

# MATHEMATICS

## Syllabus

**Program Code: UMT**

**2021-2022 onwards**

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**MANNAR THIRUMALAI NAICKER COLLEGE**

**(AUTONOMOUS)**

**Re-accredited with "A" Grade by NAAC**

**PASUMALAI, MADURAI – 625 004**

## Eligibility for Admission

Candidate should have passed the Higher Secondary Examination conducted by the Board of Higher Secondary Education, Government of Tamil Nadu CBSE Board with Mathematics as one of the Courses in Higher Secondary Education. The duration of the course shall be three academic years comprising six semesters with two semesters in each academic year.

## Subjects of Study

Part I : Tamil / Company Secretarial Practice and Modern Office Management

Part II : English

Part III :

1. Core Subjects
2. Allied Subjects
3. Electives

Part IV :

1. Non Major Electives (II Year)
2. Skill Based Subjects
3. Environmental Studies - Mandatory Subject
4. Value Education - Mandatory Subject

Part V :

Extension Activities

## Pattern of the question paper for the Continuous Internal Assessment

**Note: Duration – 1 hour**

**(For Part I, Part II & Part III)**

The components for continuous internal assessment are:

### Part –A

Four multiple choice questions (answer all) 4 x 01= 04 Marks

### Part –B

Three short answers questions (answer all) 3 x 02= 06 Marks

### Part –C

Two questions ('either .... or 'type) 2 x 05=10 Marks

### Part –D

Two questions out of three 1 x 10 =10 Marks

Total

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30 Marks  
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### **The scheme of Examination for Part-I, II & III**

The components for continuous internal assessment are:

(60 Marks of two continuous internal assessments will be converted to 15 marks)

Two tests and their average --15 marks

Seminar /Group discussion --5 marks

Assignment --5 marks

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Total 25 Marks  
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### **Pattern of the question paper for the Summative Examinations:**

**Note: Duration- 3 hours**

#### **Part –A**

Ten multiple choice questions 10 x01 = 10 Marks

No Unit shall be omitted: not more than two questions from each unit.)

#### **Part –B**

Short answer questions (one question from each unit) 5 x02 = 10 Marks

#### **Part –C**

Five Paragraph questions ('either .... or 'type) 5 x 05 = 25 Marks

(One question from each Unit)

#### **Part –D**

Three Essay questions out of five 3 x 10 =30 Marks

(One question from each Unit)

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Total 75 Marks  
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### **Part-IV- Skill Based Papers / NME:**

**The Scheme of Examination for Skill Based Papers: (Except Practical Lab Subjects)**

**Pattern of the questions paper for the continuous Internal Assessment**

**45 MCQs will be asked for each internal assessment tests (45 x 1=45 Marks) and converted for 15 marks**

The components for continuous internal assessment are:

Two tests and their average --15 marks

Seminar /Group discussion --5 marks

Assignment --5 marks

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Total 25 Marks  
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### **Summative Examination Pattern**

#### **Pattern of the Question Paper for Skill Based Papers (External)**

**75 Multiple choice questions will be asked from five units (75 x 1=75 Marks)**

**(15MCQ's from each unit)**

### **Part-IV- Environmental Studies and Value Education**

#### **The Scheme of Examination (Environmental Studies and Value Education)**

Two tests and their average	--15 marks
Project Report	<u>--10 marks*</u>
Total	<u>--25 marks</u>

\* The students as Individual or Group must visit a local area to document environmental assets – river / forest / grassland / hill / mountain – visit a local polluted site – urban / rural / industrial / agricultural – study of common plants, insects, birds – study of simple ecosystem – pond, river, hill slopes, etc.

### **Question Paper Pattern**

**(Internal Assessment)**

#### **Pattern of the Question Paper for Environmental Studies & Value Education only) (Internal)**

**45 MCQs will be asked for each internal assessment tests (45 x 1=45 Marks) and converted for 15 marks**

Two tests and their average	--	15 marks
Project	--	10 marks
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Total		25 Marks
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### **Summative Examination Pattern**

#### **Pattern of the Question Paper for Environmental Studies & Value Education only) (External)**

**75 Multiple choice questions will be asked from five units (75 x 1=75 Marks)**

**(15MCQ's from each unit)**

**Part V Extension Activities: (Maximum Marks: 100)**

1. NCC
2. NSS
3. Physical Education
4. YRC
5. RRC
6. Health & Fitness Club
7. Eco Club
8. Human Rights Club

**Pattern of the Question Paper for (Internal Examination & Summative Examination)**

Internal Examinations      - - 40 Marks

Summative Examinations - - 60 Marks

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**100**

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**Minimum Marks for a Pass**

40% of the aggregate (Internal +Summative Examinations).

No separate pass minimum for the Internal Examinations.

27 marks out of 75 is the pass minimum for the Summative Examinations.

## VISION

To empower the students so as to face the competitive world and make them fit for the MNCs according to their necessity and requirement

## MISSION

- To maintain the standard of teaching in various areas of Pure and Applied Mathematics
- To provide an excellent learning environment with theoretical and practical knowledge where students can explore mathematical concepts.
- To mold the students to become a competent users of Mathematics and its applications.
- To instill the spirit of research through innovative teaching and research facilities.
- To qualify the students to meet the industry expectations.

The 12 Graduate Attributes\*:

1. (KB) A knowledge base for engineering: Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.
2. (PA) Problem analysis: An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions
3. (Inv.) Investigation: An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data and synthesis of information in order to reach valid conclusions.
4. (Des.) Design: An ability to design solutions for complex, open-ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.
5. (Tools) Use of engineering tools: An ability to create, select, apply, adapt, and extend appropriate techniques, resources, and modern engineering tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations.
6. (Team) Individual and teamwork: An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.
7. (Comm.) Communication skills: An ability to communicate complex engineering concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.
8. (Prof.) Professionalism: An understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest.

9. (Impacts) Impact of engineering on society and the environment: An ability to analyze social and environmental aspects of engineering activities. Such ability includes an understanding of the interactions that engineering has with the economic, social, health, safety, legal, and cultural aspects of society, the uncertainties in the prediction of such interactions; and the concepts of sustainable design and development and environmental stewardship.
10. (Ethics) Ethics and equity: An ability to apply professional ethics, accountability, and equity.
11. (Econ.) Economics and project management: An ability to appropriately incorporate economics and business practices including project, risk, and change management into the practice of engineering and to understand their limitations.
12. (LL) Life-long learning: An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge

<b>WA</b>	<b>Graduate Attributes</b>	<b>Caption as</b>
<b>1</b>	Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.	<b>A knowledge base for engineering</b>
<b>2</b>	An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions	<b>Problem analysis</b>
<b>3</b>	An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data and synthesis of information in order to reach valid conclusions.	<b>Investigation</b>
<b>7</b>	An ability to communicate complex engineering concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.	<b>Communication skills</b>
<b>6</b>	An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.	<b>Individual and teamwork</b>
<b>10</b>	An ability to apply professional ethics, accountability, and equity.	<b>Ethics and equity</b>
<b>12</b>	An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge	<b>Life-long learning</b>

**PROGRAM EDUCATIONAL OBJECTIVE (PEOs) are:**

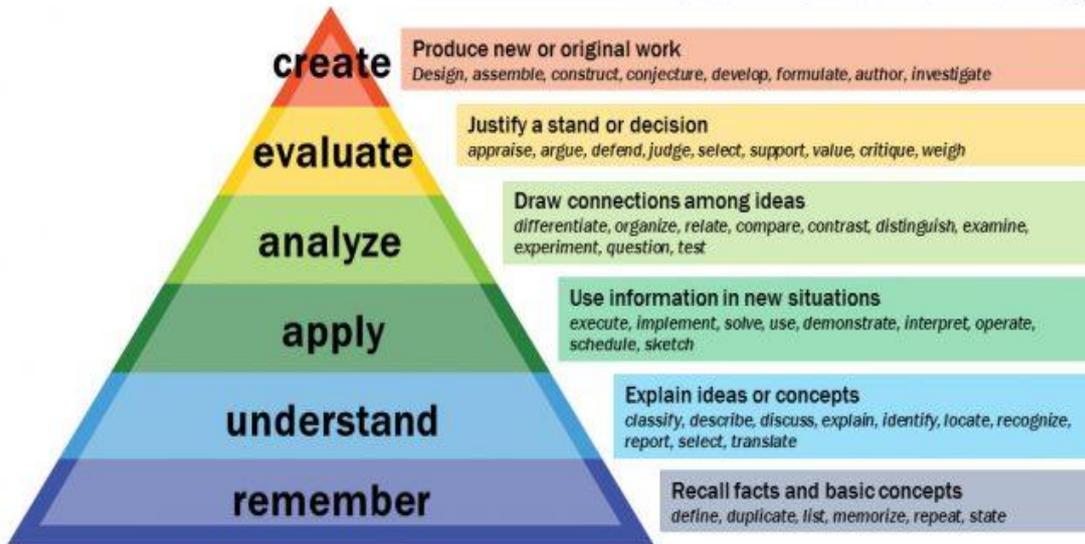
<b>PEO1:</b>	Enhance the entrepreneurial abilities, life skills and research initiates through experiential learning practices and building self confidence
<b>PEO2:</b>	Collaborate with industry and alumnae to explore the new avenues in respective domains and raise the employability ratio
<b>PEO3:</b>	Equip with soft skills and critical thinking to produce an erudite and trustworthy generation to fit into versatile situations
<b>PEO4:</b>	Adhere to the ethical and environmental sustainability to create morally upright and empowered citizens to face industry/ Institution
<b>PEO5:</b>	Up-skill / Re-skill their primary knowledge and potentials to compete in the dynamic global environment.
<b>PEO6:</b>	To build confidence to appear for Competitive / Civil Service examinations and to conquer commanding positions in organizational level.

