) Calculate $f(9)$
    b) Calculate $f(x)$ for $0 <= x <= 10$
14. Create 3×3 matrix to demonstrate that matrix multiplication is not commutative.
15. Program to find the first and second derivative of $f(x) = x^5 - 12.1x^4 + 40.59x^3 - 17.015x^2 - 71.95x + 35.88$
16. Program to find the first and second derivative of $f(x) = e^{3x+2}$ and find $\int_0^{\frac{\pi}{2}} \sin(2x)\, dx$
17. Program to find the inverse of a matrix.
18. Program to find the element by element operations.
19. Program in a script file that determines the real roots of a quadratic equation
$$ax^2 + bx + c = 0.$$

20. The maximum daily temperatures (in ^{0}F) for New York city and Anchorage Alaska during the month of January 2001 are given in the vectors below (data from the U.S. National Oceanic Atmospheric Administration). TNY=[31 26 30 33 33 39 41 41 34 33 45 42 36 39 37 45 43 36 41 37 32 32 35 42 38 33 40 37 36 51 50]
TANC=[37 24 28 25 21 28 46 37 36 20 24 31 34 40 43 36 34 41 42 35 38 36 35 33 42 42 37 26 20 25 31].Write a Program in a script file to answer the following:
a) Calculate the average temperature for the month in each city.
b) How many days was the temperature below the average in each city.
c) How many days, and which dates in the month, was the temperature the same in both cities?
d) How many days, and which dates in the month, was the temperature in both cities above freezing(above 32^0F)

21. Program for divide the polynomial $15x^5 + 35x^4 - 37x^3 - 19x^2 + 41x - 15$ by polynomial $5x^3 - 4x + 3$

Text Book:

Amos Gilat, *MATLAB - An Introduction with Application*, John Wiley & Sons, Singapore, Third Edition, 2007.

Books for Reference:

1. Etter D. M., Kuncicky D. C. and Moore H., Introduction to MATLAB 7, Prentice Hall, New Jersy, 2009.
2. Palm W. J., Introduction to MATLAB 7 for Engineers, McGraw-Hill Education, New York, 2005.
3. Prata R. P., Getting Started with MATLAB - A Quick Introduction for Scientist and Engineers, Oxford University Press, New Delhi, 2010.

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Dr. N. SELVANAYAKI Signature	Name: Dr. V. INTHUMATHI Signature	Name:K. SRINIVASAN Signature	Name: K. SRINIVASAN Signature

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Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UPS	**ProgrammeTitle :**	B.Sc. Physics	
Course Code:	24UPS2A2	**Title**	**Batch :**	2024-2027
		MATHEMATICS FOR PHYSICS-II	**Semester**	II
Hrs/Week	6		**Credits :**	4

Course Objective

This paper enables the students to acquire the ability in solving problems in hyperbolic functions, Laplace and Inverse Laplace transforms and vector calculus.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of circular functions and hyperbolic functions.	K2
CO2	Apply Laplace transform for solving differential equations.	K3
CO3	Apply the concepts of Gradient, Curl and Divergence in computing vector differentiation problems.	K3
CO4	Compute problems on line integral, surface integral and volume integral.	K4
CO5	Solve the multiple integrals by applying Gauss divergence theorem and Green's theorem.	K4

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	H	M	H	H	H	H
CO2	H	M	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H	H	H
CO4	H	M	H	H	H	H	M	H	H
CO5	H	H	H	H	M	M	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Hyperbolic functions**: Relations between circular and hyperbolic functions - Addition formula for hyperbolic functions - Problems. **Chapter 14: Sections: 1-9** **(Pg. No. : 14.31 to14.37 and 14.40 to 14.55)** **Laplace Transform**: Definition - Laplace transform of elementary function - Linear Property – Shifting Property - Change of scale property - Laplace transform of derivatives - Laplace transform of integrals - Multiplication by t - problems. **Chapter 27: Sections:1,2** **(Pg. No. : 27.1 to 27.20)**	18
Unit II	**Inverse Laplace Transform**: Inverse Laplace Transform of some functions-Properties of Inverse Laplace Transform-Problems-Solving Differential Equations using Laplace Transform-Problems. **Chapter 27: Sections:4, 5** **(Pg. No. : 27.23 to 27.62)**	18
Unit III	**Vector Differentiation**: Gradient, Curl and Divergence – Problems-Divergence and Curl of a Vector point function-Problems-Vector Identities-Problems. **Chapter 28** **(Pg. No.: 6 to 53)**	18
Unit IV	**Vector Integration:**Line Integral - Surface Integral - Volume Integral - Simple Problems. **Chapter 29** **(Pg. No. : 59 to 88)**	18
Unit V	**Vector Integration:**Gauss Divergence Theorem(without proof) -Stoke's Theorem(without proof) -Green's theorem (without proof) - Simple Problems. **Chapter 29** **(Pg. No.: 94 to 141)**	18
	Total Contact Hrs.	**90**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Vittal P. R,*Allied Mathematics,* Fourth Edition, Margham Publications, Chennai, 2010.

Books for Reference:

1. Murray R. Spiegel*, Shaum's outline of theory and problem of vector analysis.*
2. Murray R. Spiegel*, Shaum's outline of theory and problem of Laplace transform.*

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.youtube.com/watch?v=Pq-tUQzeSRw
2. https://www.youtube.com/watch?v=M0H1UJbn-V4

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Dr. V. INTHUMATHI Signature	Name: Dr. V. INTHUMATHI Signature	Name:K. SRINIVASAN Signature	Name: K. SRINIVASAN Signature

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Pollachi - 642 001.

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Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UPS	**Programme Title:**	B.Sc. Physics	
Course Code:	24UPS2A3	**Title**	**Batch:**	2024 - 2027
		Programming Lab for Physics using MATLAB	**Semester:**	II
Lecture Hrs./Week or Practical Hrs./Week	2		**Credits:**	2

Course Objective

This course ensures a practical knowledge for computing the sub matrices from the existing matrix and finding the derivative of polynomials.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Create a matrix using MATLAB	K3
CO2	Calculateeigen values and eigen vectors of the matrix using MATLAB.	K5
CO3	Solve a system of linear equations using MATLAB	K4
CO4	Calculate the first and second derivative of a polynomial using MATLAB	K5
CO5	Find the integral of a function using MATLAB	K3

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	H	M	H	M	M	H
CO2	H	H	H	H	M	H	H	M	H
CO3	H	H	H	H	M	H	H	M	H
CO4	H	H	H	H	M	H	H	M	H
CO5	H	H	H	H	M	H	H	M	H

H - HIGH; M - MEDIUM; L - LOW.

List of programs:

1. Program for creating a matrix 5×4
2. Program for finding the characteristic equation of the 3×3 matrix

3. Program to illustrate the row vector problem in a given matrix $\begin{bmatrix} 6 & 43 & 2 & 11 & 87 \\ 12 & 6 & 34 & 0 & 5 \\ 34 & 18 & 7 & 41 & 9 \end{bmatrix}$
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5. Program to illustrate the creation of sub matrix from a given 4×7 matrix
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7. Program to check the matrix 3×3 is symmetric or skew symmetric
8. Program to solve the system of linear equations $\begin{aligned} 4x - 2y + 6z &= 8 \\ 2x + 8y + 2z &= 4 \\ 6x + 10y + 3z &= 0 \end{aligned}$

9. Program to create a 6×6 matrix in which the middle rows and the middle two columns are 1's and the rest are zeros.
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11. The number of days the temperature was above 75°
12. The number of days the temperature was between 65° and 80°
13. The days of the month that the temperature was between 50° and 60°
14. A worker is paid according to his hourly wage up to 40 hours, and 50% more for overtime. Write a program in a script file that calculates the pay to a worker. The programs ask the user to enter the number of hours and the hourly wage. The program the displays the pay.
15. A vector is given by V=[5,17,-3,8,0,-1,12,15,20,-6,6,4,-7,16]. Write a program as a script file that doubles the elements that are positive and are divisible by 3 and/or 5, and raise to the power of 3 the elements that are negative but greater than -5.
16. For the polynomial $f(x) = x^5 - 12.1x^4 + 40.59x^3 - 17.015x^2 - 71.95x + 35.88$
17. Calculate $f(9)$
18. Calculate $f(x)$ for $0 <= x <= 10$
19. Create 3×3 matrix to demonstrate that matrix multiplication is not commutative.
20. Program to find the first and second derivative of $f(x) = x^5 - 12.1x^4 + 40.59x^3 - 17.015x^2 - 71.95x + 35.88$
21. Program to find the first and second derivative of $f(x) = e^{3x+2}$ and find $\int_0^{\frac{\pi}{2}} \sin(2x)\, dx$
22. Program to find the inverse of a matrix.
23. Program to find the element by element operations.
24. Program in a script file that determines the real roots of a quadratic equation
    a. $ax^2 + bx + c = 0$.

25. The maximum daily temperatures (in ^{0}F) for New York city and Anchorage Alaska during the month of January 2001 are given in the vectors below (data from the U.S. National Oceanic Atmospheric Administration). TNY=[31 26 30 33 33 39 41 41 34 33 45 42 36 39 37 45 43 36 41 37 32 32 35 42 38 33 40 37 36 51 50]
26. TANC=[37 24 28 25 21 28 46 37 36 20 24 31 34 40 43 36 34 41 42 35 38 36 35 33 42 42 37 26 20 25 31].Write a Program in a script file to answer the following:
    i. Calculate the average temperature for the month in each city.
    ii. How many days was the temperature below the average in each city.
    iii. How many days, and which dates in the month, was the temperature the same in both cities?
    iv. How many days, and which dates in the month, was the temperature in both cities above freezing(above 32^0F)

27. Program for divide the polynomial $15x^5 + 35x^4 - 37x^3 - 19x^2 + 41x - 15$ by polynomial $5x^3 - 4x + 3$

Text Book:

Amos Gilat, *MATLAB - An Introduction with Application,* John Wiley & Sons, Singapore, Third Edition, 2007.

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2. Palm W. J., Introduction to MATLAB 7 for Engineers, McGraw-Hill Education, New York, 2005.
3. Prata R. P., Getting Started with MATLAB - A Quick Introduction for Scientist and Engineers, Oxford University Press, New Delhi, 2010.

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K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS305	**Title**	**Batch:**	2024 - 2027
		STATICS	**Semester:**	III
Lecture Hrs./Week or Practical Hrs./Week	4		**Credits:**	4

Course Objective

This course enables a deep knowledge about the concept of Forces, Moments, Friction, Gravity and resultant of more than one force acting on a surface. It also includes simple problems in each topic which develops the application skills of the students in solving them.

Course Outcomes(CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Recall the basic concepts like friction, centre of gravity, moments.	K1
CO2	Apply the concepts of parallel forces and moments, use them to solve problems.	K3
CO3	Apply and solve the problems in coplanar forces, couples forces and resultant of more than one force acting on a surface.	K3
CO4	Analyse the concepts of friction and centre of gravity.	K4
CO5	Enrich the knowledge in this course to pursue higher degree and get employability.	K3

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	M	M	M	M	M	H	M
CO2	H	H	H	H	H	M	M	H	M
CO3	H	H	H	H	H	H	M	H	M
CO4	H	H	H	H	H	H	H	H	M
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	Forces acting at a point - Simple problems. **Chapter 2: Sections: 5-16.**	12
Unit II	Parallel forces -*Moments (Self study)* - Simple problems. **Chapter 3: Sections: 1 - 13.**	12
Unit III	Couples - Simple problems **Chapter 4: Sections: 1-10.**	12
Unit IV	Equilibrium of three forces acting on a rigid body - *Coplanar forces (Self study)* - Simple Problems. **Chapter 5: Sections: 1 - 6, Chapter 6: Sections: 1 - 9.**	12
Unit V	Friction and Centre of gravity – Simple problems. **Chapter 7:Sections: 1, 3-8, 10-12, Chapter 8: Sections : 1-6, 18.**	12
	Total Contact Hrs.	**60**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Venkataraman M. K, *Statics*, Sixth Edition, Agasthiar publications, 2007.