<b>PO NO</b>	<b>PROGRAMME OUTCOMES (POs)</b>	
<b>At the end of the programme, the students will be able to</b>		
<b>PO – 1</b>	Demonstrate the knowledge and understanding of Science concepts and its relevant fields.	<b>Disciplinary Knowledge</b>
<b>PO – 2</b>	Identify, formulate, analyse complex problems and reach valid conclusions using the methodologies of Science.	<b>Problem Solving</b>
<b>PO – 3</b>	Employ critical and analytical thinking in understanding the concepts and apply them in various problems appearing in different branches of Science.	<b>Analytical Reasoning &amp; Critical Thinking</b>
<b>PO - 4</b>	Communicate the known concepts effectively within the profession and with any forum	<b>Communication Skills</b>
<b>PO - 5</b>	Function successfully as a member/leader in any team and to apply ethics, accountability and equity in their life.	<b>Team Work and Moral/Ethical Awareness</b>
<b>PO - 6</b>	Use ICT tools in various learning situations, related information sources, suitable software to analyze data and furthermore participating in learning activities throughout life to meet the demands of work place through knowledge /up-skilling / re-skilling	<b>Digital Literacy &amp; Life-long Learning</b>

**PROGRAM SPECIFIC OUTCOME (PSOs)**

<b>PSO1:</b>	Demonstrate a knowledge and understanding of the concepts of Mathematics and other relevant fields.
<b>PSO2:</b>	Apply the acquired knowledge to solve different kinds of problems in real life situations.
<b>PSO3:</b>	Employ critical and analytical thinking in knowledge development and face various competitive examinations.
<b>PSO4:</b>	Listen, read carefully and express Mathematical concepts/views effectively by using appropriate media in writing and orally within the profession / any forum.
<b>PSO5:</b>	Work efficiently as a member/leader in any team and use ethical practices in all work.
<b>PSO6:</b>	Use ICT tools in various learning situations and appropriate mathematical software to analyze data; take part in learning activities over course of life time to meet the demands of work place through knowledge /up-skilling / re-skilling

## Bloom's Taxonomy



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS), MADURAI**  
**MATHEMATICS CURRICULUM**

*(For the student admitted during the academic year 2021-2022 onwards)*

Course Code	Title of the Course	Hrs	Credits	Maximum Marks		
				Int	Ext	Total
<b>FIRST SEMESTER</b>						
<b>Part – I</b>	<b>Tamil / Alternate Course</b>					
21UTAG11	இக்காலக் கவிதையும் நாடகமும்	6	3	25	75	100
<b>Part – II</b>	<b>English</b>					
21UENG11	Communicative English - I	6	3	25	75	100
<b>Part - III</b>	<b>Core Courses</b>					
21UMTC11	Differential Calculus	4	4	25	75	100
21UMTC12	Theory of Equations and Its Application	4	4	25	75	100
<b>Part III</b>	<b>Allied Course</b>					
21UPHA11	Allied Physics – I (Mechanics, Properties of Matter, Heat and Sound)	4	4	25	75	100
21UPHAP1	Allied Physics Practical - I	2	-	-	-	-
<b>Part IV</b>	<b>Skill Based Course</b>					
21UMTS11	Quantitative Aptitude	2	2	25	75	100
<b>Part IV</b>	<b>Mandatory Course</b>					
21UEVG11	Environmental Studies	2	2	25	75	100
	<b>Total</b>	<b>30</b>	<b>22</b>	<b>175</b>	<b>525</b>	<b>700</b>
<b>SECOND SEMESTER</b>						
<b>Part – I</b>	<b>Tamil / Alternate Course</b>					
21UTAG21	இடைக்கால இலக்கியமும் சிறுகதையும்	6	3	25	75	100
<b>Part – II</b>	<b>English</b>					
21UENG21	Communicative English - II	6	3	25	75	100
<b>Part - III</b>	<b>Core Courses</b>					
21UMTC21	Integral Calculus	4	4	25	75	100
21UMTC22	Analytical Geometry of Three Dimensions	4	4	25	75	100
<b>Part III</b>	<b>Allied Course</b>					
21UPHA21	Allied Physics – II (Electricity, Electronics, Optics and Modern Physics )	4	3	25	75	100
21UPHAP1	Allied Physics Practical - I	2	1	40	60	100
<b>Part IV</b>	<b>Skill Based Course</b>					
21UMTSP1	M.S Office - Lab	2	2	40	60	100
<b>Part IV</b>	<b>Value Education</b>					
21UVLG21	Value Education	2	2	25	75	100
	<b>Total</b>	<b>30</b>	<b>22</b>	<b>230</b>	<b>570</b>	<b>800</b>

<b>THIRD SEMESTER</b>						
<b>Part – I</b>	<b>Tamil / Alternate Course</b>					
21UTAG31	காப்பிய இலக்கியமும் உரைநடையும்;	6	3	25	75	100
<b>Part – II</b>	<b>English</b>					
21UENG31	Communicative English - III	6	3	25	75	100
<b>Part - III</b>	<b>Core Courses</b>					
21UMTC31	Mechanics	5	5	25	75	100
21UMTC32	Trigonometry and Vector Calculus	4	4	25	75	100
<b>Part III</b>	<b>Allied Course</b>					
21UMTA31	Operations Research	5	5	25	75	100
<b>Part IV</b>	<b>Skill Based Course</b>					
21UMTS31	Transform Techniques	2	2	25	75	100
<b>Part IV</b>	<b>Non – Major Elective Course</b>					
21UMTN31	Mathematics for Competitive Examinations - I	2	2	25	75	100
	<b>Total</b>	<b>30</b>	<b>24</b>	<b>175</b>	<b>525</b>	<b>700</b>
<b>FOURTH SEMESTER</b>						
<b>Part – I</b>	<b>Tamil / Alternate Course</b>					
21UTAG41	பண்டைய இலக்கியமும் புதினமும்	6	3	25	75	100
<b>Part – II</b>	<b>English</b>					
21UENG41	Communicative English - IV	6	3	25	75	100
<b>Part - III</b>	<b>Core Courses</b>					
21UMTC41	Modern Algebra	5	5	25	75	100
21UMTC42	Sequence and Series	4	4	25	75	100
<b>Part III</b>	<b>Allied Course</b>					
21UMTA41	Programming in C++	3	3	25	75	100
21UMTAP1	Programming in C++ Lab	2	1	40	60	100
<b>Part IV</b>	<b>Skill Based course</b>					
21UMTS41	Fourier Series and Fourier Transform	2	2	25	75	100
<b>Part IV</b>	<b>Non – Major Elective Course</b>					
21UMTN41	Mathematics for Competitive Examinations - II	2	2	25	75	100
<b>Part V</b>	<b>Extension Activities</b>					
21UEAG40 - 21UEAG44	NSS, NCC, YRC, RRC, PHY	-	1	40	60	100
	<b>Total</b>	<b>30</b>	<b>24</b>	<b>255</b>	<b>645</b>	<b>900</b>

<b>FIFTH SEMESTER</b>						
<b>Part - III</b>	<b>Core Courses</b>					
21UMTC51	Linear Algebra	6	4	25	75	100
21UMTC52	Real Analysis	6	4	25	75	100
21UMTC53	Differential Equations	6	4	25	75	100
<b>Part III</b>	<b>Core Elective Courses</b>					
<b>21UMTE51</b>	<b>Statistics – I</b>					
21UMTE52	Astronomy	5	5	25	75	100
21UMTE53	Optimization Techniques					
<b>21UMTE54</b>	<b>Numerical Methods</b>					
21UMTE55	Mathematical Modeling	5	5	25	75	100
21UMTE56	Combinatorics					
<b>Part IV</b>	<b>Skill Based Course</b>					
21UMTSP2	R Language Lab	2	2	40	60	100
	<b>Total</b>	<b>30</b>	<b>24</b>	<b>165</b>	<b>435</b>	<b>600</b>
<b>SIXTH SEMESTER</b>						
<b>Part - III</b>	<b>Core Courses</b>					
21UMTC61	Complex Analysis	6	4	25	75	100
21UMTC62	Graph Theory and its Applications	6	4	25	75	100
21UMTPR1	Project	6	4	40	60	100
<b>Part III</b>	<b>Core Elective Courses</b>					
<b>21UMTE61</b>	<b>Statistics – II</b>					
21UMTE62	Data Structures and Algorithm	5	5	25	75	100
21UMTE63	Number Theory					
<b>21UMTE64</b>	<b>Discrete Mathematics</b>					
21UMTE65	Fuzzy Sets Theory	5	5	25	75	100
21UMTE66	Formal Languages and Automata					
<b>Part IV</b>	<b>Skill Based Course</b>					
21UMTSP3	SPSS Lab	2	2	40	60	100
	<b>Total</b>	<b>30</b>	<b>24</b>	<b>180</b>	<b>420</b>	<b>600</b>
	<b>Grand Total</b>	<b>180</b>	<b>140</b>	<b>1180</b>	<b>3120</b>	<b>4300</b>

# FIRST SEMESTER



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>DIFFERENTIAL CALCULUS</b>			
<b>Course Code</b>	<b>21UMTC11</b>	<b>L</b>	<b>P</b>	<b>C</b>
<b>Category</b>	<b>Core</b>	4	-	4
<b>Nature of course:</b>	<b>EMPLOYABILITY</b>	✓	SKILL ORIENTED	ENTREPRENEURSHIP
<b>Course Objectives:</b>				
<ul style="list-style-type: none"> <li>• To develop problem solving skills</li> <li>• To familiarize the applications of differential calculus.</li> <li>• To explain about the nature and its types.</li> <li>• To provide the capability of finding the circle, radius and centre of curvatures.</li> <li>• To identify and solve the higher derivatives</li> </ul>				
<b>Unit: I</b>				12
Successive differentiation - $n^{\text{th}}$ derivative – Standard results – Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz formula.				
<b>Unit: II</b>				12
Maxima and Minima of two variables – Lagrange’s method of undetermined multipliers - Equations of tangent and normal at any point of the curve.				
<b>Unit: III</b>				12
Angle of intersection of curves – Sub tangent and Sub Normal - Curvature – Circle, radius and centre of curvatures - Cartesian formula for radius of curvature – The coordinates of the centre of curvature.				
<b>Unit: IV</b>				12
Envelopes - Evolute and Involute – Radius of curvature in Polar co-ordinates- p-r equation – Pedal equation of curves.				
<b>Unit: V</b>				12
Meaning of the derivative – Geometrical interpretation – Meaning of the sign of the differential coefficient – rate of change of variable.				
<b>Total Lecture Hours</b>				60
<b>Books for Study:</b>				
T.K.Manickavashagam Pillai and S.Narayanan, <b>Calculus, Volume I</b> , S.Viswanathan Publishers, Chennai, 1996.				
Unit-I – Chapter 3, Sections: 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 2.1				
Unit-II – Chapter 8, Sections: 4, 5 & Chapter 9, Sections: 1.2, 1.3,				
Unit–III – Chapter 9, Section: 1.4, Section 2, & Chapter 10, Sections: 2.1, 2.2, 2.3, 2.4.				
Unit-IV – Chapter 10, Sections: 1.1, 1.2, 1.3, 1.4, 2.5, 2.6, 2.7.				
Unit- V – Chapter 4, Sections: 1, 2, 3.				
<b>Books for References:</b>				
1. S.Arumugam and Isaac, <b>Calculus</b> , New Gamma Publishing House, Palayamkottai,2008.				
2. Shanthi Narayan, <b>Differential Calculus</b> , S.Chand & Company Ltd , New Delhi,1979.				
3. George B.Thomas, <b>Thomas’ Calculus</b> , Maurice D.Weir and Joel Hass, Pearson Education Company, 12 <sup>th</sup> Edition, 2015.				

<b>Web Resources</b>	
1. <a href="https://nptel.ac.in/courses/111/104/111104085/">https://nptel.ac.in/courses/111/104/111104085/</a>	
2. <a href="https://nptel.ac.in/courses/122/104/122104017/">https://nptel.ac.in/courses/122/104/122104017/</a>	
<b>COURSE OUTCOMES</b>	<b>K Level</b>
<b>On the successful completion of the course, the students will be able to</b>	
<b>CO1:</b>	Make use of Leibnitz formula to find the nth derivative of algebraic and trigonometric functions and formation of equations involving derivatives <span style="float:right"><b>K3</b></span>
<b>CO2:</b>	Apply partial differentiation to determine the maxima and minima of functions of two variables and Lagrange’s method of undetermined multipliers. <span style="float:right"><b>K3</b></span>
<b>CO3:</b>	Understand the equations of the tangent, normal, Sub tangent and Sub Normal. <span style="float:right"><b>K4</b></span>
<b>CO4:</b>	Determine envelope, curvatures, involute and evolute of the curve. <span style="float:right"><b>K4</b></span>
<b>CO5:</b>	Analyze the Applications of Differential Calculus <span style="float:right"><b>K4</b></span>

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	-	1	-	3	-
CO 2	2	1	1	1	1	1
CO 3	3	1	1	-	3	-
CO 4	2	1	2	1	3	1
CO 5	3	2	1	1	3	1

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

UNIT	COURSE NAME	Hrs	Pedagogy
<b>I</b>	Successive differentiation - n <sup>th</sup> derivative – Standard results – Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz formula.	12	<b>Chalk, PPT &amp; Talk</b>
<b>II</b>	Maxima and Minima of two variables – Lagrange’s method of undetermined multipliers - Equations of tangent and normal at any point of the curve.	12	<b>Chalk &amp; Talk</b>
<b>III</b>	Maxima and Minima of two variables – Lagrange’s method of undetermined multipliers - Equations of tangent and normal at any point of the curve.	12	<b>Chalk &amp; Talk</b>
<b>IV</b>	Envelopes - Evolute and Involute – Radius of curvature in Polar co-ordinates- p-r equation – Pedal equation of curves.	12	<b>Chalk, PPT &amp; Talk</b>
<b>V</b>	Meaning of the derivative – Geometrical interpretation – Meaning of the sign of the differential coefficient – rate of change of variable.	12	<b>Chalk &amp; Talk</b>

Course Designed by: **Dr.V.Ramachandran** and **Mrs.R.Sumathi**

**Learning Outcome Based Education & Assessment (LOBE)  
Formative Examination - Blue Print  
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Upto K3	2	K1&K2	1	K1	2	1
AI	CO2	Upto K3	2	K1&K2	2	K2	2	1
CI	CO3	Upto K4	2	K1&K2	1	K2	2	1
AII	CO4	Upto K4	2	K1&K2	2	K2	2	1
Question Pattern CIA I & II	No. of Questions to be asked		4		3		4	2
	No. of Questions to be answered		4		3		2	1
	Marks for each question		1		2		5	10
	Total Marks for each section		4		6		10	10

**Distribution of Marks with K Level CIA I & CIA II**

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K3	2	K1&K2	1	K1	2(K1&K1)	1(K2)
2	CO2	Upto K3	2	K1&K2	1	K1	2(K3&K3)	1(K3)
3	CO3	Upto K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
4	CO4	Upto K4	2	K1&K2	1	K2	2(K4&K4)	1(K3)
5	CO5	Upto K4	2	K1&K2	1	K2	2(K2&K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D ( Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	17
K2	5	6			11	9.17	
K3			25	20	45	37.5	37
K4			25	30	55	45.83	46
Marks	10	10	50	50	120	100	100
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.</b>							

**Summative Examinations - Question Paper – Format**

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K3	
22	CO2	K2	
23	CO3	K3	
24	CO4	K3	
25	CO5	K4	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>THEORY OF EQUATIONS AND ITS APPLICATION</b>				
<b>Course Code</b>	21UMTC12	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	Core	4	-	4	
<b>Nature of course:</b>	<b>EMPLOYABILITY</b>	✓	SKILL ORIENTED	ENTREPRENEURSHIP	
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>• To familiarize with the theory of equations.</li> <li>• To introduce the transformation of equations.</li> <li>• To write the standard form of reciprocal equation.</li> <li>• To develop the knowledge of algebraic concepts on mathematics.</li> <li>• To find the approximate solution using Newton’s and Horner’s method.</li> </ul>					
<b>Unit: I</b>					12
Theory of equations – Formation of Equation – Relation between the roots and coefficients.					
<b>Unit: II</b>					12
Sum of the power of the roots of an equation – Newton’s theorem – Reciprocal equations – Standard Reciprocal Equations.					
<b>Unit: III</b>					12
Transformations of equations - Removal of terms – Multiple roots –Nature & Position of roots - Descarte’s rule of sign.					
<b>Unit: IV</b>					12
Roll’s theorem (only statement) – Strum’s theorem (only problems) –Cubic equations – Cardon’s method for solving a cubic equation.					
<b>Unit: V</b>					12
Approximate solutions of Numerical equations- Newton’s method – Horner’s method.					
<b>Total Lecture Hours</b>					<b>60</b>
<b>Books for Study:</b>					
S. Arumugam and Isaac, <b>Classical Algebra</b> , New Gamma Publishing House, Palayamkottai, 2016.					
Unit I : Page 08 – 31 Unit II : Page 32 – 56 Unit III : Page 56 – 77 Unit IV : Page 78 – 100 Unit V : Page 103 – 112					
<b>Books for Reference:</b>					
1. T.K .Manicavasagam Pillai and S. Narayanan, <b>Algebra – Volume I</b> , S.Viswanathan Printers Publishers Pvt. Ltd, Chennai, 2007.					
2. Hari kishan, Theory of equations, Atlantic publishers and Distributers Pvt Ltd, December 2013.					
3. MacDuffee, C.C. - Theory of Equations, John Wiley & Sons Inc., 1954.					
<b>Web Resources</b>					
1. <a href="https://www.khanacademy.org/math/linear-algebra">https://www.khanacademy.org/math/linear-algebra</a>					
2. <a href="https://nptel.ac.in/courses/111/105/111105112/">https://nptel.ac.in/courses/111/105/111105112/</a>					
<b>COURSE OUTCOMES</b>					<b>K Level</b>

<b>On the successful completion of the course, the students will be able to</b>		
<b>CO1:</b>	Relate the roots of the equation with its coefficients	<b>K2</b>
<b>CO2:</b>	Determine the powers of the roots by Newton's theorem and roots of reciprocal equations	<b>K3</b>
<b>CO3:</b>	Analyse the nature and position of the roots using Descarte's rule of sign.	<b>K4</b>
<b>CO4:</b>	Solve equations using various method.	<b>K4</b>
<b>CO5:</b>	Predict approximate solutions to Numerical equations using Newton's and Horner's method.	<b>K4</b>

**CO & PO Mapping:**

<b>COS</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>
<b>CO 1</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>-</b>
<b>CO 2</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>-</b>
<b>CO 3</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>1</b>
<b>CO 4</b>	<b>3</b>	<b>-</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>-</b>
<b>CO 5</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>1</b>

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

<b>UNIT</b>	<b>COURSE NAME</b>	<b>Hrs</b>	<b>Pedagogy</b>
<b>I</b>	Theory of equations – Formation of Equation – Relation between the roots and coefficients.	<b>12</b>	<b>Chalk &amp; Talk</b>
<b>II</b>	Sum of the power of the roots of an equation – Newton's theorem – Reciprocal equations – Standard Reciprocal Equations.	<b>12</b>	<b>Chalk &amp; Talk</b>
<b>III</b>	Transformations of equations - Removal of terms – Multiple roots – Nature & Position of roots - Descarte's rule of sign.	<b>12</b>	<b>Chalk &amp; Talk</b>
<b>IV</b>	Roll's theorem (only statement) – Strum's theorem (only problems) – Cubic equations – Cardon's method for solving a cubic equation.	<b>12</b>	<b>Chalk &amp; Talk</b>
<b>V</b>	Approximate solutions of Numerical equations- Newton's method – Horner's method.	<b>12</b>	<b>Chalk &amp; Talk</b>

Course Designed by: **Mrs.S.Ragavi** and **Dr.A.Hamari Choudhi**

**Learning Outcome Based Education & Assessment (LOBE)  
Formative Examination - Blue Print  
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Upto K2	2	K1&K2	1	K1	2	1
AI	CO2	Upto K3	2	K1&K2	2	K2	2	1
CI	CO3	Upto K4	2	K1&K2	1	K2	2	1
AII	CO4	Upto K4	2	K1&K2	2	K2	2	1
Question Pattern CIA I & II	No. of Questions to be asked		4		3		4	2
	No. of Questions to be answered		4		3		2	1
	Marks for each question		1		2		5	10
	Total Marks for each section		4		6		10	10

**Distribution of Marks with K Level CIA I & CIA II**

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5** will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K2	2	K1&K2	1	K1	2(K1 & K1)	1(K2)
2	CO2	Upto K3	2	K1&K2	1	K1	2(K3 & K3)	1(K3)
3	CO3	Upto K4	2	K1&K2	1	K2	2(K3 & K3)	1(K4)
4	CO4	Upto K4	2	K1&K2	1	K2	2(K4 & K4)	1(K3)
5	CO5	Upto K4	2	K1&K2	1	K2	2(K2 & K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

**(Figures in parenthesis denotes, questions should be asked with the given K level)**

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D ( Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	17
K2	5	6			11	9.17	
K3			25	20	45	37.5	37
K4			25	30	55	45.83	46
Marks	10	10	50	50	120	100	100

**NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.**

**Summative Examinations - Question Paper – Format**

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
Q.No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
Q.No	CO	K Level	Questions
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K4	
18) b	CO3	K4	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
Q.No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K4	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>ALLIED PHYSICS–I: Mechanics, Properties of Matter, Heat and Sound</b>				
<b>Course Code</b>	<b>21UPHA11</b>	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	<b>Allied</b>	4	-	4	
<b>Nature of course:</b>	<b>EMPLOYABILITY</b> ✓	<b>SKILL ORIENTED</b> ✓	ENTREPRENEURSHIP		
<b>Course Objectives:</b>					
The learners will be able:					
<ol style="list-style-type: none"> <li>1. To recollect Newton’s law of motion</li> <li>2. To understand the elasticity property and types of modulus</li> <li>3. To understand the viscosity and application of Bernoulli’s theorem</li> <li>4. To recollect Kinetic theory of gases</li> <li>5. To understand the concepts of S.H.M</li> </ol>					
<b>Unit: I</b>	<b>Mechanics</b>				<b>13</b>
Torque – Angular momentum –Moment of Inertia –Perpendicular and Parallel axes theorem - Kepler’s laws of planetary motion - Newton’s laws of gravitation–Mass and density of Earth – Boy’s method for G–Compound pendulum-Expression for period-Experiment to find “g”					
<b>Unit: II</b>	<b>Elasticity</b>				<b>12</b>
Stress and Strain - Elasticity–Different moduli of Elasticity-Poisson’s ratio–Bending of beams– Expression for bending moment–Determination of Young’s modulus by uniform and non uniform bending–Torsion–Expression for couple per unit twist–Work done in twisting - Torsional oscillations of a body - Workdone in twisting– Rigidity modulus by torsion pendulum					
<b>Unit: III</b>	<b>Viscosity</b>				<b>11</b>
Coefficient of viscosity -Derivation of Poiseuille’s formula - coefficient of viscosity of a liquid by Poiseuille’s method – Equation of continuity-Bernoulli’s theorem–derivation–Applications of Bernoulli’s theorem (Venturimeter and Pitot tube).					
<b>Unit: IV</b>	<b>Heat</b>				<b>12</b>
Kinetic theory of gases – Mean free path – Transport phenomena – Expression for the coefficient of Diffusion, viscosity and thermal conductivity – Degrees of freedom – Boltzman’s law of equipartition of energy – calculation of $\gamma$ for mono atomic and diatomic gases - Thermodynamics – First and second laws of thermodynamics (statement only) – Entropy – change of entropy in Carnot’s cycle – Change of entropy in conversion of ice into steam					
<b>Unit: V</b>	<b>Sound</b>				<b>12</b>
Simple harmonic motion – Composition of two S.H.M’s of equal time periods at right angles – Stationary waves – Properties of stationary waves – Melde’s experiment for the frequency of electrically maintained tuning fork (Transverse and Longitudinal modes) - Ultrasonics – Production –Piezoelectric method – Detection – Kundt’s tube and Piezoelectric - Properties –Applications					
<b>Total Lecture Hours</b>					<b>60 Hrs</b>
<b>Books for Study:</b>					
<ol style="list-style-type: none"> <li>1. R.Murugesan, Mechanics, Properties of Matter and Sound, Madurai, first edition, July 2016. [B.Sc. Ancillary Physics                     <ul style="list-style-type: none"> <li>* Unit–I: 1.1, 2.1–2.7, 2.13-2.15, 3.1-3.5</li> <li>* Unit–II: 4.1-4.5, 4.7, 4.8, 4.10-4.13</li> </ul> </li> </ol>					

- \* Unit–III: 5.2-5.7 -
  - \* Unit-V: 6.1, 6.3,6.4, 6.7-6.9, 6.12
2. R..Murugesan, Thermal Physics, Madurai, First edition July, 2016. (B.Sc., Ancillary Physics)
- \* Unit–IV: 6.1, 6.3-6.7, 6.9-6.11, 7.4-7.7

**Books for References:**

1. S.L.Kakani,C.Hemarajani,S.Kakani,**Mechanics**,IIIedition,VivaBooks Ltd,NewDelhi,2011.
2. HalidayResnic,JearlWalker,**PrinciplesofPhysics**,9<sup>th</sup>Edition,WileyIndia Pvt.Ltd, New Delhi, 2012.
3. D.S.Mathur,**Mechanics**,S.ChandandCo.,NewDelhi,2008
4. Brijlaland N.Subramanyam, **Propertiesofmatter**,S.ChandandCo., New Delhi,2004
5. BrijlalandN.Subramanyam,**HeatandThermodynamics**, S.Chandand Co, New Delhi, 2004.

**Web Resources:**

1. <https://latestcontents.com/bsc-physics-mechanics-notes/>
2. [www.khanacademy.org/science/physics/elasticity/surface\\_tension](http://www.khanacademy.org/science/physics/elasticity/surface_tension)
3. <https://www.askiitians.com/revision-notes/physics/kinetic-theory-of-gases/>
4. <https://www.askiitians.com/revision-notes/physics/thermodynamics/>

Course Outcomes		K Level
After successful completion of the course, the student is expected to		
<b>CO1:</b>	Understand the concepts of Newton’s law of Gravitation, different modulus of elasticity, mean free path, degrees of freedom, laws of thermodynamics and stationary waves	<b>K2</b>
<b>CO2:</b>	Define centripetal and centrifugal force, angular velocity, moment of inertia, elasticity, Poisson’s ratio, bending of beams, Bernouli’s theorem, Transport Phenomena, mono and diatomic gases, S.H.M, properties of Ultrasonic waves	<b>K3</b>
<b>CO3:</b>	Apply torque, angular momentum, expression for bending moment, couple per unit twist, Bernouli's theorem, Boltzmann’s law of equipartition of energy, change of entropy in conversion of ice to steam, applications of Ultrasonic waves	<b>K3</b>
<b>CO4:</b>	Analyze parallel and perpendicular axis theorem, Boy’s method for G, determine and analyze uniform and non-uniform bending, Poiseuille’s formula to find the coefficient viscosity of liquid	<b>K4</b>
<b>CO5:</b>	Analyze the change of entropy in Carnot's cycle , Kundt's tube and Piezo electric method for the production of Ultrasonic waves, Melde’s experiment for the frequency of tuning fork	<b>K4</b>

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	3	2	3
CO 2	3	2	1	2	1	2
CO 3	3	2	1	2	2	2
CO 4	3	2	2	1	1	2
CO 5	2	2	1	1	2	2

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

Unit	<b>ALLIEDPHYSICS-I Mechanics, Properties of Matter, Heat and Sound</b>	Hrs	Pedagogy
<b>I</b>	<b>Mechanics</b> Torque – Angular momentum –Moment of Inertia –Perpendicular and Parallel axes theorem - Kepler’slawsofplanetarymotion-Newton’slawsofgravitation–Massanddensityof Earth–Boyle’s method for G–Compound pendulum-Expression for period-Experiment to find “g”	<b>13</b>	<b>Lecture method, PPT, Demonstration</b>
<b>II</b>	<b>Elasticity</b> Different moduli of Elasticity-Poisson’sratio–Bendingofbeams–Expression for bending moment–Determination of Young’s modulus by uniform and non uniform bending – Torsion–Expression for couple per unit twist – Workdone in twisting Torsional oscillations of a body - Workdone in twisting– Rigidity modulus by torsion pendulum	<b>12</b>	<b>Lecture method, PPT, Demonstration</b>
<b>III</b>	<b>Viscosity</b> Viscosity - Derivation of Poiseuille’s formula - coefficient of viscosity of a liquid by Poiseuille’s method – Equation of continuity - Bernoulli’s theorem – derivation – Applications of Bernoulli’s theorem (Venturimeter and Pitot tube )	<b>11</b>	<b>Lecture method, PPT, Model</b>
<b>IV</b>	<b>Heat</b> Kinetic theory of gases – Mean free path – Transport phenomena – Expression for the coefficient of Diffusion, viscosity and thermal conductivity – Degree of freedom – Boltzman’s law of equipartition of energy – calculation of $\gamma$ for mono atomic and diatomic gases - Thermodynamics – First and second laws of thermodynamics (statement only) – Entropy – change of entropy in Carnot’s cycle – Change of entropy in conversion of ice into steam	<b>12</b>	<b>Lecture method, PPT</b>
<b>V</b>	<b>Sound</b> Simple harmonic motion – Composition of two S.H.M’s of equal time periods at right angles - Stationary waves –Properties of stationary waves – Melde’s experiment for the frequency of electrically maintained tuning fork (Ttransverse and Longitudinal modes) - Ultrasonics – Production – Piezo electric method – Detection – Kundt’s tube and Piezo electric - Properties – Applications	<b>12</b>	<b>Lecture method, PPT</b>

Course Designed by: **1. Mrs.A.Lakshmi, 2. Dr.S.S.Jayabalakrishnan**

**Learning Outcome Based Education & Assessment (LOBE)  
Formative Examination - Blue Print  
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	COs	K - Level	Unit	Section A		Section B		Section C (Either or Choice)		Section D (Open Choice)	
				MCQs		Short Answers		No. of. Questions	K - Level	No. of. Questions	K - Level
				No. of. Questions	K - Level	No. of. Questions	K - Level				
CIA I	CO1 to CO5	K1 to K4	I	2	K1&K2	1	K1	2	K2	1	K2
			II	2	K1&K2	2	K2	2	K3	1	K3
CIA II	CO1 to CO5	K1 to K4	III	2	K1&K2	1	K2	2	K3	1	K3
			IV	2	K1&K2	2	K2	2	K4	1	K4
Question Pattern CIA I & II		No. of Questions to be asked		4		3		4		2	
		No. of Questions to be answered		4		3		2		1	
		Marks for each question		1		2		5		10	
		Total Marks for each section		4		6		10		10	

**Distribution of Marks with K Level CIA I & CIA II**

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

- K1-** Remembering and recalling facts with specific answers  
**K2-** Basic understanding of facts and stating main ideas with general answers  
**K3-** Application oriented- Solving Problems  
**K4-** Examining, analyzing, presentation and make inferences with evidences

**UNIT-V** will be allotted for individual Assignment in **CO5 - K4** level which carries five marks as part of CIA component.