Books for Reference:

1. Dharmapadam A. V, *Statics*,S. Viswanathan printers and Publishers Pvt. Ltd, 1993.
2. Duraipandian P and LaxmiDuraipandian, *Mechanics*, Ram Nagar, New Delhi, S. Chand & Co. Pvt. Ltd, 1985.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

https://nptel.ac.in/courses/112/106/112106180/

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Mrs. M.AMSAVENI Signature	Name: Dr. V. INTHUMATHI Signature	Name: Signature	Name: Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

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Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS306	**Title**	**Batch:**	2024 - 2027
		NUMERICAL TECHNIQUES	**Semester:**	III
Lecture Hrs./Week or Practical Hrs./Week	4		**Credits:**	3

Course Objective

This course helps the students to have an in-depth knowledge of various advanced methods in numerical analysis. The students to use numerical techniques to get numerical solutions of equations like transcendental and non-linear differential equations when ordinary analytical methods fail.

Course Outcomes (CO)

On successful completion of this core paper, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the need of numerical analysis techniques in the areas of approximation theory, and recall some basic concepts.	K1
CO2	Apply the numerical methods for approximating the solution to problems of algebraic and transcendental equations, simultaneous linear equations.	K3
CO3	Estimating the value of a function for any intermediate value of the independent variable using Newton Forward and Backward interpolation Formula as well compute the derivatives using Newton's forward and backward difference formula and Sterling's formula.	K3
CO4	Solve the ordinary and partial differential equations by using Numerical method techniques like Taylors method, Euler's method, RungeKutta method etc.	K4
CO5	Enrich the knowledge of numerical techniques and getting insight of algorithmic approach.	K4

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	M	M	M	M	H	M
CO2	H	H	H	H	M	M	M	H	M
CO3	H	H	H	H	H	H	H	H	M
CO4	H	H	H	H	H	H	H	H	M
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Simultaneous Linear Algebraic Equations:** Introduction – Gauss Elimination Method – Gauss Jordan Method – Computation of the inverse of a Matrix using Gauss's Elimination Method. **Chapter 4: Sections: 1 – 3.** **Simultaneous Linear Algebraic Equations:** Iterative Methods - Gauss-Jacobi Method – Gauss-Seidal Method – *Comparison of Gauss elimination and Gauss-Seidal Iteration methods (Self study).* **Chapter 4: Sections: 6, 7.**	12
Unit II	**Interpolation**: Introduction - Linear interpolation - Gregory Newton Forward and Backward interpolation Formula - Equidistant terms with one or more missing values. **Chapter 6: Sections: 1 - 5.** **Interpolation with unequal intervals:** Divided differences-Properties of Divided Differences-Newton's Interpolation Formula for unequal Intervals. **Chapter 8: Sections: 1 - 3.**	12
Unit III	**Numerical Differentiation**: Introduction - Newton's forward difference formula to compute the derivatives - Newton's backward difference formula to compute the derivatives - Derivatives using Stirling's formula. **Chapter 9: Sections: 1 - 4.** **Numerical Integration**: The Trapezoidal rule - Romberg's method - Simpson's one third rule - Practical applications of Simpson's rule. **Chapter 9: Sections: 8 -10 and 12.**	12
Unit IV	**Numerical Solution of Ordinary Differential Equations**: Solution by Taylor Series - Taylor Series method for higher order differential equations- Euler's method - Improved Euler's method - Modified Euler method - RungeKutta method - Second order RungeKutta Method - *Higher order RungeKutta methods (Self study)*. **Chapter 11: Sections: 6, 8, 10 - 15**.	12
Unit V	**Numerical Solution of Partial Differential Equations**: Elliptic equations – Solution of Laplace's equation by Iteration – Poisson's equation. **Chapter 12: Sections: 5, 6, 7.**	12
	Total Contact Hrs.	**60**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Venkataraman M. K, *Numerical Methods in Science and Engineering*, The National Publishing Company, Madras, 2009.

Book for Reference:

Kandasamy P, Thilagavathy K and Gunavathi K, *Numerical Methods*, S. Chand company Ltd, 2012.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

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

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Dr. R. SANTHI Signature	Name: Dr. V. INTHUMATHI Signature	Name: Signature	Name: Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS3N1	**Title**	**Batch:**	2024 - 2027
		Non Major Elective I: QUANTITATIVE APTITUDE – I	**Semester:**	III
Lecture Hrs./Week or Practical Hrs./Week	2		**Credits:**	2

Course Objective

The objective of this syllabus is to make the students to clear competitive examination like Banking recruitment, Postal recruitment, Railway recruitment and TNPSC exams.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Recall the necessary fundamentals to take up the course	K2
CO2	Solve simple problems related to percentage , profit & loss, ratio & proportion.	K3
CO3	Apply the concepts of probability, permutations and combinations in solving real life problems.	K3
CO4	Develop logical thinking, problem solving skills and time management.	K4
CO5	Clear competitive exams in banking, postal and railway services, IT, etc..	K4

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	M	H	M	M	M	M	H
CO2	H	M	M	H	M	M	M	M	H
CO3	H	H	M	H	M	M	M	M	H
CO4	H	H	M	H	M	M	M	M	H
CO5	H	H	M	H	M	M	M	M	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Percentage:** Introduction - Important facts and family - Concept of percentage - Simple problems. **Chapter 10** **Simplification:** Introduction - BODMAS rule - Simple problems. **Chapter 4**	3
Unit II	**Ratio and Proportion**: Ratio - Proportion - Simple problems. **Chapter 12:**	3
Unit III	**Profit and loss**: Introduction - Cost price - Selling price - Profit and loss - Simple Problems. **Chapter 11**	3
Unit IV	**Permutations and Combinations:** Factorial Notation – Permutations – Combinations. **Chapter 30**	3
Unit V	**Probability:** Sample Space – Results on probability. **Chapter 34**	3
	Total Contact Hrs.	**15**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Aggarwal R. S, *Quantitative Aptitude,* S. Chand & Company Ltd, Ram Nagar, New Delhi, 2013.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://youtu.be/2_XXuqkJFgs
2. https://youtu.be/g_Fahsgyn-Q

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Mrs. M. AMSAVENI Signature	Name: Dr. V. INTHUMATHI Signature	Name: Signature	Name: Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS3N2	**Title**	**Batch:**	2024 - 2027
		Non Major Elective I: ASTRONOMY- I	**Semester:**	III
Lecture Hrs./Week or Practical Hrs./Week	2		**Credits:**	2

Course Objective

This paper enables the learners to gain basic knowledge of the Solar System and the Milky Way.

Course Outcomes (CO)

On successful completion of this core paper, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concept of the Solar System.	K2
CO2	Become familiar with the Double & Multiple stars.	K2
CO3	Acquire the knowledge in the Milky Way.	K3
CO4	Know the various constellations.	K4
CO5	Analyze the concepts of Seasonal changes	K4

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	M	M	H	M	M	M	M	M
CO2	M	M	M	M	M	M	M	M	M
CO3	M	M	M	H	M	M	M	M	M
CO4	M	M	M	H	M	M	M	M	M
CO5	M	M	M	H	M	M	M	M	M

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**The Solar System**: Introduction - The Sun - Mercury - Venus - Mars - Asteroids - Jupiter - Saturn - Uranus - Neptune. **Chapter 16: Sections: 316 - 326.Pg.No : 455 – 467**	3
Unit II	**The Solar System**: Comets - Meteors - Zodiacal light. **Chapter 16 Sections: 327 - 329.Pg.No : 467 – 472**	3
Unit III	**Double And Multiple Stars**: Introduction - Variables stars - Eclipsing Variables Cepheid variables - Long period variables - Irregular variables - Novae - Star clusters Nebulae - Constellations - Zodiacal Constellations. **Chapter 17: Sections: 339 - 345.Pg.No : 481 -489**	3
Unit IV	**The Milky Way**: Introduction - Seasonal changes in the night sky - The winter Constellations - The spring Constellations. **Chapter 17: Sections: 346 - 347.Pg.No : 489 – 497**	3
Unit V	**Constellations**: Introduction - The summer Constellations - The autumn Constellations. **Chapter 17: Section: 347.Pg.No : 497 – 504**	3
	Total Contact Hrs.	**15**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Kumaravelu S and Susheela Kumaravelu, *Astronomy for degree classes*, 7th edition 1986.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://youtu.be/libKVRa01L8
2. **https://youtu.be/pIFiCLhJmig**

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Mrs. M. AMSAVENI Signature	Name: Dr. V. INTHUMATHI Signature	Name: Signature	Name: Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS407	**Title**	**Batch:**	2024 - 2027
		DYNAMICS	**Semester:**	IV
Lecture Hrs./Week or Practical Hrs./Week	4		**Credits:**	4

Course Objective

This course provides a thorough knowledge about the characteristics of Projectiles, Energies during impact and Collision. Each topic involves problems to solve which develops the application skills and thinking process of the students.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Recall the notions of matter, velocity, acceleration , force, momentum , moment of inertia etc.,	K1
CO2	Understand the concept of projectile motion and solving some simple problems related to it.	K2
CO3	Calculate radial and transverse components of velocity and acceleration, areal velocity of central orbits, describe the differential equation and pedal equation of central orbits.	K3
CO4	Apply the concepts of composition of simple harmonic motion in two directions.	K3
CO5	Analyze the concept of impulse, impulsive forces, direct & oblique impact of elastic bodies under collision and solve simple problems.	K4

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	M	M	M	H	H	M	H	H
CO2	H	H	H	H	H	H	M	H	H
CO3	H	H	H	H	H	H	M	H	H
CO4	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	Projectiles - Simple problems. **Chapter 6 :Sections : 6.1 - 6.8, 6.12 -6.15**	12
Unit II	Simple Harmonic Motion - Simple problems. **Chapter 10: Sections: 10.1 - 10.7.**	12
Unit III	Motion under the action of central forces - *Differential Equations of central orbits (Self study)* - Simple problems. **Chapter 11: Sections: 11.1 - 11.9.**	12
Unit IV	Impulsive forces - Simple problems. **Chapter 7: Sections: 7.1 - 7.6.**	12
Unit V	Collision of elastic bodies -. *Compression and Restitution (Self study)* - Simple problems. **Chapter 8: Sections: 8.1 - 8.8.**	12
	Total Contact Hrs.	**60**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Venkataraman M. K, *Dynamics*, Thirteenth Edition, Agasthiar publications, 2009.