<b>Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)</b>											
S.No.	COs	K - Level	Unit	MOQs		Short Answers		Section C (Either / or Choice)		Section D (Open Choice)	
				No.of Questions	K – Level	No.of Questions	K – Level	No.of Questions	K – Level	No.of Questions	K – Level
1	CO1 - CO5	K1 to K4	I	2	K1 & K2	1	K1	2	K2 & K2	1	K2
2	CO1 - CO5	K1 to K4	II	2	K1 & K2	1	K1	2	K3 & K3	1	K3
3	CO1 - CO5	K1 to K4	III	2	K1 & K2	1	K2	2	K3 & K3	1	K3
4	CO1 - CO5	K1 to K4	IV	2	K1 & K2	1	K2	2	K4 & K4	1	K4
5	CO1 - CO5	K1 to K4	V	2	K1 & K2	1	K2	2	K4 & K4	1	K4
No. of Questions to be Asked				10		5		10		5	
No. of Questions to be answered				10		5		5		3	
Marks for each question				1		2		5		10	
Total Marks for each section				10		10		25		30	

**Distribution of Marks with K Level**

<b>K Level</b>	<b>Section A (Multiple Choice Questions)</b>	<b>Section B (Short Answer Questions)</b>	<b>Section C (Either/ or Choice)</b>	<b>Section D ( Open Choice)</b>	<b>Total Marks</b>	<b>% of (Marks without choice)</b>	<b>Consolidated %</b>
K1	5	4			9	12	47
K2	5	6	10	10	31	34.66	
K3			20	20	40	27	27
K4			20	20	40	26.66	26
Marks	10	10	50	50	120	100	100

**NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.**

**Summative Examinations - Question Paper – Format**

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
Q.No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
Q.No	CO	K Level	Questions
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K4	
20) b	CO5	K4	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
Q.No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>ALLIED PHYSICS PRACTICAL - I</b>			
<b>Course Code</b>	<b>21UPHAP1</b>	<b>L</b>	<b>P</b>	<b>C</b>
<b>Category</b>	<b>Allied</b>	-	2	-
<b>Nature of course:</b>	<b>EMPLOYABILITY</b> ✓	<b>SKILL ORIENTED</b> ✓	ENTREPRENEURSHIP	
<b>Course Objectives:</b>				
The learners will be able:				
1. To gain knowledge about the experiments based on Optics, Electricity and Electronics				
2. To demonstrate modulus of elasticity				
3. To understand the bending of beam, forward and reverse biasing, frequency response				
4. To understand current conduction in electrical circuits.				
5. To learn about transistor amplifier, oscillator and Operational amplifier				
<b>LIST OF EXPERIMENTS (Any Fourteen Experiments)</b>				
1.. Uniform bending	- (Pin & Microscope)			
2. Torsion Pendulum	- Determination of Rigidity modulus and M.I			
3. Thermal conductivity of Bad conductor	- Lee's disc			
4. Sonometer	- Verification of laws			
5. Calibration of low range Voltmeter	- Potentiometer			
6. Carey Foster Bridge	- Resistance & resistivity of a wire.			
7. Spectrometer	- Refractive index of a Prism			
8..Mirror Galvanometer	- Voltage and current sensitiveness			
9.LCR – Series resonance	- Determination of L & Q factor			
10.Air wedge	- Thickness of a wire			
11.Grating N by $\lambda$ Normal incidence	- Spectrometer			
12.Single stage transistor amplifier	- CE mode			
13.Hartley oscillator	- Determination of frequency			
14.Logic gates – NAND and NOR	- Using Discrete Components.			
15.Zener diode	- Forward & Reverse Characteristics			
16.OP AMP	- Adder and Subtractor			
<b>Total Practical Hours</b>				<b>30 Hrs</b>
<b>Books for Study:</b>				
1. Srinivasan.M.N.,Balasubramanian.S.,Ranganathan.R., <b>A Text Book of Practical Physics</b> , 2017 Edition Sultan Chand & Sons				
<b>Books for References:</b>				
1. Ouseph.C., Practical Physics and Electronics,2013.S.Viswanathan.P.Ltd				
2. Practical Physics and Electronics, C.C.Ouseph, U.J.Rao, V.Vijayendran, S.Viswanathan Publishers(2007)				
<b>Web Resources:</b>				
1. <a href="https://nptel.ac.in/course.html/physics/experimental%20physics%20I,%20II%20and%20III">https://nptel.ac.in/course.html/physics/experimental physics I, II and III</a>				
2. <a href="https://nptel.ac.in/courses/115/105/115105110/">https://nptel.ac.in/courses/115/105/115105110/</a>				
3. <a href="https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLoFRX7n8z4tHYK">https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLoFRX7n8z4tHYK</a>				
<b>Course Outcomes</b>				<b>K Level</b>

On successful completion of the course, the learners should be able to		
<b>CO1:</b>	Understand and evaluate the Young's modulus and Rigidity modulus of the given material, the ways to calibrate a low range voltmeter using potentiometer	<b>K4</b>
<b>CO2:</b>	Acquire the knowledge of the characteristics of an operational amplifier	<b>K3</b>
<b>CO3:</b>	Apply the basic principles of optics to determine the thickness of a wire	<b>K4</b>
<b>CO4:</b>	Analyze the electrical parameters like resistance and resistivity using Carrey Foster bridge and characteristics of Zener diode	<b>K4</b>
<b>CO5:</b>	Construct Amplifier and Oscillator	<b>K4</b>

**CO & PO Mapping:**

<b>COS</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>
<b>CO 1</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>
<b>CO 2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>
<b>CO 3</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>CO 4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>2</b>
<b>CO 5</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>3</b>

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

<b>Semester</b>	<b>Allied Physics Practical - I</b>	<b>Hrs</b>	<b>Pedagogy</b>
<b>I</b>	1. Uniform bending - Pin & Microscope 2. Torsion Pendulum - Determination of Rigidity modulus and M.I 3. Thermal conductivity of Bad conductor - Lee's disc 4. Sonometer - Verification of laws 5. Calibration of low range Voltmeter - Potentiometer 6. LCR – Series resonance - Determination of L & Q factor 7. Logic gates – NAND and NOR - (Discrete Components). 8. Zener diode - Forward & Reverse Characteristics	<b>30</b>	<b>Demonstration</b>

Course Designed by: **1. Mrs.A.Lakshmi, 2. Dr.R.Sangeetha**



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
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<b>Course Name</b>	<b>QUANTITATIVE APTITUDE</b>				
<b>Course Code</b>	<b>21UMTS11</b>	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	<b>Skill</b>	2	-	2	
<b>Nature of course:</b>	<b>EMPLOYABILITY</b>	✓	<b>SKILL ORIENTED</b>	ENTREPRENEURSHIP	
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>To understand concepts of Mathematics along with analytical ability.</li> <li>To demonstrate the computational skills needed.</li> <li>To improve the ability to face the competitive examinations.</li> <li>To face the Competitive Examination bravely in future on employability.</li> <li>To solve problems using mathematical shortcuts.</li> </ul>					
<b>Unit: I</b>					6
	Problems on ages.				
<b>Unit: II</b>					6
	Profit and Loss				
<b>Unit: III</b>					6
	Ratio and proportion.				
<b>Unit: IV</b>					6
	Time and Work.				
<b>Unit: V</b>					6
	Permutations and Combinations.				
	<b>Total Lecture Hours</b>				30
<b>Books for Study:</b>					
R.S.Aggarwal, <b>Quantitative Aptitude</b> , Revised and Enlarged Edition, S.Chand publication, New Delhi, Reprint 2009.					
Unit I: Chapter 8 (Examples and Exercise first ten problems)					
Unit II: Chapter 11 (Examples and Exercise first ten problems)					
Unit III: Chapter 12 (Examples and Exercise first ten problems)					
Unit IV: Chapters 15 (Examples and Exercise first ten problems)					
Unit V: Chapters 30 (Examples and Exercise first ten problems).					
<b>Books for References:</b>					
1. Abhigit Guha, <b>Quantitative Aptitude</b> , 4th Edition, Tata Mc Graw Hill Publication, New Delhi, 2011.					
2. U.Mohan Rao, <b>Quantitative Aptitude</b> , Scitech Publications, Chennai, Reprint 2013.					
3. <b>Rajesh Verma</b> , Fast Track Objective Arithmetic Paperback, <b>Arihant Publications, 2018</b>					
<b>Web Resources</b>					
<a href="https://lecturenotes.in/placement-preparations">https://lecturenotes.in/placement-preparations</a>					
<a href="https://www.youtube.com/watch?v=-igPpeEQmFA">https://www.youtube.com/watch?v=-igPpeEQmFA</a>					
<a href="https://www.ibpsguide.com/important-aptitude-shortcuts-and-mind-tricks-for-problems-on-ages-ibps-po-2017-18/">https://www.ibpsguide.com/important-aptitude-shortcuts-and-mind-tricks-for-problems-on-ages-ibps-po-2017-18/</a>					

COURSE OUTCOMES		K Level
<b>On the successful completion of the course, the students will be able to</b>		
<b>CO1:</b>	Solve problems on ages.	<b>K3</b>
<b>CO2:</b>	Find profit / loss	<b>K3</b>
<b>CO3:</b>	Develop problem solving skills using ratio and proportion	<b>K3</b>
<b>CO4:</b>	Relate various concepts in solving time and work	<b>K3</b>
<b>CO5:</b>	Choose the suitable method to solve permutation and combination	<b>K3</b>

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	3	-	3	2	2
CO 2	2	2	1	3	2	2
CO 3	3	2	1	3	2	2
CO 4	2	2	2	3	2	2
CO 5	3	3	2	3	1	1

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

UNIT	COURSE NAME	Hrs	Pedagogy
<b>I</b>	Problems on ages.	<b>6</b>	<b>Chalk &amp; Talk</b>
<b>II</b>	Profit and Loss	<b>6</b>	<b>Chalk &amp; Talk</b>
<b>III</b>	Ratio and proportion.	<b>6</b>	<b>Chalk &amp; Talk</b>
<b>IV</b>	Time and Work.	<b>6</b>	<b>Chalk &amp; Talk</b>
<b>V</b>	Permutations and Combinations.	<b>6</b>	<b>Chalk &amp; Talk</b>