Books for Reference:

1. Dharmapadam A. V, *Dynamics*, S. Viswanathan Printers and Publishers Pvt. Ltd, Chennai, 1998.
2. ViswanathNaik K and Kasi M. S, *Dynamics*, Emerald Publishers, 1992.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://youtu.be/uM2HpLBVAkA
2. https://youtu.be/glsXr4SpOMQ
3. https://youtu.be/pZZt357pk-I

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Mrs. A.GNANASOUNDARI Signature	Name: Dr. V. INTHUMATHI Signature	Name: Signature	Name: Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS408	**Title**	**Batch:**	2024 - 2027
		PROGRAMMING IN 'C'	**Semester:**	IV
Lecture Hrs./Week or Practical Hrs./Week	2		**Credits:**	3

Course Objective

C is a general- purpose structured programming language that is powerful, efficient and compact. The programming language C finds a wide variety of applications in the development of software. This course provides the students with all the fundamental concepts of the C language with some practical experience. Also helps the students to develop their programming skills and to build large programs.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the keywords, C-data types and variables.	K2
CO2	Apply the use of statements and looping structures.	K3
CO3	Analyze the concepts of user-defined functions, in-built functions and nesting of functions	K4
CO4	Acquire knowledge about use of multi-dimensional arrays & pointers.	K3
CO5	Sense the basic structure of C program and apply them to small projects.	K3

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	M	M	H	H	M	M	M
CO2	H	H	H	H	H	H	M	M	M
CO3	H	H	H	H	H	H	M	H	H
CO4	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Overview of C:** History of C - Importance of C - Basic Structure of C Programs **Constants ,Variables and Data Types:** Introduction - Character set - C Tokens - Keywords and identifiers - Constants - Variables - Data types - Declaration of variables - Assigning values to variables - Defining symbolic constants **Operators and Expressions:** Introduction -Arithmetic operators - Relational operators - Logical operators - Assignment operators - increment and Decrement operators - conditional operators- Bitwise operators- Special operators - Arithmetic expressions - Evaluation of expressions - *Precedence of arithmetic operators (Self study)* - Type conversions in expressions - Operator precedence - Mathematical functions. **Chapter 1: Sections : 1.1,1.2,1.8, Chapter 2: Sections : 2.1-2.8,2.10,2.11 Chapter 3: Sections : 3.1-3.12, 3.14-3.16**	6
Unit II	**Managing Input and Output Operations**: Introduction - Reading a character - writing a character - Formatted input - Formatted output. **Decision Making and Branching**: Introduction - Decision making with if statement - Simple if statement - The If … else statement - Nesting of if … else statements - The else if ladder - The switch statement - The ?: operator - The Go to statement. **Decision Making and Looping:** Introduction - The while statement - The do statement - The for statement - Jumps in loops - Simple programs. **Chapter 4: Sections: 4.1- 4.5, Chapter 5: Sections : 5.1-5.9** , **Chapter 6: Sections :6.1-6.5.**	6
Unit III	**Arrays:** Introduction - One dimensional arrays - Declarations of One dimensional arrays - Initializations of One dimensional arrays - Two dimensional arrays - Initializing Two dimensional arrays. **Arrays and Strings**: Introduction - Declaring and initializing string variables - Reading strings from terminal - Writing strings to screen - Arithmetic operations on characters - Putting strings together - comparison of two strings - String handling functions - *Table of strings (Self study).* **Chapter 7: Sections: 7.1 - 7.6 , Chapter 8: Sections : 8.1 - 8.9.**	6
Unit IV	**User defined Functions**: Introduction - Need for user defined functions - Multi-function Program - Elements of user defined functions - Definitions of functions - Return values and their types - Function Calls - Function Declaration - Category of Functions - No arguments and no return values - Arguments but no return values - Arguments with return values - No arguments but returns a value - Functions that return multiple values - Nesting of functions - Recursion. **Chapter 9 :Sections : 9.1 - 9.16**	6
Unit V	**Pointers:** Introduction - Understanding pointers - Accessing the address of a variable - Declaring pointer variables - Initialization of pointer variables - Accessing a variable through its pointer - Chain of Pointers - Pointer expressions - Pointer increments and scale factor - Pointers and arrays - Pointers and characters strings - Array of Pointers - Pointers as function arguments - Functions returning Pointers - Pointers to Functions . **Chapter 11: Sections: 11.1-11.15.**	6
	Total Contact Hrs.	**30**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Balagurusamy E., *Programming in ANSI C*, 7th Edition, Tata McGraw Hill Publishing Company Ltd, 2017.

Books for Reference:

1. Kernighan B. W and Ritchie D. M, *The C programming language*, Prentice Hall, 1997.
2. Kochan S. G, *Programming in C*, Hyden, 1983.
3. Venugopal, K. R and Prasad S. R, *Programming with C*, Tata McGraw Hill Publishing company ltd, 1997.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://youtu.be/55l-aZ7_F24
2. https://youtu.be/sY-s7O0FiYE

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Mrs. M.AMSAVENI Signature	Name: Dr. V. INTHUMATHI Signature	Name: Signature	Name: Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

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POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS409	**Title**	**Batch:**	2024 - 2027
		PROGRAMMING LAB IN 'C'	**Semester:**	IV
Lecture Hrs./Week or Practical Hrs./Week	2		**Credits:**	1

Course Objectives

The course is designed to provide a practical exposure to the students on 'C' language.

Course Outcomes (CO)

On completion of the course the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Write the programming code to understand the concepts of looping structure and conditional statements.	K3
CO2	Write the programming code for matrix operations to understand the array concepts	K3
CO3	Write the programming code using user-defined functions and nesting of functions	K3
CO4	Write the programming code using pointers	K4
CO5	Enrich the programming knowledge and debugging .	K3

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	M	M	H	M	H	M	M	H
CO2	H	H	H	H	M	H	H	M	H
CO3	H	M	H	H	M	H	H	M	H
CO4	H	M	H	H	M	H	H	M	H
CO5	H	M	H	H	M	H	H	M	H

H - HIGH; M - MEDIUM; L - LOW.

List of Programs:

1. Program to convert the given temperature in Fahrenheit to Celsius.
2. Program to convert days into months and days.
3. Program to find the solution of quadratic equation.
4. Program for finding Fibonacci sequence.
5. Program to sort a list and find its median.
6. Program to sort a list in ascending / descending order.
7. Program to calculate mean and standard deviation of a given series of numbers.
8. Program for finding the addition of two matrices.
9. Program for finding the multiplication of two matrices.
10. Program to find the largest of two numbers using nested if else statements.
11. Program to sort a list of strings in alphabetical order.
12. Program to compute nCr value.
13. Program to check whether the number is prime or not.
14. Program to check whether the year is leap year or not.
15. Program to illustrate the use of pointers in one dimensional array.

Text Book:

Balagurusamy E, *Programming in ANSI C*, 7th Edition, Tata McGraw Hill Publishing Company Ltd, 2017.

Books for Reference:

1. Kernighan B. W and Ritchie D. M, *The C programming language*, Prentice Hall, 1997.
2. Kochan S. G, *Programming in C*, Hyden, 1983.
3. Venugopal, K. R and Prasad S. R, *Programming with C*, Tata McGraw Hill Publishing company ltd, 1997.

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1. https://youtu.be/D53l7rRPlSs
2. https://youtu.be/s9fF8aSfQwg

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Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UAP			**Programme Title:**	B.A., / B.Sc., / B. Com.,	
CourseCode:	24UAP4S1			**Title**	**Batch:**	2024-2027
				SEC II: Naan Mudhalvan: QUANTITATIVE APTITUDE	**Semester:**	IV
LectureHrs./Week or PracticalHrs./Week	2	**Tutorial Hrs./Sem.**	5		**Credits:**	2

Course Objective

- To enable the students to refine their mathematical, logical, and analytical skills.
- The student will be able to answer real-life simple problems by using HCF and LCM.
- The student is able to apply the correct sequence of operations to find out the value of a given mathematical expression.
- The student will be able to solve the problem involving square roots, cube roots, and average.
- To make them prepare for various public and private sector exams and placement drives.
- To understand the functions of tableau for data process and deploy dashboard.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	To have fundamental **knowledge** of Mathematics about problems of numbers using Mathematical formulae.	K1
CO2	To **understand** the concepts of profit & loss related processing, simplification, etc.,	K2
CO3	To **apply** the formulae to real time problems on probability, Areas of surfaces and **apply** data visualization tool for any data set.	K3
CO4	To **analyze** the problems solving related to Age, Time and Distance and Time and Work etc. To **examine** their employability skills.	K4
CO5	Use their logical thinking and analytical abilities to **evaluate** puzzle and decision making related questions from company specific and other competitive tests / To critically **evaluate** numerous possibilities related to puzzles. To **develop** their Competitive skills and **improve** the decision-making skills. To **generate** analytical reports and presentations using Data Interpretation.	K5 K6

Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	H	M	M	M	L	H	M	M	M	M	M	M
CO2	H	L	H	M	M	M	L	M	M	M	M	M
CO3	H	H	M	M	L	H	H	H	L	H	M	H
CO4	H	M	H	H	H	M	H	H	H	H	L	H
CO5	M	M	L	H	M	H	M	M	M	M	H	M

H-High; M-Medium; L-Low

Units	Content	Hrs
Unit I	Numbers-HCF And LCM of Numbers-Decimal Fractions- Comparison of Fractions - Simplification- Square Root and Cube Roots – Average.	6
Unit II	Time and Work - Time and Distance – Mixtures or Allegations - Problems on Numbers - Problems on Ages –Percentage - Profits and Loss.	6
Unit III	Ratio and Proportion - Time and Work - Time and Distance - Simple Interest - Compound Interest - Area-Volume and Surface Area.	6
Unit IV	Permutation and Combination - Probability, Height and Distances - Boats and Streams - Odd Man Out &Series.	6
Unit V	Interpretation: Tabulation, Bar Graphs, Pie Chart, Line Charts.	6
	Total Contact Hrs	**30**

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods

Seminar, Quiz, Assignments, GroupTask.

Text Book

R.S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S.Chand & Company Ltd., New Delhi,2018.

Reference Books

1. Dinesh Khattar, The Pearson Guide to Quantitative Aptitude for Competitive Examinations, Pearson's Publications, New Delhi, 2nd Edition, 2013.
2. Praveen R.V., Quantitative Aptitude and Reasoning, PHI Learning Pvt. Ltd., New Delhi. 3rd Edition, 2016.
3. Rajesh Varma, Fast Track Objective Arithmetic, Arihant Publications India Limited, New Delhi, 2018.

4. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, McGraw Hill Education (India) Private Limited. 7th Edition, 2020.
5. Sarvesh K Verma, Quantitative Aptitude Quantum CAT, Arihant Publications India Limited, New Delhi; Twelve edition, 2022.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://www.javatpoint.com/aptitude/quantitative
2. https://www.toppr.com/guides/quantitative-aptitude/
3. https://www.tutorialspoint.com/quantitative_aptitude/index.htm
4. https://www.sscadda.com/quantitative-aptitude/
5. https://prepinsta.com/learn-aptitude/
6. https://www.indiabix.com/
7. https://www.icai.org/post.html?post_id=17790
8. https://tnpsc.news/tnpsc-study-materials
9. http://www.kalvisolai.com/p/kalvisolai-tnpsc-study-materials.html
10. https://byjus.com/free-ias-prep/tnpsc-study-material/

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Mr. K. SRINIVASAN & Dr. V. INDHUMATHI Signature	Name: Dr. V. INTHUMATHI Signature	Name: Signature	Name: Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
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Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS4N3	**Title**	**Batch:**	2024 - 2027
		Non Major Elective II: QUANTITATIVE APTITUDE – II	**Semester:**	IV
Lecture Hrs./Week or Practical Hrs./Week	2		**Credits:**	2

Course Objective

The objective of this syllabus is to make the students to clear competitive examination like Banking recruitment, Postal recruitment, Railway recruitment and TNPSC exams.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Recall the necessary fundamentals to take up the course	K2
CO2	Solve simple problems related to problems on ages , problems on trains and boats and streams.	K3
CO3	Apply the concepts of time and work, time and distance in solving real life problems.	K3
CO4	Develop logical thinking, problem solving skills and time management.	K4
CO5	Clear competitive exams in banking, Postal and railway services, IT, etc..	K4

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	M	M	M	H	M	H	M	M	H
CO2	H	H	M	H	M	H	M	M	H
CO3	H	H	M	H	M	H	M	M	H
CO4	H	H	M	H	M	H	M	M	H
CO5	H	H	M	H	M	H	M	M	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Problems on ages**: Problems on ages - Simple problems. **Chapter 8**.	3
Unit II	**Time and work**: Time and work - Simple problems. **Chapter 15**.	3
Unit III	**Time and Distance :** Time and Distance - Simple problems **Chapter 17.**	3
Unit IV	**Problems on trains**: Problems on trains with solved examples. **Chapter 18**	3
Unit V	**Boats and Streams:** Boats and Streams- Simple problems **Chapter 19**.	3
	Total Contact Hrs.	**15**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Aggarwal R. S, *Quantitative Aptitude,* S. Chand & Company Ltd, Ram Nagar, New Delhi, 2013.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://youtu.be/KE7tQf9spPg
2. https://youtu.be/ufbDCFUn6PY

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Mrs. M. AMSAVENI HOD Signature	Name: Dr. V. INTHUMATHI V. Inthumathi Signature	Name: Signature	Name: Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

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Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS4N4	**Title**	**Batch:**	2024 - 2027
		Non Major Elective II: ASTRONOMY – II	**Semester:**	IV
Lecture Hrs./Week or Practical Hrs./Week	2		**Credits:**	2

Course Objective

This paper enables the learners to learn about the Moon and Ellipses.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic knowledge of the Moon.	K2
CO2	Acquire the facts in Eclipses.	K2
CO3	Know the concept of planetary Phenomena.	K3
CO4	Find the application of Astronomical Instruments like sidereal clock and chronometer.	K4
CO5	Evaluate the Heliocentric motion of a planet	K4

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	M	M	H	M	H	M	M	M
CO2	M	M	H	H	M	H	M	M	M
CO3	M	M	H	H	M	H	M	M	M
CO4	M	M	M	H	M	H	M	M	M
CO5	M	H	M	H	M	H	M	M	M

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**The Moon:** Introduction - Sidereal month - Synodic month Elongation - Conjugation - Opposition - Quadratures Daily motion of the moon - Age of moon - Phase of moon. **Chapter 12: Sections: 228 – 238**	3
Unit II	**The Moon:** Moon exhibits the same side to the earth -Lunar Librations - summer and winter full moons path of the moon with respect to the sun - Perturbations of lunar orbit. **Chapter 12: Sections: 241 – 245**	3
Unit III	**Eclipses:** Introduction – Umbra and penumbra – Lunar eclipse – Solar eclipse – Length of earth's shadow **Chapter 13: Sections: 254 -257 and 264**	3
Unit IV	**Planetary Phenomena**: Introduction – Bode's law – Elongation – Conjugation, opposition and quadratures – Heliocentric motion of a planet. **Chapter 14: Sections: 283,284 and 286 – 288**	3
Unit V	**Astronomical Instruments**: Sidereal clock – Chronometer – Gnomon Sundial – The sextant. **Chapter 15: Sections: 303-306 and 310**	3
	Total Contact Hrs.	**15**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Kumaravelu S and Susheela Kumaravelu, *Astronomy for degree classes*,7th edition 1986.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://youtu.be/6Vc9ZiJ0qqw
2. https://youtu.be/qdI-1p21Cio

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Mrs. M. AMSAVENI HOD Signature	Name: Dr. V. INTHUMATHI V. Inthumathi Signature	Name: Signature	Name: Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

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Curriculum Development Cell (CDC)
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Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS510	**Title**	**Batch:**	2024 - 2027
		MODERN ALGEBRA	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	6		**Credits:**	5

Course Objective

To promote a better understanding of algebra and provides an adequate foundation for further study in abstract algebra and its applications in various branches of Mathematics.

Course Outcomes (CO)

On successful completion of this core paper, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the algebraic structures such as sets, mappings, relations, groups, rings and field.	K2
CO2	Understand the properties of groups, subgroups and applying in simple proofs and solving problems.	K3
CO3	Apply the results from group theory to study the properties of rings and fields and to possess the ability to work within their algebraic structures.	K3
CO4	Understand and analyze the concepts of group homomorphism, isomorphism for groups, rings and Euclidian rings.	K4
CO5	Enrich the knowledge in algebra to pursue higher degree and choose a teaching career.	K4

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	M	H	M	M	H	H
CO2	H	H	H	H	H	M	M	H	H
CO3	H	H	H	H	H	H	M	H	H
CO4	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Preliminary Notions:***Set Theory(Self study)-Mappings(Self study).* **Group Theory:**Definition of a Group - Some Examples of Groups - Some preliminary Lemmas – Subgroups – A Counting Principle. **Chapter 1:In Section 1.1, Theorem 1.1.1 only** **In Section 1.2, Lemma 1.2.1 onwards** **Chapter 2: Sections: 2.1 - 2.5.**	18
Unit II	**Group Theory:**Normal Subgroups and Quotient Groups - Homomorphisms. **Chapter 2: Sections: 2.6, 2.7.**	18
Unit III	**Group Theory:**Automorphisms - Cayley's Theorem - Permutation Groups – Another Counting Principle. **Chapter 2: Sections: 2.8 - 2.11.**	18
Unit IV	**Ring Theory:**Definition and Examples of Rings - Some Special Classes of Rings - Homomorphisms - Ideals and Quotient Rings. **Chapter 3: Sections: 3.1 - 3.4.**	18
Unit V	**Ring Theory:**More Ideals and Quotient Rings - The Field of Quotients of an Integral Domain - Euclidean Rings - A Particular Euclidean Ring. **Chapter 3: Sections: 3.5 - 3.8**	18
	Total Contact Hrs.	**90**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Herstein, I. N, *Topics in Algebra*, Wiley India Pvt. Ltd., New Delhi,2nd Edition, 2010.

Books for Reference:

1. Bhattacharya. P. B, Jain S. K, *A first course in group theory*, Wiley Eastern Pvt. Ltd, 1972.
2. Herstein I. N, *Abstract Algebra*, Prentice-Hall international, 1996.
3. Surjeetsingh, Qazizameeruddin, *Modern Algebra*, Vikas Publishing House Pvt. Ltd, Second Edition, 1975.
4. Santiago M.L, *Modern Algebra*, Tata McGraw Hill, 2003.
5. R. Balakrishnan and N. Ramabhadran, *A Text Book of Modern Algebra*, Vikas, New Delhi, 2000.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://nptel.ac.in/courses/111/106/111106137/
2. https://nptel.ac.in/courses/111/105/111105112/

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Dr. S. SIVASANKAR  Signature	Name: Dr. V. INTHUMATHI  Signature	Name:  Signature	Name:  Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS511	**Title**	**Batch:**	2024 - 2027
		REAL ANALYSIS - I	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	6		**Credits:**	4

Course Objective

To enable the learner to get into basic concepts of Real Analysis and obtain a foundation for further study in analysis.

Course Outcomes (CO)

On successful completion of the course student will be able to

CO Number	CO Statement	Knowledge Level
CO1	Demonstrate the fundamental properties of the real numbers which underpin the formal development of real analysis.	K2
CO2	Apply the concepts of closure and interior of sets, continuity, convergence to effectively communicate mathematics.	K3
CO3	Calculate the limits of various types of sequences, discuss the nature of continuity andanalyze their properties.	K3
CO4	Analyze the applications of intersection theorem, covering theorems and Bolzano-Weierstrass theorem.	K4
CO5	Understand the structure of a metric space and deal with the notions of continuity, completeness and connectedness.	K2

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	M	M	M	H	H	M	H	H
CO2	H	H	H	H	H	H	M	H	H
CO3	H	H	H	H	H	H	H	H	H
CO4	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Unit -1** **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 the supremum - Properties of the integers deduced from the completeness axiom - The Archimedean property of the real number system- Absolute values and the triangle inequality - The Cauchy Schwarz inequality - Plus and minus infinity and the extended real number system R*. **Chapter 1: Sections: 1.1 - 1.20 (Except 1.15 - 1.17).**	18
Unit II	**Some Basic Notations of Set Theory**: Ordered pairs - Cartesian product of two sets - Relations and functions - One to one functions and inverses - Composite functions - Sequences -Similar sets - Finite and infinite sets - Countable and uncountable sets - Unaccountability of the real number system - Set algebra - Countable collections of countable sets. **Chapter 2: Sections: 2.3 - 2.15 (Except 2.6).**	18
Unit III	**Elements of Point Set Topology**: Euclidean space R^n - Open balls and open sets in R^n - The structure of open sets in R^1 - Closed sets - Adherent points, Accumulation points - Closed sets and adherent points - The Bolzano-Weierstrass theorem - The Cantor intersection theorem - Lindelof covering theorem - The Heine-Borel covering theorem - Compactness in R^n . **Chapter 3: Sections: 3.2 - 3.12.**	18
Unit IV	**Elements of Point Set Topology**: Metric spaces - Point set topology in metric spaces - Compact subsets of a metric space - Boundary of a set. Limits and Continuity: Convergent sequences in a metric space - Cauchy sequences - Complete metric spaces - Limit of a function - Limits of vector valued functions. **Chapter 3: Sections: 3.13 - 3.16, Chapter 4: Sections : 4.2 - 4.5, 4.7.**	18
Unit V	**Limits and Continuity**: Continuous function - Continuity of composite functions - Continuity and inverse images of open or closed sets - Connectedness - Uniform continuity - Uniform continuity and compact sets - Discontinuities of real valued functions - Monotonic functions. **Chapter 4: Sections: 4.8, 4.9, 4.12, 4.16, 4.19, 4.20, 4.22, 4.23.**	18
	Total Contact Hrs.	**90**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Tom M. Apostal, *Mathematical Analysis*, Addison Wesley, Second Edition 2002.

Books for Reference:

1. Ralp P. Boas, *A primer of Real function*, The mathematical Association of America, 1960.
2. Walter Rudin, *Principles of Mathematical Analysis*, Third Edition, McGraw Hill Inter Editions, 1976.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://nptel.ac.in/courses/111/106/111106053/
2. https://ocw.mit.edu/courses/mathematics/18-100c-real-analysis-fall-2012/
3. https://cosmolearning.org/courses/real-analysis-with-prof-sh-kulkarni/

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Dr. S. KALEESWARI Signature	Name: Dr. V. INTHUMATHI Signature	Name: Signature	Name: Signature

Dr. V. Inthumathi, Ph.D.,
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Department of Mathematics
N.G.M College, Pollachi - 642 001.