Course Designed by: **Mrs.R.Sumathi** and **Dr.M.Saravanan**

# SECOND SEMESTER



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>INTEGRAL CALCULUS</b>				
<b>Course Code</b>	<b>21UMTC21</b>	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	<b>Core</b>	4	-	4	
<b>Nature of course:</b>	<b>EMPLOYABILITY</b>	✓	SKILL ORIENTED	ENTREPRENEURSHIP	
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>• To give an idea about the properties of definite integrals.</li> <li>• To evaluate double and triple integrals.</li> <li>• To interchange Cartesian to polar co-ordinates.</li> <li>• To understand the relation between the derivative and definite integrals</li> <li>• To know the properties of Beta and Gamma functions.</li> </ul>					
<b>Unit: I</b>					15
Integration of rational algebraic functions –Special cases – Integration of irrational algebraic functions – Properties of definite integrals.					
<b>Unit: II</b>					15
Integration by parts– Reduction formulae for $\sin^n x$ , $\cos^n x$ , $\tan^n x$ , $\operatorname{cosec}^n x$ , $\sin^m x \cos^n x$ –Bernoulli's formula.					
<b>Unit: III</b>					15
Evaluation of double integral – Changing of order of integration– Double integral in Polar co- ordinates – Triple integral.					
<b>Unit: IV</b>					15
Jacobian – Change of variables in the case of two variable and three variables – Transformation from Cartesian to polar coordinate – Transformation from Cartesian to spherical coordinates.					
<b>Unit: V</b>					15
Properties – relation between Beta and Gamma functions – Recurrence formula.					
<b>Total Lecture Hours</b>					<b>75</b>
<b>Books for Study:</b>					
Narayanan. S and Manickavasagam Pillai. T.K, Calculus Volume II , (2015)					
Unit I : Chapter 1 : 7.3, 7.4, 7.5, 8, 11					
Unit II : Chapter 1: 12,13,15.1					
Unit III: Chapter 5 : 2.1, 2.2, 3.1, 4					
Unit IV : Chapter 6: 1.1, 1.2, 2.1,2.2,2.3,2.4					
Unit V: Chapter 7: 2.1, 2.2, 2.3, 3, 4, 5					
<b>Books for References:</b>					
1. Bali. N. P, <b>Integral Calculus</b> , Laxmi Publications, (1991), Delhi.					
2. Arumugam. S and Isaac, <b>Calculus</b> , New Gamma Publishing House, 2008, Palayamkottai.					
3. George B.Thomas, Maurice D.Weir and Joel Hass <b>Calculus</b> 12th Edition, Pearson Education, 2015.					
<b>Web Resources</b>					
1. <a href="https://www.khanacademy.org/math/integral-calculus/ic-integration/ic-integral-calc-intro/v/introduction-to-integral-calculus">https://www.khanacademy.org/math/integral-calculus/ic-integration/ic-integral-calc-intro/v/introduction-to-integral-calculus</a>					
2. <a href="https://nptel.ac.in/courses/111/107/111107108/">https://nptel.ac.in/courses/111/107/111107108/</a>					

COURSE OUTCOMES		K Level
<b>On the successful completion of the course, the students will be able to</b>		
<b>CO1:</b>	Demonstrate the understanding of basic concepts of integration.	<b>K2</b>
<b>CO2:</b>	Examine various techniques of integration	<b>K4</b>
<b>CO3:</b>	Apply the various concepts in solving definite and improper integrals.	<b>K3</b>
<b>CO4:</b>	Solve problems using transformation of one coordinate system to another	<b>K4</b>
<b>CO5:</b>	Analyze the properties of Beta and Gamma functions.	<b>K4</b>

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	1	2	3	1
CO 2	3	2	1	2	3	1
CO 3	3	2	2	2	3	1
CO 4	3	3	2	2	3	1
CO 5	3	2	2	2	3	1

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

UNIT	COURSE NAME	Hrs	Pedagogy
<b>I</b>	Integration of rational algebraic functions –Special cases – Integration of irrational algebraic functions – Properties of definite integrals.	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>II</b>	Integration by parts– Reduction formulae for $\sin^n x$ , $\cos^n x$ , $\tan^n x$ , $\operatorname{cosec}^n x$ , $\sin^m x \cos^n x$ -Bernoulli's formula.	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>III</b>	Evaluation of double integral – Changing of order of integration– Double integral in Polar co- ordinates – Triple integral.	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>IV</b>	Jacobian – Change of variables in the case of two variable and three variables – Transformation from Cartesian to polar coordinate – Transformation from Cartesian to spherical coordinates.	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>V</b>	Properties – relation between Beta and Gamma functions – Recurrence formula.	<b>15</b>	<b>Chalk &amp; Talk</b>

Course Designed by: **Mrs.R.Sumathi** and **Dr.V.Ramachandran**

**Learning Outcome Based Education & Assessment (LOBE)  
Formative Examination - Blue Print  
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Upto K2	2	K1&K2	1	K1	2	1
AI	CO2	Upto K3	2	K1&K2	2	K2	2	1
CI	CO3	Upto K4	2	K1&K2	1	K2	2	1
AII	CO4	Upto K4	2	K1&K2	2	K2	2	1
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

**Distribution of Marks with K Level CIA I & CIA II**

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K2	2	K1&K2	1	K1	2(K1&K1)	1(K2)
2	CO2	Upto K3	2	K1&K2	1	K1	2(K3&K3)	1(K3)
3	CO3	Upto K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
4	CO4	Upto K4	2	K1&K2	1	K2	2(K4&K4)	1(K3)
5	CO5	Upto K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D ( Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	17
K2	5	6			11	9.17	
K3			25	20	45	37.5	37
K4			25	30	55	45.83	46
Marks	10	10	50	50	120	100	100
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.</b>							

Summative Examinations - Question Paper – Format

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K4	
17) b	CO2	K4	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K4	
20) b	CO5	K4	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K2	
22	CO2	K4	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	



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<b>Course Name</b>	<b>ANALYTICAL GEOMETRY OF THREE DIMENSIONS</b>				
<b>Course Code</b>	<b>21UMTC22</b>	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	<b>Core</b>	4	-	4	
<b>Nature of course:</b>	<b>EMPLOYABILITY</b>	✓	SKILL ORIENTED	ENTREPRENEURSHIP	
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>• To recall the basic concepts of two dimensions</li> <li>• To understand about lines, planes, spheres</li> <li>• To compare the two dimensions and three dimensions</li> <li>• To find the distance between the Lines and the Planes</li> <li>• To find the angle between the Lines, the Planes, the Spheres</li> </ul>					
<b>Unit: I</b>					12
The plane – Equation of a Plane – Intercept form - Normal form- Transformation to the Normal form- Angle between two planes - Length of perpendicular – Angle Bisectors of Two Planes.					
<b>Unit: II</b>					12
The Straight Line – Equation of a Straight Line- Symmetric form – Two Point form – Angle between the Lines – Problems					
<b>Unit: III</b>					12
A Plane and a Line- Coplanar Lines- Angle between the line and the plane- Distance between two lines					
<b>Unit: IV</b>					12
Shortest distance between two lines - The Sphere – Equation of the sphere- Problems					
<b>Unit: V</b>					12
General Form of a Sphere- Diameter Form- Tangent Line and Tangent Plane- Angle of Intersection of Two Spheres- Section of a Sphere – Simple problems.					
<b>Total Lecture Hours</b>					60
<b>Books for Study:</b>					
Dr. Arumugam. S and A. Thangapandi Isaac, <b>Analytical Geometry of three Dimensions and Vector Calculus</b> , New Gamma Publications, Reprint 2017, Palayamkottai.					
Unit I	Chapter 2 : Full				
Unit II	Chapter 3 : Section 3.1				
Unit III	Chapter 3 : Section 3.2				
Unit IV	Chapter 3 : Section 3.2 & Chapter 4: Section 4.1				
Unit V	Chapter 4 : Section 4.2, 4.3				
<b>Books for References:</b>					
1. Manicka Vasagam Pillai and Natarajan, <b>Analytical Geometry of three Dimensions and Vector Calculus</b> , Viswanathan. S, Printers and Publishers Pvt. Ltd., Reprint 2001, Chennai.					
2. Duraipandian.P, Laxmidurai pandian and Muhilan.D, <b>Analytical Geometry of two Dimensions</b> , Emerald Publishers, Reprint, 1985, Chennai.					
3. Analytical Geometry: 2D and 3D, P.R.Vittal- Pearson Publications - January 2013					
<b>Web Resources</b>					
1. <a href="http://www.brainkart.com/article/Three-Dimensional-Analytical-Geometry_6453/">http://www.brainkart.com/article/Three-Dimensional-Analytical-Geometry_6453/</a>					

2. <https://www.youtube.com/watch?v=a2mt2L0e06Y>

COURSE OUTCOMES		K Level
<b>On the successful completion of the course, the students will be able to</b>		
<b>CO1:</b>	Compute the angle between two planes, equation of the plane and its normal forms	<b>K3</b>
<b>CO2:</b>	Solve the problems in straight lines	<b>K3</b>
<b>CO3:</b>	Illustrate the angle between the planes and lines	<b>K4</b>
<b>CO4:</b>	Calculate the distance between points, lines and planes.	<b>K3</b>
<b>CO5:</b>	Identify sphere in general form, intersection of two spheres and its related problems	<b>K3</b>

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	1	1	3	-
CO 2	3	1	1	-	3	1
CO 3	3	-	2	2	3	1
CO 4	3	-	1	1	3	-
CO 5	2	-	1	-	2	-

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

UNIT	COURSE NAME	Hrs	Pedagogy
<b>I</b>	The plane – Equation of a Plane – Intercept form - Normal form- Transformation to the Normal form- Angle between two planes - Length of perpendicular – Angle Bisectors of Two Planes.	<b>12</b>	<b>Chalk &amp; Talk</b>
<b>II</b>	The straight line – Equation of a Straight Line- Symmetric form – Two Point form – Angle between the Lines – Problems	<b>12</b>	<b>Chalk &amp; Talk</b>
<b>III</b>	A Plane and a Line- Coplanar Lines- Angle between the line and the plane- Distance between two lines	<b>12</b>	<b>Chalk &amp; Talk</b>
<b>IV</b>	Shortest distance between two lines - The Sphere – Equation of the sphere- Problems	<b>12</b>	<b>Chalk &amp; Talk</b>
<b>V</b>	General Form of a Sphere- Diameter Form- Tangent Line and Tangent Plane- Angle of Intersection of Two Spheres- Section of a Sphere – Simple problems.	<b>12</b>	<b>Chalk &amp; Talk</b>