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Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS512	**Title**	**Batch:**	2024 - 2027
		SEC: OPERATIONS RESEARCH	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	5		**Credits:**	4

Course Objective

The prime objective of this paper is to introduce certain OR techniques such as LPP, Transportation problems, Assignment problems, Sequencing and Replacing models to help the students to develop logical reasoning for applying mathematical tools to managerial and real life oriented problems.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Formulate real world problems as an LP model and explain the relationship between a linear program and its dual.	K2
CO2	Solve linear programming problems using appropriate techniques and interpret the results.	K3
CO3	Understand and solve replacement problems, build and solve specialized linear programming problems like transportation and assignment problems.	K3
CO4	Effectively communicate ideas, explain procedures, devise optimum allocations, interpret results and make firm decisions.	K4
CO5	Identify and develop operational research models from the verbal description of the real system in the areas of management science, industry, engineering fields and transportation.	K4

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	H	H	H	M	H	H
CO2	H	H	H	H	H	H	M	H	H
CO3	H	H	H	H	H	H	H	H	H
CO4	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Linear Programming Problem: Mathematical formulation:** Introduction - Linear Programming Problem - Mathematical Formulation of the Problem – illustration on Mathematical formulation of LPP's. **Chapter 2: Sections: 2.1 - 2.4** **Linear Programming Problem:Graphical Solution and Extension:** Introduction - Graphical Solution Method –Some exceptional cases - General Linear Programming Problem - Canonical and Standard Forms of L.P.P. **Chapter 3: Sections: 3.1 - 3.5**	15
Unit II	**Linear Programming Problem:Simplex Method:** Introduction - The Computational Procedure – Use of Artificial Variables- Degeneracy in Linear Programming - Applications of Simplex Method. **Chapter 4: Sections: 4.1, 4.3 - 4.5. (Excluding Two-phase method in 4.4.)**	15
Unit III	**Duality in Linear Programming:**Introduction – General Primal-Dual pair – Formulating a Dual problem - Primal-Dual pair in Matrix form- Duality Theorems – Duality and Simplex Method – Dual Simplex Method. **Chapter 5: Sections: 5.1 – 5.4, 5.5, 5.7, 5.9**	15
Unit IV	**Transportation Problem:** LP formulation of the Transportation Problem - Existence of Solution in TP - The Transportation Table - Loops in Transportation Tables - Finding an initial basic feasible solution - North West corner rule - Least cost Method - Vogel's approximation Method (Self Study) -Test for Optimality - Determining the Net evaluations (The uv method) - Transportation algorithm (MODI Method) - Some exceptional cases - Unbalanced Transportation Problem. **Chapter 10: Sections: 10.2, 10.3, 10.5, 10.6, 10.9, 10.10, 10.13, 10.15.**	15
Unit V	**Assignment & Replacement Problem:** Introduction - Mathematical Formulation of the Assignment Problem - Solution of Assignment Problem –Hungarian Assignment Method - Special cases in Assignment Problems– The Travelling Salesman problem –Introduction - Replacement of equipment / Assert that deteriorates gradually -Value of money does not change with time - Value of money changes with time - Selection of best equipment amongst two - Simple problems. **Chapter 11: Sections: 11.1- 11.3, 11.4, 11.7.** **Chapter 18: Sections: 18.1, 18.2.**	15
	Total Contact Hrs.	**75**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Kanti Swarup, Gupta P. K and Man Mohan, Operations Research, Sultan Chand & Sons, New Delhi, 2014.

Books for Reference:

1. Phillips T, Ravindran A and Solberg J, Operations Research: Principles and Practice, John Willey & Sons, 1976.
2. Taha H. A, Operation Research - An introduction, Prentice Hall of India Pvt Ltd, New Delhi, 2006.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://youtu.be/Q31jKiEXxdc
2. https://youtu.be/BUGIhEecipE

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Dr. J. JAYASUDHA Signature	Name: Dr. V. INTHUMATHI Signature	Name: Signature	Name: Signature

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Department of Mathematics
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Controller of Examinations
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POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS513	**Title**	**Batch:**	2024 - 2027
		COMPLEX ANALYSIS	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	6		**Credits:**	4

Course Objective

This course help the students to have an in depth knowledge of limits and continuity, analytic functions, uniform convergence, conformal mapping and Singularities.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamental ideas of the functions of complex variables and complex integrals.	K2
CO2	Analyze the concepts of sequences and series of complex functions to generate Taylor series and Laurent series.	K3
CO3	Analyze integrals along a path in the complex plane by applying Cauchy integral formula and its various versions.	K3
CO4	Apply the concept of line integrals in fundamental theorems like Cauchy theorem for rectangle and Cauchy theorem for disc.	K3
CO5	Determine zeros and poles of simple functions, find the nature of the singularities and hence to calculate residues.	K3

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	H	H	H	H	H	H
CO2	H	H	H	H	M	M	H	H	H
CO3	H	H	H	H	M	M	H	H	H
CO4	H	H	H	H	M	M	H	H	H
CO5	H	H	H	H	M	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Introduction to the concept of analytic function**: Limits and Continuity – Analytic functions - Polynomials - *Rational Functions. (Self study)* **Chapter 1: Sections: 1.1 - 1.4**.	18
Unit II	**Elementary theory of power series**: Sequences - Series - Uniform Convergence - Power Series - Abel's Limit Theorem. **Chapter 2: Sections: 2.1 - 2.5**.	18
Unit III	**The Exponential, Trigonometric Functions and Conformality**: *The Exponential –The Trigonometric Functions (Self study)* - The periodicity – The Logarithm - Arcs and Closed Curves - Analytic Functions in Regions - Conformal Mapping. **Chapter 2: Sections: 3.1 - 3.4** **Chapter 3: Sections: 2.1 - 2.3.**	18
Unit IV	**Fundamental Theorems** : Line Integrals – Line Integrals as Function of Arcs – Cauchy's Theorem in a Rectangle - Cauchy's Theorem in a Disc – The Index of a Point with respect to a Closed Curve - Cauchy's Integral Formula. **Chapter 4 : Sections: 1.1, 1.3, 1.4, and 1.5.** **Chapter 4: Sections: 2.1- 2.2.**	18
Unit V	**Local Properties of Analytic functions**: Removable Singularities, Taylor's Theorem – Zeros and Poles - The Local Mapping – The Maximum Principle. **Chapter 4 : Sections: 3.1- 3.4**.	18
	Total Contact Hrs.	**90**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Lars V. Ahlfors, Complex Analysis, MCGRAW HILL international Edition, (Indian Edition), 2013.

Books for Reference:

1. Goyal& Gupta, *Functions of a Complex Variable* – Pragati's Edition, 2012.
2. Ponnusamy S., *Foundations of Complex Analysis* Narosa publishing house, Second Edition, 2009.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://nptel.ac.in/courses/111/107/111107056/
2. https://nptel.ac.in/courses/111/103/111103070/

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name and Signature	CDC	COE
Name:Dr. R. SANTHI  Signature	Name: Dr. V.INTHUMATHI  Signature	Name:  Signature	Name:  Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS5E1	**Title**	**Batch:**	2024 - 2027
		OOP with C++	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	4		**Credits:**	3

Course Objective

The aim of this course is to know all needed about C++ and object oriented programming and also to meet the global requirements in software industries.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basics of tokens, expressions and control structures.	K2
CO2	Understand and apply the concepts of functions, classes, objects.	K3
CO3	Analyze the concepts of single inheritance, multiple inheritance, call by function, call by reference of a function and polymorphism.	K4
CO4	Analyze the use of operator overloading and type conversions.	K4
CO5	Develop program codes effectively using OOPS.	K5

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	M	M	H	H	M	H	M	M	H
CO2	M	M	H	H	M	H	M	M	H
CO3	H	H	H	H	H	H	H	M	H
CO4	H	H	H	H	H	H	H	M	H
CO5	H	H	H	H	H	H	H	M	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Beginning with C++:** What is C++? - Applications of C++ - A Simple C++ Program - More C++ Statements - An Example with Class - Structure of C++ Program. **Tokens, Expressions and Control Structures:** Introduction–*Tokens(Self study)* - Keywords - Identifiers and Constants - Basic Data Types - User-Defined Data Types - Storage Classes - Derived Data Types - Symbolic constants - Type Compatibility - Declaration of Variables - Dynamic Initialization of Variables - Reference Variables - Operators in C++ - Scope Resolution Operator - Member Dereferencing Operators - Memory Management Operators - Manipulators - Type Cast Operator - Expressions and Their Types - Special Assignment Expressions - Implicit Conversions - Operator Overloading - Operator Precedence - Control Structures. **Chapter 2: Sections: 2.1-2.6.** **Chapter 3: Sections: 3.1- 3.25**	12
Unit II	**Functions in C++**: Introduction - The Main Function - Function Prototyping - Call by Reference - Return by Reference - Inline Functions -Default Arguments - const Arguments - Recursion - Function Overloading - Friend and Virtual Functions - Math Library Functions. **Classes and objects:**Introduction - C Structures Revisited - Specifying a Class - Defining Member Functions - C++ Program with Class - Making an Outside Function Inline - Nesting of Member Functions - Private Member Functions - Arrays within a Class - Memory Allocation for Objects. **Chapter 4: Sections: 4.1-4.12** **Chapter 5: Sections: 5.1-5.10.**	12
Unit III	**Classes and objects:**Static Data Members - Static Member Functions- Array of Objects - Object as Function Arguments - Friendly Functions - Returning Objects - const Member Function - Pointers to Members - Local Classes. **Constructors and Destructors:**Introduction - Constructors - Parameterized Constructors - Multiple Constructors in a Class - Constructors with Default Arguments - Dynamic Initialization of Objects - Copy Constructors - Dynamic Constructors - Constructing Two-Dimensional Arrays - const Objects - Destructors. **Chapter 5: Sections: 5.11-5.19.** **Chapter 6: Sections: 6.1-6.11.**	12
Unit IV	**Operator overloading and Type conversions:** Introduction - Defining Operator Overloading - Overloading Unary Operator - Overloading Binary Operators - Overloading Binary Operators Using Friends - Manipulation of Strings Using Operators - Some Other Operator Overloading Examples - Rules for Overloading Operators - Type Conversions. **Inheritance: Extending Classes:** Introduction - Defining Derived Classes - Single Inheritance - Making a Private Member Inheritable - Multilevel Inheritance - Multiple Inheritance - Hierarchical Inheritance - Hybrid	12

	Inheritance - Virtual Base Classes - Abstract Classes - Constructors in Derived Classes - Member Classes: Nesting of Classes. **Chapter 7: Sections: 7.1-7.9** **Chapter 8: Sections: 8.1-8.12.**	
Unit V	**Pointers, Virtual Functions and Polymorphisms:** Introduction - *Pointers (Self study)* Pointers to Objects - this Pointer - Polymorphism - Pointers to Derived Classes - Virtual Functions - Pure Virtual Functions. **Chapter 9: Sections: 9.1-9.8.**	12
	Total Contact Hrs.	60

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Balagurusamy E, *Object Oriented Programming with C++*,Tata McGraw Hill Publishing Company, Seventh Edition, New Delhi, 2018.

Books for Reference:

1. BjarneStroustroup, *The C++ Programming language,* Addison Wesley, 1991.
2. Herbert Schildt Osborne, *Teach You C++*,McGraw Hill Publishing Company, 1994.
3. Robert Lafore, *Object Oriented Programming in turbo C++*, Waite group, 1992.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://youtu.be/xoL6WvCARJY
2. https://youtu.be/m_MQYyJpIjg

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name and Signature	CDC	COE
Name:Mrs. A. GNANASOUNDARI Signature	Name: Dr. V.INTHUMATHI Signature	Name: Signature	Name: Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS5E2	**Title**	**Batch:**	2024 - 2027
		ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	4		**Credits:**	3

Course Objective

On successful completion of the course the students are able to understand the concepts of problem solving logics, reasoning knowledge, Decision making, Learning with searches and algorithms.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Recall the basic logical searches, learning algorithms and improve decision making systems.	K1
CO2	Summarize the idea about knowledge representation and reasoning	K2
CO3	Illustrate new knowledge with probabilistic reasoning solutions	K3
CO4	Analyze Decision making system and its different process	K4
CO5	Evaluate the learning skills with many observations and machine learning algorithms	K5

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	H	M	H	H	H	H
CO2	H	M	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H	H	H
CO4	H	M	H	H	H	H	M	H	H
CO5	H	H	H	H	M	M	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**INTRODUCTION:** The Introduction of AI - The History of AI - Intelligent agents – Agents based system. PROBLEM SOLVING: State Space models – Searching for solution – Uniformed/ Blind search – Informed/Heuristic search - A* search - Hill - climbing search - Meta Heuristic: Genetic Algorithm - Adversary based search: Minimax - Expect Imax- Alpha Beta pruning - Constraint satisfaction problem - Backtracking search.	12
Unit II	**KNOWLEDGE REPRESENTATION AND REASONING**:Knowledge representation - Logics - bivalent logic - inference - Fuzzy logic: membership - Fuzzy rules and reasoning - Fuzzy inference	12
Unit III	**UNCERTAIN KNOWLEDGE AND PROBABILISTIC REASONING**: Uncertainty - Probabilistic reasoning - Semantics of Bayesian network - Exact inference in Bayesian network- Approximate inference in Bayesian network -Probabilistic reasoningovertime Inference in temporal models - HiddenMarkov Models Dynamic BayesianNetworks	12
Unit IV	**DECISION-MAKING**: Basics of utility theory, Utility functions - Sequential decision problems - Markov decision process - Value iteration - Policyiteration - Decisions in Multi agent system: Multi agent decision theory - Group decision making	12
Unit V	**Machine learning:** Introduction- Probability distributions: Binary variables, Multinomial variables. Neural networks feed forward network function-Error propagation. Kernel methods-radial bias function networks .Graphical models-Bayesian networks-Discrete variables, linear Gaussian model. Mixture models andEM-K means clustering-.Combining models-Boosting Algorithm.	12
	Total Contact Hrs.	**60**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Books:

1. Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, Pearson Education, 2014.
2. David Pool and Alan Mackworth, *Artificial Intelligence: Foundations of Computational agents*, Cambridge University Press, 2017.
3. Christopher M.Bishop, *Pattern Recognition and Machine Learning*, Springer, 2013.

Books for Reference:

1. C. S. Krishnamoorthy, S.. Rajeev, *Artificial Intelligence and Expert Systems for Engineers*, CRCPress, 1996.
2. Nils J. Nilsson, *The Quest for Artificial Intelligence: A History of Ideas and achievements*,Cambridge University press, 2010.
3. Alpaydin Ethem,*Introduction to Machine Learning*, Massachusetts Institute of Technology Press, 2009.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1.https://youtu.be/yaL5ZMvRRqE
2.https://youtu.be/ukzFI9rgwfU

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Mrs. M.AMSAVENI Signature	Name: Dr. V. INTHUMATHI Signature	Name: Signature	Name: Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS5E3	**Title**	**Batch:**	2024 - 2027
		Programming Lab in OOP with C++	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	2		**Credits:**	1

Course Objective

This course is designed to provide a practical knowledge to the students on C++.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Develop the OOPS program to understand the concepts of multi dimensional arrays.	K3
CO2	Develop the program to understand the concepts of constructors, destructors and overloading constructors.	K4
CO3	Develop the program for single and multilevel inheritance.	K4
CO4	Develop the program for understanding the concepts of pointer object and polymorphism.	K4
CO5	Competent in developing the programming code and debugging.	K5

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	M	H	H	M	M	M	M	H
CO2	H	M	H	H	M	M	M	M	H
CO3	H	M	H	H	M	H	M	M	H
CO4	H	M	H	H	M	H	M	M	H
CO5	H	M	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

List of programs:

1. Program to illustrate the use of array of objects
2. Program to illustrate the use of objects as arguments
3. Program to swap private data of classes using friend function
4. Program to illustrate overloaded constructors
5. Program to illustrate overloading + operators
6. Program to explain hybrid inheritance
7. Program to illustrate multilevel inheritance
8. Program to illustrate the use of initialization lists in the base and derived constructors
9. Program to illustrate the use of pointers to objects
10. Program to illustrate runtime polymorphism

Difference between C and C++ programs:

11. Program to find the Mean and variance
12. Program to find the largest of two numbers using nesting of member functions
13. Program to illustrate matrix multiplication
14. Program for finding Fibonacci sequence
15. Program to check whether the number is prime or not.

Text Book:

Balagurusamy E, *Object Oriented Programming with C++*,Tata McGraw Hill Publishing Company, Seventh Edition, New Delhi, 2018.

Books for Reference:

1. BjarneStroustroup, *The C++ Programming language,* Addison Wesley, 1991.
2. Herbert Schildt Osborne, *Teach You C++*,McGraw Hill Publishing Company, 1994.
3. Robert Lafore, *Object Oriented Programming in turbo C++*, Waite group, 1992.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://youtu.be/xoL6WvCARJY
2. https://youtu.be/m_MQYyJpIjg

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name and Signature	CDC	COE
Name:Mrs. A. GNANASOUNDARI Signature	Name: Dr. V.INTHUMATHI Signature	Name: Signature	Name: Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS5AL	**Title**	**Batch:**	2024 - 2027
		ALC I (OPTIONAL): ADVANCED OPERATIONS RESEARCH - I	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	-		**Credits:**	3*

Course Objective

The course aims to introduce some OR techniques like Integer programming, Gold programming, dynamic programming etc. to build capabilities in students for analyzing different business situations involving limited resources and obtained logical solutions.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Recall Linear programming techniques, understand and apply advanced techniques in linear programming and duality to real life problems	K2 & K3
CO2	Understand and solve variety of problems such as replacement problems, transportation problem etc.	K2 &K3
CO3	Sketch the theoretical workings of Integer programming, Goal programming, Dynamic programming problems and their solution procedures.	K3
CO4	Analyze any real system and formulate Mathematical models.	K4
CO5	Make effective decisions under various business situations by applying appropriate optimization techniques.	K4

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	H	H	M	M	H	H
CO2	H	M	H	H	H	H	M	H	H
CO3	H	H	H	H	M	M	M	H	H
CO4	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content
Unit I	**Duality in Linear Programming:**Economic Interpretation of Duality - Dual Simplex method. **LPP - Advanced Techniques:** Introduction - Revised Simplex Method - Bounded Variables. **Chapter 5: Sections: 5.8, 5.9.** **Chapter 9: Sections: 9.1, 9.2and 9.4.**
Unit II	**Integer Programming:** Introduction - Pure And Mixed Integer Programming Problems - Gomory's All-IPP Method - Construction of Gomory's constraint Fractional Cut Method - All Integer LPP, Fractional Cut Method - Mixed Integer LPP - Branch and Bound Method. **Chapter 7: Sections: 7.1 - 7.7.**
Unit III	**Goal Programming:** Introduction - Categorization of Goal Programming -Formulation of Linear Goal Programming Problem – Graphical Goal Attainment Method – Simplex Method for Goal Programming Problem. **Chapter 8: Sections: 8.1 - 8.5.**
Unit IV	**Dynamic Programming:** Introduction - The Recursive Equation Approach - Characteristics of Dynamic Programming - Dynamic Programming Algorithm. **Chapter 13: Sections: 13.1 - 13.4.**
Unit V	**Replacement problem and System Reliability:**Replacement of Equipment that fails suddenly - Recruitment and Promotion problem. **Transportation Problem:** Stepping Stone Solution Method - Time Minimization Transportation Problem - Transshipment Problems. **Chapter 18: 18.3 and 18.4.** **Chapter 10: 10.14, 10.16 and 10.17.**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Kanti Swarup, Gupta P.K. & Man Mohan, Operations Research (2014), Sultan Chand & Sons, New Delhi.

Books for Reference :

1. Philips T, Ravindran A and Solberg J, *Operations Research: Principles and Practice*, John Willey & Sons, 1976.
2. Taha H. A, *Operation Research - An introduction*, Prentice Hall of India Pvt. Ltd, New Delhi, 2006.
3. P. K Gupta &D. S Hira, Operations Research, S. Chand and company Ltd, New Delhi, 2014.
4. S. Dharani Venkatakrishnan, Operations Research principles problems, Keerthi Publishing house Pvt. Ltd.,1994.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://www.youtube.com/watch?v=xGkpXkAnWU&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZYcNtsoX&index=30
2. https://www.youtube.com/watch?v=h0bdo06qNVw&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZYcNtsoX&index=33
3. https://www.youtube.com/watch?v=H58TPQNr2kM&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZYcNtsoX&index=34

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name and Signature	CDC	COE
Name: Dr. J. JAYASUDHA Signature	Name: Dr. V.INTHUMATHI Signature	Name: Signature	Name: Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS614	**Title**	**Batch:**	2024 - 2027
		LINEAR ALGEBRA	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	6		**Credits:**	5

Course Objective

To enable the students to study how to solve system of linear algebraic equations, basic concepts of an algebraic structure namely vector space and its properties of linear transformations on vector spaces and their relation between matrices.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Solve systems of linear equations and to reduce the augmented matrix to echelon form or to row reduced echelon form.	K3
CO2	Understand the basic ideas of vector spaces and the concepts of span, linear independence, basis, dimension and to apply these concepts to vector spaces and subspaces.	K2
CO3	Find row space, column space, null space, rank and nullity of a matrix and to understand the relationship of these concepts to associated systems of linear equations.	K3
CO4	Apply the principles of matrix algebra to linear transformations and analyze the competence with the basic ideas in Vector spaces, Dual spaces and linear transformation.	K4
CO5	Enrich the knowledge in Linear Algebra to pursue higher degree in Mathematics and other discipline, as well to get employability in education field and IT sectors.	K4

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	H	M	M	M	H	H
CO2	H	H	H	H	M	H	M	H	H
CO3	H	H	H	H	H	H	M	H	H
CO4	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Linear Equations:** Fields - Systems of Linear Equations - Matrices and Elementary Row Operations- Row Reduced Echelon Matrices -*Matrix Multiplication (Self study)* – Invertible Matrices. **Chapter 1: Sections: 1.1 - 1.6.**	18
Unit II	**Vector Spaces:** Vector Spaces - Subspaces - Bases and Dimension - Coordinates - *Summary of Row Equivalence (Self study).* **Chapter 2: Sections: 2.1 - 2.5.**	18
Unit III	**Linear Transformations:** Linear transformations - The Algebra of Linear Transformations - Isomorphism. **Chapter 3: Sections: 3.1 - 3.3**.	18
Unit IV	**Linear Transformation:** Representation of Transformations by Matrices - Linear Functionals. **Chapter 3: Sections: 3.4, 3.5**.	18
Unit V	**Linear Transformation:** The Double Dual - The Transpose of a Linear Transformation. **Chapter 3: Sections: 3.6, 3.7**.	18
	Total Contact Hrs.	**90**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Kenneth Hoffman and Ray Kunze, Linear *Algebra*, Second Edition, PHI Learning Pvt. Ltd, New Delhi, 2013.