Course Designed by: **Dr.A.Hamari Choudhi** and **Mrs.S.Ragavi**

**Learning Outcome Based Education & Assessment (LOBE)  
Formative Examination - Blue Print  
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Upto K2	2	K1&K2	1	K1	2	1
AI	CO2	Upto K3	2	K1&K2	2	K2	2	1
CI	CO3	Upto K4	2	K1&K2	1	K2	2	1
AII	CO4	Upto K4	2	K1&K2	2	K2	2	1
Question Pattern CIA I & II	No. of Questions to be asked		4		3		4	2
	No. of Questions to be answered		4		3		2	1
	Marks for each question		1		2		5	10
	Total Marks for each section		4		6		10	10

**Distribution of Marks with K Level CIA I & CIA II**

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	10	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5** will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K2	2	K1&K2	1	K1	2(K1 & K1)	1(K2)
2	CO2	Upto K3	2	K1&K2	1	K1	2(K3 & K3)	1(K3)
3	CO3	Upto K4	2	K1&K2	1	K2	2(K3 & K3)	1(K4)
4	CO4	Upto K4	2	K1&K2	1	K2	2(K4 & K4)	1(K3)
5	CO5	Upto K3	2	K1&K2	1	K2	2(K2 & K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D ( Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	17
K2	5	6			11	9.17	
K3			25	20	45	37.5	37
K4			25	30	55	45.83	46
Marks	10	10	50	50	120	100	100
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.</b>							

Summative Examinations - Question Paper – Format

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K4	
18) b	CO3	K4	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K3	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K3	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>ALLIED PHYSICS – II: Electricity, Electronics , Optics and Modern Physics</b>				
<b>Course Code</b>	<b>21UPHA21</b>	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	<b>Allied</b>	4	-	3	
<b>Nature of course:</b>	<b>EMPLOYABILITY</b> ✓	<b>SKILL ORIENTED</b> ✓	ENTREPRENEURSHIP		
<b>Course Objectives:</b>					
The learners will be able:					
1. To understand the laws of electricity					
2. To recollect different types of diodes and transistors					
3. To apply decimal and binary number system					
4. To understand the various types of lenses, prism, aberrations, interference and diffraction					
5. To understand and apply the basic concepts of laser					
<b>Unit: I</b>	<b>Electricity</b>				<b>12</b>
Capacitors –Expression for C of a parallel plate capacitor – Energy of a charged capacitor – Loss of energy on sharing of charges between two capacitors- Kirchoff’s laws – Application of Kirchoff’s laws to Wheatstone’s network – Carey Foster Bridge – Measurement of resistance – Principle of Potentiometer – Calibration of ammeter and voltmeter( low range only)					
<b>Unit: II</b>	<b>Electronics</b>				<b>12</b>
Transistor –Working of n-p-n transistor– Characteristics(CE mode only) –Common - Emitter transistor amplifier – Frequency response - Hartley oscillator –Modulation – Types of Modulation - OPAMP and its characteristics – OPAMP as adder and subtractor– Logic circuits – Boolean algebra – De Morgan’s theorem – OR, AND, NOR , NOT , NAND gates					
<b>Unit: III</b>	<b>Geometrical Optics</b>				<b>12</b>
Deviation produced by thin lens – Focal length of two thin lenses in and out of contact – Refraction through a thin prism – Dispersion – Dispersive power – Combination of thin prisms to produce (a) Deviation without dispersion and (b) Dispersion without deviation – Direct vision spectroscope – Chromatic aberration in lenses – Spherical aberration in lenses – Theory of primary and secondary rainbows.					
<b>Unit: IV</b>	<b>Physical Optics</b>				<b>12</b>
Interference in thin films – air wedge – Newton’s rings (reflected beam only) – Determination of wavelength – Diffraction – Theory of plane transmission grating (normal incidence only) – Experiment to determine wavelengths - Double refraction – Nicol prism – Construction, action and uses – Quarter wave plate (QWP) – Half wave plate (HWP) – Optical activity – Biot’s laws – Specific rotatory power – Laurent’s Half shade polarimeter – Determination of specific rotatory power					
<b>Unit: V</b>	<b>Lasers</b>				<b>12</b>
Introduction of Lasers-Spontaneous and stimulated emission-Population Inversion-Einstein’s A and B coefficients-derivation. Types of lasers-Nd:YAG,CO <sub>2</sub> ,Semiconductor lasers-Industrial and Medical Applications.					
					<b>Total Lecture Hours</b>
					<b>60 Hrs</b>
<b>Books for Study:</b>					
1. R. Murugesan, <b>Electricity and Electronics</b> , Madurai, First Edition, July 2016.					

Unit – I : 1.5,1.6, 1.9-1.14, 1.18,1.19,2.1,2.3-2.7  
 Unit – II : 4.1,4.2,4.4,4.5.4.6,4.10-4.12,4.14-4.18,4.24,4.25, 5.1-5.7,5.9-14,5.16  
 2. R.Murugesan, **Optics Spectroscopy and Modern Physics**, Madurai, First Edition, July 2016.  
 Unit – III : 1.1-1.3,1.5-1.11,1.13,1.17,1.23,1.24  
 Unit – IV : 2.1,2.2,2.4-2.6,2.9,2.10,3.1,3.2,3.4,3.5-3.10  
 3. P.Mani, **A Text book of Engineering Physics**,12<sup>th</sup> edition, , Dhanam Publications, Chennai  
 Unit – V : 7.1 – 7.45

**Books for References:**

1. Kakaniand Bhandari Sultan ,**Optics and Spectroscopy**, Chand and Sons,New Delhi,2004.
- 2.Brijlaland Subramanyam.,**A Text book of Optics**,S.Chandand Co,New Delhi,2004.
3. B.K.Sharma, **Spectroscopy**, GOEL Publishing House, Meerut, 2006.
4. NarayanamoorthyandNagarathinam, **Electricity and Magnetism**, National Publishing Co,

**Web Resources:**

1. <https://www.youtube.com/watch?v=ML7HcZo6IaE>
2. <https://www.khanacademy.org/science/physics/light-waves/introduction-to-light-waves/v/polarization-of-light-linear-and-circular>
3. [waves/v/polarization-of-light-linear-and-circular](https://www.khanacademy.org/science/physics/light-waves/introduction-to-light-waves/v/polarization-of-light-linear-and-circular)

**Course Outcomes**

**K Level**

After successful completion of the course, the student is expected to

<b>CO1:</b>	Remember principle of capacitors, Kirchhoff's laws, forward and reverse bias, frequency response, modulation, focal length, dispersive power, cardinal points, double refraction, Biot's law, Principals of Laser.	<b>K2</b>
<b>CO2:</b>	Understand energy of a capacitor, principle of potentiometer, diode characteristics, working of npn transistor, logic circuits, basics of types of laser.	<b>K3</b>
<b>CO3:</b>	Apply Kirchhoff's laws, Boolean algebra, Refraction through a prism, Einstein's coefficients	<b>K3</b>
<b>CO4:</b>	Calibration of ammeter and voltmeter, OP AMP as an adder and subtractor, logic gates, deviation without dispersion ,dispersion without deviation, Q.W.P, H.W.P, Applications of lacer.	<b>K4</b>
<b>CO5:</b>	Examine parallel plate capacitor, Cary Foster bridge, transistor characteristics CE mode, frequency of Hartley oscillator, Specific rotatory power, Nd:YAG,CO <sub>2</sub> ,Semiconductor lasers	<b>K4</b>

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
<b>CO 1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>
<b>CO 2</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>
<b>CO 3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>
<b>CO 4</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>2</b>
<b>CO 5</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN – Allied Physics - II**

Unit	Electricity, Electronics , Optics and Modern Physics	Hrs	Pedagogy
I	<b>Electricity</b> Capacitors –Expression for C of a parallel plate capacitor – Energy of a charged capacitor – Loss of energy on sharing of charges between two capacitors- Kirchoff’s laws – Application of Kirchoff’s laws to Wheatstone’s network – Carey Foster Bridge – Measurement of resistance – Principle of Potentiometer – Calibration of ammeter and voltmeter( low range only)	13	<b>Lecture method, PPT, Demonstration</b>
II	<b>Electronics</b> Transistor –Working of n-p-n transistor– Characteristics(CE mode only) –Common - Emitter transistor amplifier – Frequency response - Hartley oscillator –Modulation – Types of Modulation - OPAMP and its characteristics – OPAMP as adder and subtractor– Logic circuits – Boolean algebra – De Morgan’s theorem – OR, AND, NOR , NOT , NAND gates	12	<b>Lecture method, PPT, Demonstration</b>
III	<b>Geometrical Optics</b> Deviation produced by thin lens – Focal length of two thin lenses in and out of contact – Refraction through a thin prism – Dispersion – Dispersive power – Combination of thin prisms to produce (a) Deviation without dispersion and (b) Dispersion without deviation – Direct vision spectroscope – Chromatic aberration in lenses – Spherical aberration in lenses – Theory of primary and secondary rainbows.	11	<b>Lecture method, PPT, Model</b>
IV	<b>Physical Optics</b> Interference in thin films – air wedge – Newton’s rings (reflected beam only) – Determination of wavelength – Diffraction – Theory of plane transmission grating (normal incidence only) – Experiment to determine wavelengths - Double refraction – Nicol prism – Construction, action and uses – Quarter wave plate (QWP) – Half wave plate (HWP) – Optical activity – Biot’s laws – Specific rotatory power – Laurent’s Half shade polarimeter – Determination of specific rotatory power	12	<b>Lecture method, PPT</b>
V	<b>Lasers</b> Introduction of Lasers-Spontaneous and stimulated emission-Population Inversion-Einstein’s A and B coefficients-derivation. Types of lasers-Nd:YAG,CO <sub>2</sub> ,Semiconductor lasers-Industrial and Medical Applications.	12	<b>Lecture method, PPT</b>

Course Designed by: **1. Mrs.A.Lakshmi, 2. Dr.R.Sangeetha**

**Learning Outcome Based Education & Assessment (LOBE)  
Formative Examination - Blue Print  
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	COs	K - Level	Unit	Section A		Section B		Section C (Either or Choice)		Section D (Open Choice)	
				MCQs		Short Answers		No. of Questions	K - Level	No. of Questions	K - Level
				No. of Questions	K - Level	No. of Questions	K - Level				
CIA I	CO1 to CO5	K1 to K4	I	2	K1&K2	1	K1	2	K2	1	K2
			II	2	K1&K2	2	K2	2	K3	1	K3
CIA II	CO1 to CO5	K1 to K4	III	2	K1&K2	1	K2	2	K3	1	K3
			IV	2	K1&K2	2	K2	2	K4	1	K4
Question Pattern CIA I & II			No. of Questions to be asked	4		3		4		2	
			No. of Questions to be answered	4		3		2		1	
			Marks for each question	1		2		5		10	
			Total Marks for each section	4		6		10		10	