Books for Reference:

1. Herstein I. N, *Topics in algebra*, Vikas Publishing House Pvt. Ltd, 1981.
2. Kumaresan S, *Linear Algebra*, Prentice Hall of India, 2001.
3. Seymour Lipschutz and Marc Lipson, *Linear Algebra*, Tata McGraw Hill,3rd Edition, 2001.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://nptel.ac.in/courses/111/105/111105112/
2. https://nptel.ac.in/courses/111/106/111106051/

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name and Signature	CDC	COE
Name:Dr. S. SIVASANKAR  Signature	Name: Dr. V.INTHUMATHI  Signature	Name:  Signature	Name:  Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS615	**Title**	**Batch:**	2024 - 2027
		REAL ANALYSIS – II	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	6		**Credits:**	4

Course Objective

To equip the students for study in Real analysis by introducing further some of advanced topics in Real Analysis.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Understand and use abstract mathematical concepts of derivatives and functions of bounded variation.	K2
CO2	Apply the properties of monotonic functions and continuous functions of bounded variation in the context of real analysis.	K3
CO3	Apply the ideas of total variation and step into the theory of Riemann Stieltjes Integral.	K3
CO4	Analyze the Riemann Integral and Riemann-Stieltjes integral in detail and write complete, correct and coherent proofs.	K4
CO5	Enhance higher order learning and demonstrate how abstract ideas in real analysis can be applied to practical problems.	K4

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	H	H	H	M	H	H
CO2	H	H	H	H	H	H	M	H	H
CO3	H	H	H	H	H	H	M	H	H
CO4	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Derivatives:** Introduction - Definition of derivative – Derivatives and continuity - Algebra of Derivatives – The chain rule – One sided Derivatives and infinite derivatives -Functions with nonzero derivative – Zero derivatives and local extrema - Rolle's theorem - The Mean Value Theorem for derivatives –Intermediate value theorem for derivatives - Taylor's formula with remainder. **Chapter 5 :Sections: 5.1 - 5.12.**	18
Unit II	**Functions of Bounded Variations**: Introduction - Properties of monotonic functions - Functions of bounded variations - Total variations - Additive property of total variation - Total variation on [a, x] as a function of x - Functions of bounded variation expressed as the difference of increasing functions - Continuous functions of bounded variation. **Chapter 6 :Sections: 6.1 - 6.8.**	18
Unit III	**The Riemann-Stieltjes Integral**: Introduction - Notation - The definition of Riemann-Stieltjes Integral - Linear properties - Integration by parts - Change of variable in Riemann-Stieltjes integral - Reduction to a Riemann integral - Step functions as integrators - Reduction of a Riemann-Stieltjes integral to a finite sum - Euler's summation formula. **Chapter 7 :Sections: 7.1 - 7.10**	18
Unit IV	**The Riemann-Stieltjes Integral**: Monotonically increasing integrators - Upper and lower integrals - Additive and linearity properties of upper and lower integrals - Riemann's condition - Comparison theorems - Integrators of bounded variation - Sufficient conditions for existence of Riemann-Stieltjes integrals - Necessary conditions for existence of Riemann-Stieltjes integrals. **Chapter 7 :Sections: 7.11 - 7.17.**	18
Unit V	**The Riemann-Stieltjes Integral**: Mean Value Theorems for Riemann-Stieltjes Integrals - The integral as a function of the interval - Second fundamental theorem of integral calculus - Change of variable in a Riemann integral - Second Mean-Value Theorem for Riemann integrals. **Chapter 7 :Sections: 7.18 - 7.22**.	18
	Total Contact Hrs.	90

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Tom M. Apostal, *Mathematical Analysis*, Narosa Publishing House, Second Edition 2002.

Books for Reference:

1. Goldberg R. R, *Methods of Real Analysis*, Oxford and IBH Publishing Co., 1973.
2. Soma Sundaram D, Choudhary B, *A first course in Mathematical Analysis*,Narosa Publishing House, 1996.
3. Walter Rudin, *Principles of Mathematical Analysis*, McGraw Hill Inc, Third Edition, 1976.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://ocw.mit.edu/courses/mathematics/18-100c-real-analysis-fall-2012/
2. https://cosmolearning.org/courses/real-analysis-with-prof-sh-kulkarni/

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name and Signature	CDC	COE
Name:Dr. S. KALEESWARI Signature	Name: Dr. V.INTHUMATHI Signature	Name: Signature	Name: Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS616	**Title**	**Batch:**	2024 - 2027
		SEC III: Naan Mudhalvan RESOURCE MANAGEMENT TECHNIQUE	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	5		**Credits:**	4

Course Objective

The prime objective of this paper is to introduce certain OR techniques such as game theory, sequencing and networking models to help the students to develop logical reasoning for applying mathematical tools to managerial and other life oriented problems.

Course Outcomes (CO)

On successful completion of the course student will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recall and apply linear programming techniques to develop and solve simple models of Game theory.	K2
CO2	Determine the optimal sequence of allocation of jobs to machines in a production line by minimizing the idle time.	K3
CO3	Comprehend several queuing system models and extend the same to practical situations, develop network models and analyze a project with deterministic and probabilistic activity times.	K4
CO4	Identify the importance of stocks, need for holding stocks and determine the optimum order quantity based on the available constraints.	K4
CO5	Make constructive decisions and use the resources (labor, capital, materials, machinery) more effectively by analyzing & applying the techniques of operations research to problems in engineering, industry, management or any business environment.	K4

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	H	H	M	H	H	H
CO2	H	H	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H	H	H
CO4	H	H	H	H	H	H	M	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Games and strategies**: Two person zero sum games - Some basic terms - The Maximin - Minimax principle - Games without Saddle points - Mixed strategies - Graphical Solution of 2xn and mx2 games – Dominance Property. **Chapter 17: Sections: 17.1 - 17.7.**	15
Unit II	**Sequencing problems**: Problem of Sequencing - Basic terms used in Sequencing - Processing n jobs through 2 machines - *Processing n jobs through k-machines (Self study)* processing 2 jobs through k-machines. **Chapter 12: Sections: 12.1 - 12.6.**	15
Unit III	**Queuing Theory**: Introduction- Queuing System - Elements of a Queuing System - Operating characteristics of a Queuing system - Classification of Queuing Models – Definition of Transient and Steady States - Poisson Queuing System Model I : (M/M/ 1): (∞/FIFO) Model III : (M/M/ 1): (N/FIFO) Model V : (M/M/ C): (∞/FIFO) *Model VI : (M/M/ C): (N/FIFO)(Self study)* - Simple Problems. **Chapter 21: Sections: 21.1 - 21.4, 21.7, 21.8, 21.9.**	15
Unit IV	**Inventory control**: Introduction - Types of inventories - Reasons for carrying inventories- The inventory decisions - Costs associated with inventories - Factors affecting inventory control - The concept of EOQ - Deterministic inventory problems with no shortages. Case (i) The fundamental Problem of EOQ Case (ii) Problem of EOQ with finite replenishment (Production). Deterministic inventory Problems with shortages Case (i) Problem of EOQ with instantaneous Production and variable order cycle Case (ii) Problem of EOQ with instantaneous Production and Fixed order cycle. Case (iii) Problem of EOQ with finite replenishment (Production). Problem of EOQ with price breaks Case (i) Problem of EOQ with one price break Case (ii) Problem of EOQ with more than one price break. **Chapter 19: Sections: 19.1 - 19.4, 19.6, 19.7, 19.9-19.12.**	15
Unit V	**Network scheduling by PERT/CPM**: Network: Basic compounds - Logical Sequencing - Rules of Network constructions – Concurrent Activities- *Critical Path Method (CPM) (Self study)* - Probability considerations in PERT - Distinction between PERT & CPM - Simple Problems. **Chapter 25: Sections: 25.1 - 25.8.**	15
	Total Contact Hrs.	**75**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Kanti Swarup, Gupta P.K. & Man Mohan, Operations Research (2014), Sultan Chand & Sons, New Delhi.

Books for Reference:

1. Philips T, Ravindran A and Solberg J, *Operations Research: Principles and Practice,* John Willey & Sons, 1976.
2. Taha H. A, *Operation Research - An introduction,* Prentice Hall of India Pvt. Ltd, New Delhi, 2006.
3. P. K Gupta &D. S Hira, Operations Research, S. Chand and company Ltd, New Delhi, 2014.
4. S. Dharani Venkatakrishnan, Operations Research principles problems, Keerthi Publishing house Pvt. Ltd.,1994.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://www.youtube.com/watch?v=xGkpXkAnWU&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZYcNtsoX&index=30
2. https://www.youtube.com/watch?v=h0bdo06qNVw&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZYcNtsoX&index=33
3. https://www.youtube.com/watch?v=H58TPQNr2kM&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZYcNtsoX&index=34

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Dr. J. JAYASUDHA Signature	Name: Dr. V. INTHUMATHI Signature	Name: Signature	Name: Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS6E4	**Title**	**Batch:**	2024 - 2027
		THEORY OF NUMBERS	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	6		**Credits:**	5

Course Objective

This course exposes the elementary basic theory of numbers and several famous functions, related theorems and some unsolved problems about primes to the students in order to enable them to deeper their understanding of the subject.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of divisibility, congruence, greatest common divisor and prime-factorization.	K2
CO2	Apply the properties of multiplicative functions such as the Euler phi-function and quadratic residues to solve the problems of number theory.	K3
CO3	Demonstrate the concepts of linear congruence and polynomial congruence using Fermat's Theorem and Wilson's Theorem.	K3
CO4	Analyze and solve linear Diophantine equations, congruences of various types and evaluate the unsolved problems about primes.	K4
CO5	Clear competitive exams in banking, insurance, TNPSC and UPSC.	K3

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	M	H	H	H	M	H	H
CO2	H	H	H	H	H	H	M	H	H
CO3	H	H	H	H	H	H	M	H	H
CO4	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Basic Representation**: Principles of Mathematical Induction - The Basis Representation Theorem. **The Fundamental Theorem of Arithmetic:** Euclid's Division Lemma - Divisibility - The Linear Diophantine Equation - The Fundamental Theorem of Arithmetic. **Chapter 1: Sections: 1.1 -1. 2.** **Chapter 2: Sections: 2.1 -2. 4.**	18
Unit II	**Combinational and Computational Number Theory**: Permutations and Combinations - Fermat's Little Theorem (Statement only) - Wilson's Theorem (Statement only) – Generating Functions. **Fundamentals of Congruence's:***Basic Properties of Congruence's (Self study)* -Residue Systems. **Chapter 3: Sections: 3.1 - 3.4.** **Chapter 4: Sections: 4.1-4.2.**	18
Unit III	**Solving Congruences**: Linear Congruences - The Theorems of Fermat and Wilson Revisited - The Chinese Remainder Theorem - *Polynomial Congruences (Self study).* **Chapter 5: Sections: 5.1-5.4.**	18
Unit IV	**Arithmetic Functions**: Combinatorial Study of $\Phi(n)$ - Formulae For $d(n)$ and $\sigma(n)$ - Multiplicative Arithmetic Functions - The Mobius Inversion Formula. **Chapter 6: Sections: 6.1-6.4.**	18
Unit V	**Primitive Roots**: Properties of Reduced Residue Systems - Primitive Roots Modulo P. **Prime Numbers:** Elementary Properties of $\pi(x)$ - Tchebyshev's Theorem - Some Unsolved Problems About Primes. **Chapter 7: Sections: 7.1-7.2.** **Chapter 8:Sections: 8.1-8.3.**	18
	Total Contact Hrs.	**90**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

George E. Andrews, *Number Theory*, HPS (India), 1992.

Books for Reference:

1. David M. Burten, *Elementary Number Theory*, McGraw- Hill edition, 2010.
2. Kumaravelu et al., *Elements of Number Theory*, Nagerkovil, SKV, 2002.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://nptel.ac.in/courses/111/101/111101137/
2. https://nptel.ac.in/courses/111/103/111103020/

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Dr. V. CHITRA Signature	Name: Dr. V. INTHUMATHI Signature	Name: Signature	Name: Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS6E5	**Title**	**Batch:**	2024 - 2027
		FUZZY SET THEORY	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	6		**Credits:**	5

Course Objective

To enable the learners to obtain basic knowledge in fuzzy set theory.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Recall the concepts of crisp sets and fuzzy sets.	K2
CO2	Understand the types and concept of fuzzy sets.	K2
CO3	Analyze the difference between crisp sets and fuzzy sets.	K4
CO4	Understand the concepts of operations on fuzzy sets.	K2
CO5	Apply the concept of fuzzy sets in research and real life problems.	K3

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	M	H	M	H	H	H	M	H	H
CO2	M	H	H	M	H	M	M	H	H
CO3	H	H	H	H	H	H	M	H	H
CO4	M	H	M	M	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**From Classical(crisp) sets to fuzzy sets:** A Ground Paradigm shift-Introduction-Crisp sets: An overview.	18
Unit II	Fuzzy sets: Basic types-Basic concepts-Characteristic and significance of the paradigm shift.	18
Unit III	**Fuzzy sets versus Crisp sets:** Additional properties of α-cuts-Representations of Fuzzy sets-Extension Principle for Fuzzy sets.	18
Unit IV	**Operations on Fuzzy sets:** Types of operations-Fuzzy complements-Fuzzy intersections: t-Norms.	18
Unit V	Fuzzy Unions: t-Conorms-Combinations of operations-Aggregation operations.	18
	Total Contact Hrs.	**90**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

George J. Klir and Bo Yuan, Fuzzy sets and Fuzzy Logic(Theory and Applications), Prentice Hall of India Private Limited, New Delhi, 2000.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://nptel.ac.in/courses/111/107/111107103/
2. https://nptel.ac.in/courses/111/104/111104025/

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Dr. V. CHITRA Signature	Name: Dr. V. INTHUMATHI Signature	Name: Signature	Name: Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS6E6	**Title**	**Batch:**	2024 - 2027
		DISCRETE MATHEMATICS	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	6		**Credits:**	5

Course Objective

In this course a set of topics that are of genuine use in computer science and elsewhere are identified and combined together in a logically coherent fashion, to enable the students to get a good training in these topics which will inevitably lead the students in the direction of clear thinking, sound reasoning and a proper attitude towards the applications of Mathematics in computer science and other related fields.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic definitions of logic, lattice theory, graph theory and automata theory.	K2
CO2	Acquire knowledge about discrete structures which include sets, relations, functions, graphs and recurrence relations.	K3
CO3	Analyze how lattices and Boolean algebra are used as tools and mathematical models in the study of networks.	K4
CO4	Apply logically valid forms of arguments to avoid logical errors and to construct mathematical arguments using logical connectives and quantifiers.	K4
CO5	Apply the concepts to the field of computer science, information technology, cryptography and software engineering.	K3

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	M	H	H	M	H	H
CO2	H	H	H	M	H	H	M	H	H
CO3	H	H	H	H	H	H	H	H	H
CO4	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Recurrence Relations and Generating functions**: Recurrence - An Introduction - Polynomials and their Evaluations - Recurrence Relations - Solution of Finite order Homogeneous (linear) Relations - Solution of Non-Homogeneous Relations - Generating Functions - *Some Common Recurrence Relations (self Study).* **Text Book 1: Chapter 5: Sections: 1 - 7.**	18
Unit II	**Logic**: Tautology - Tautological Implications and Equivalence of Formulae - Replacement Process - Functionally Complete Sets of Connectives and Duality Law - Normal Forms - Principle Normal Forms. **Text Book 1: Chapter 9: Sections: 7 - 12**.	18
Unit III	**Lattices and Boolean Algebra**: Lattices - Some Properties of Lattices - New Lattices - Modular and Distributive Lattices - Boolean Algebras **Text Book 1: Chapter 10: Sections: 1 - 5.**	18
Unit IV	**Graph Theory:** Introduction - Basic Terminology - Paths, Cycles and Connectivity - Subgraphs - Types of Graphs - Isomorpic Graphs - Homeomorphic Graphs - Eulerian and Hamiltonian Graphs. **Text Book 2: Chapter 9: Sections: 9.1 - 9.7 and 9.9.**	18
Unit V	**Language , Grammar and Automata**: Introduction - Language - The Set Theory of Strings - Languages - Regular Expressions and Regular Languages - Grammar - Finite-State Machine - Finite State Automata. **Text Book 2: Chapter 15: Sections: 15.1 - 15.7.**	18
	Total Contact Hrs.	**90**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Books:

1. Venkataraman M. K, Sridharan N and Chandrasekaran N, *Discrete Mathematics,*The National Publishing Company, 2000.
2. Sharma J. K, *Discrete Mathematics*, Macmillan Publishers India Ltd, 2011.

Books for Reference:

1. Ralph P.Grimaldi, *Discrete and Combinatoral Mathematics - An applied introduction*, Third Edition, Addison Wesley Publishing Company, 1994.

2. Tremblay J. P and Manohar R, *Discrete Mathematical Structures with Applications to Computer Science*, Tata McGraw Hill, 2001.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://nptel.ac.in/courses/111/106/111106086/
2. https://nptel.ac.in/courses/111/107/111107058/

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Dr. V. CHITRA Signature	Name: Dr. V. INTHUMATHI Signature	Name: Signature	Name: Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS6E7	**Title**	**Batch:**	2024 - 2027
		GRAPH THEORY	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	6		**Credits:**	5

Course Objective

Graph theory is a major area of Combinatorics. In this Course we introduce the learners to some basic topics in graph theory.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Recall the basic concepts and definitions of graphs along with types and their examples.	K1
CO2	Demonstrate the concepts of connectivity and line connectivity.	K3
CO3	Compare the features of Eulerian graphs and Hamiltonian graphs.	K4
CO4	Apply the concept of directed graphs to solve network flow problems.	K3
CO5	Relate the graph theory to the real world problems.	K4

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	M	H	H	H	H	H
CO2	H	M	H	M	H	H	M	H	H
CO3	H	M	M	M	M	H	M	H	H
CO4	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H

H – HIGH; M – MEDIUM; L – LOW.

Units	Contents	Hrs.
Unit-I	**Graphs:** Varieties of graphs - Walks and connectedness - Degrees - Operation on Graphs. **Matrices:** The adjacency matrix - The incidence Matrix.	18
Unit-II	**Blocks:** Cut points - bridges - and blocks - Block graphs and cut point graphs. **Trees:** Characterization of trees - Centers and centroids.	18
Unit-III	**Connectivity:** Connectivity and line-connectivity. **Traversibility:** Euelerian graphs.	18
Unit-IV	**Traversibility:** Hamiltonian graphs. **Factorization:** 1-factorization - 2-factorization.	18
Unit-V	**Planarity:** Plane and planar graphs - Outer planar graphs.	18
	Total Contact Hrs.	**90**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Frank Haray. (2001). *Graph Theory.* Narosha Publishing.

Books for Reference:

1.Balakrishnan, R. and Ranganathan. K. (2000). *A Text Book on Graph Theory.* New York: Springer Verlog.

2.Gould, R. (1988). *Graph Theory*, California: The Benjamin/ Cummings Publishing Company, Inc.

3. Hartsfield, N. and Ringel, G.(1990) *Pearls in Graph Theory*, Academic Press.

4. Bondy, J.A. and Murty U.S.R. (1976) *Graph Theory with Applications*, Macmillan Company.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://youtu.be/1h2BoCtobXw
2. https://youtu.be/R9R9hhue614

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Dr. V. CHITRA Signature	Name: Dr. V. INTHUMATHI Signature	Name: Signature	Name: Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	24UMS6P1	**Title**	**Batch:**	2024 - 2027
		PROJECT	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	-		**Credits:**	2

Components of the Project may be included the following

Review No.	**Activity**
I	Problem Identification and Related Literature collection
II	Analyzing or solving problems by applying different methodology
III	Giving conclusion

Programme Code:	UMS	**Programme Title:**	Mathematics	
Course Code:	24UMS6AL	**Title**	**Batch:**	2024 - 2027
		ALC II (OPTIONAL): ADVANCED OPERATIONS RESEARCH - II	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	-		**Credits:**	3*

Course Objective

The course aims to expose non-linear programming and simulation. Further it helps the student to understand different computational algorithms used in solving non-linear programming problems. The course also enables to schedule projects and build mathematical models to study the real world system.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Understand non-linear programming problems and familiarize different solving procedures	K2& K3
CO2	Formulate and solve non-linear programming problems using appropriate techniques and interpret the results.	K3
CO3	Simulate Various real life probabilistic situations using methods like Monte Carlo simulation	K4
CO4	Analyze the resources efficiently under various constrains and estimate the probability of completing a project on time.	K4
CO5	Develop critical and analytical skills that enable to apply optimization techniques constructively to any business environment and draw wise decisions.	K4

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	H	H	M	M	H	H
CO2	H	H	H	H	M	H	M	H	H
CO3	H	M	H	H	H	M	H	H	H
CO4	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content
Unit I	**Non-linear Programming:**Introduction - Formulating a Non-linear Programming Problem (NLPP) - General Non-linear Programming Problem - Constrained Optimization with Equality Constraints - Constrained Optimization with Inequality Constraints. **Chapter 27: Sections: 27.1- 27.5.**
Unit II	**Non-linear Programming - Methods:** Introduction - Quadratic Programming - Wolfe's Modified Simplex Method - Beale's Method. **Chapter 28: Sections: 28.1, 28.4 – 28.6.**
Unit III	**Simulation:** Introduction - Why simulation? - Process of simulation - Simulation models - Even-type simulation - Generation of random numbers - Monte-Carlo Simulation. **Chapter 22: Sections:22.1 - 22.7.**
Unit IV	**Simulation:** Simulation of inventory problems - Simulation of a Queueing System - Simulation of Job Sequencing. **Chapter 22: Sections: 22.8, 22.9 and 22.12.**
Unit V	**Resource Analysis in Network scheduling:** Introduction - Project cost - Time-cost Optimization Algorithm. **Chapter 26: Sections: 26.1 - 26.3.**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Kanti Swarup, Gupta P.K., *Operations Research*, Sultan Chand & Sons, New Delhi - 2014.

Reference Books:

1. Philips T, Ravindran A and Solberg J, *Operations Research: Principles and Practice,* John Willey & Sons, 1976.
2. Taha H. A, *Operation Research - An introduction,* Prentice Hall of India Pvt. Ltd, New Delhi, 2006.
3. P. K Gupta &D. S Hira, *Operations Research,* S. Chand and company Ltd, New Delhi, 2014.
4. S. Dharani Venkatakrishnan, *Operations Research principles problems*, Keerthi Publishing house Pvt. Ltd, 1994.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://www.youtube.com/watch?v=xGkpXkAnWU&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZYcNtsoX&index=30
2. https://www.youtube.com/watch?v=h0bdo06qNVw&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZYcNtsoX&index=33
3. https://www.youtube.com/watch?v=H58TPQNr2kM&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZYcNtsoX&index=34

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Dr. J. JAYASUDHA Signature	Name: Dr. V. INTHUMATHI Signature	Name: Signature	Name: Signature

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

K. SRINIVASAN, M.C.A.,
Co-ordinator
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

K. SRINIVASAN, M.C.A
Controller of Examinations
NGM College (Autonomous)
POLLACHI - 642 001.