**Distribution of Marks with K Level CIA I & CIA II**

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	10	40	100	100
CIA II	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**UNIT-V will be allotted for individual Assignment in CO5 - K4 level which carries five marks as part of CIA component.**

**Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)**

S.No.	COs	K - Level	Unit	MOQs		Short Answers		Section C (Either / or Choice)		Section D (Open Choice)	
				No.of Questions	K – Level	No.of Questions	K – Level	No.of Questions	K – Level	No.of Questions	K – Level
1	CO1 - CO5	K1 to K4	I	2	K1 & K2	1	K1	2	K2 & K2	1	K2
2	CO1 - CO5	K1 to K4	II	2	K1 & K2	1	K1	2	K3 & K3	1	K3
3	CO1 - CO5	K1 to K4	III	2	K1 & K2	1	K2	2	K3 & K3	1	K3
4	CO1 - CO5	K1 to K4	IV	2	K1 & K2	1	K2	2	K4 & K4	1	K4
5	CO1 - CO5	K1 to K4	V	2	K1 & K2	1	K2	2	K4 & K4	1	K4
No. of Questions to be Asked				10		5		10		5	
No. of Questions to be answered				10		5		5		3	
Marks for each question				1		2		5		10	
Total Marks for each section				10		10		25		30	

**Distribution of Marks with K Level**

K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D ( Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	12	
K2	5	6	10	10	31	34.66	
K3			20	20	40	27	27
K4			20	20	40	26.66	26
Marks	10	10	50	50	120	100	100

**NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.**

**Summative Examinations - Question Paper – Format**

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K 2	
16) b	CO1	K 2	
17) a	CO2	K 3	
17) b	CO2	K 3	
18) a	CO3	K 3	
18) b	CO3	K 3	
19) a	CO4	K 4	
19) b	CO4	K 4	
20) a	CO5	K 4	
20) b	CO5	K 4	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>ALLIED PHYSICS PRACTICAL - I</b>			
<b>Course Code</b>	<b>21UPHAP1</b>	<b>L</b>	<b>P</b>	<b>C</b>
<b>Category</b>	<b>Allied</b>	-	2	1
<b>Nature of course:</b>	<b>EMPLOYABILITY</b> ✓	<b>SKILL ORIENTED</b> ✓	ENTREPRENEURSHIP	
<b>Course Objectives:</b>				
The learners will be able:				
1. To gain knowledge about the experiments based on Optics, Electricity and Electronics				
2. To demonstrate modulus of elasticity				
3. To understand the bending of beam, forward and reverse biasing, frequency response				
4. To understand current conduction in electrical circuits.				
5. To learn about transistor amplifier, oscillator and Operational amplifier				
<b>LIST OF EXPERIMENTS (Any Fourteen Experiments)</b>				
1. Uniform bending	- (Pin & Microscope)			
2. Torsion Pendulum	- Determination of Rigidity modulus and M.I			
3. Thermal conductivity of Bad conductor	- Lee's disc			
4. Sonometer	- Verification of laws			
5. Calibration of low range Voltmeter	- Potentiometer			
6. Carey Foster Bridge	- Resistance & resistivity of a wire.			
7. Spectrometer	- Refractive index of a Prism			
8. Mirror Galvanometer	- Voltage and current sensitiveness			
9. LCR – Series resonance	- Determination of L & Q factor			
10. Air wedge	- Thickness of a wire			
11. Grating N by $\lambda$ Normal incidence	- Spectrometer			
12. Single stage transistor amplifier	- CE mode			
13. Hartley oscillator	- Determination of frequency			
14. Logic gates – NAND and NOR	- Using Discrete Components.			
15. Zener diode	- Forward & Reverse Characteristics			
16. OP AMP	- Adder and Subtractor			
	<b>Total Practical Hours</b>			<b>30 Hrs</b>
<b>Books for Study:</b>				
1. Srinivasan.M.N., Balasubramanian.S., Ranganathan.R., <b>A Text Book of Practical Physics</b> , 2017 Edition Sultan Chand & Sons				
<b>Books for References:</b>				
2. Ouseph.C., Practical Physics and Electronics, 2013.S.Viswanathan.P.Ltd				
3. Practical Physics and Electronics, C.C.Ouseph, U.J.Rao, V.Vijayendran, S.Viswanathan Publishers(2007)				
<b>Web Resources:</b>				
1. <a href="https://nptel.ac.in/course.html/physics/experimental_physics_I,_II_and_III">https://nptel.ac.in/course.html/physics/experimental_physics_I,_II_and_III</a>				
2. <a href="https://nptel.ac.in/courses/115/105/115105110/">https://nptel.ac.in/courses/115/105/115105110/</a>				
3. <a href="https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLoFRX7n8z4tHYK">https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLoFRX7n8z4tHYK</a>				

Course Outcomes		K Level
On successful completion of the course, the learners should be able to		
<b>CO1:</b>	Understand and evaluate the Young's modulus and Rigidity modulus of the given material, the ways to calibrate a low range voltmeter using potentiometer	<b>K4</b>
<b>CO2:</b>	Acquire the knowledge of the characteristics of an operational amplifier	<b>K3</b>
<b>CO3:</b>	Apply the basic principles of optics to determine the thickness of a wire	<b>K4</b>
<b>CO4:</b>	Analyze the electrical parameters like resistance and resistivity using Carrey Foster bridge and characteristics of Zener diode	<b>K4</b>
<b>CO5:</b>	Construct Amplifier and Oscillator	<b>K4</b>

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
<b>CO 1</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>
<b>CO 2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>
<b>CO 3</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>CO 4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>2</b>
<b>CO 5</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>3</b>

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

Semester	Allied Physics Practical - I	Hrs	Pedagogy
<b>II</b>	1. Carey Foster Bridge - Resistance & resistivity of a wire. 2. Spectrometer - Refractive index of a Prism 3. Mirror Galvanometer - Voltage and current sensitiveness 4. Air wedge - Thickness of a wire 5. Grating N by $\lambda$ Normal incidence - Spectrometer 6. Single stage transistor amplifier - CE mode 7. Hartley oscillator - Determination of frequency 8. OP AMP - Adder and Subtractor	<b>30</b>	Demonstration

Course Designed by: **1. Mrs.A.Lakshmi, 2. Dr.R.Sangeetha**



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>MS OFFICE – LAB</b>				
<b>Course Code</b>	<b>21UMTSP1</b>	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	Skill	-	2	2	
<b>Nature of course:</b>	<b>EMPLOYABILITY</b> ✓	<b>SKILL ORIENTED</b> ✓	<b>ENTREPRENEURSHIP</b> ✓		
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>• To improve the employability skill</li> <li>• To present mathematical concepts in seminar / conference</li> <li>• To document project works</li> <li>• To prepare various type of charts for the given data</li> <li>• To familiarize the office automation tools</li> </ul>					
<b>List of Programs</b>					
<ol style="list-style-type: none"> <li>1. Design a document with at least two pages using MS word with different font style, different font sizes, header and footer, with page number.</li> <li>2. Design an invitation with two column break, use word to insert picture, design border and shading.</li> <li>3. Create a main document and database of addresses and merge them using Mail-merge tools.</li> <li>4. Create a daily attendance sheet of a class room for a week with heading, day, period etc.</li> <li>5. Create students mark list for three subjects and to list the result and rank by using string function and logical function.</li> <li>6. Create a yearly budget of a company and create different types of chart for the data.</li> <li>7. Create a slide show using blank presentation with at least 20 slides.</li> <li>8. Present the college details or any publishing work using Auto content wizard.</li> <li>9. Create a Seminar presentation using insert picture and sound.</li> </ol>					
<b>Total Lecture Hours</b>					
<b>Books for Study:</b>					
C.Nellai Kannan, <b>MS Office</b> , Nels Publications, 3 <sup>rd</sup> edition, Tirunelveli, 2004.					
<b>Books for References:</b>					
<ol style="list-style-type: none"> <li>1. Sanjay Saxena, <b>A First course in Computers</b>, Vikas Publishing House Pvt Ltd Edition, New Delhi, 2003.</li> <li>2. Vikas Gupta, <b>Comdex Computer Course Kit</b>, Dream Tech Press Edition, New Delhi, 2003.</li> <li>3. WEBSITE : <a href="https://www.free-computer-tutorials.net/word-2007.html">https://www.free-computer-tutorials.net/word-2007.html</a></li> </ol>					
<b>Web Resources</b>					
<a href="https://www.youtube.com/watch/yCVy5Kw0l8s">https://www.youtube.com/watch/yCVy5Kw0l8s</a> <a href="https://edu.gcfglobal.org/en/subjects/office/">https://edu.gcfglobal.org/en/subjects/office/</a>					
<b>COURSE OUTCOME</b>					<b>K Level</b>
<b>On the successful completion of the course, the students will be able to</b>					

<b>CO1:</b>	Demonstrate the understanding of various packages of MS Office.	<b>K2</b>
<b>CO2:</b>	Prepare documents using Ms-Word	<b>K4</b>
<b>CO3:</b>	Use mail merge tool to merge the database.	<b>K3</b>
<b>CO4:</b>	Create professional presentation using Microsoft Power Point	<b>K4</b>
<b>CO5:</b>	Manipulate the data using MS-excel	<b>K3</b>

**CO & PO Mappings:**

<b>COS</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>
<b>CO 1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>2</b>
<b>CO 2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>2</b>
<b>CO 3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>-</b>	<b>2</b>
<b>CO 4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>2</b>
<b>CO 5</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>

**\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level**

Course Designed by: **Dr.M.Saravanan & Mrs.R.Sumathi**

# THIRD SEMESTER



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>MECHANICS</b>			
<b>Course Code</b>	<b>21UMTC31</b>	<b>L</b>	<b>P</b>	<b>C</b>
<b>Category</b>	<b>Core</b>	5	-	5
<b>Nature of course:</b>	✓ <b>EMPLOYABILITY</b>	SKILL ORIENTED	ENTREPRENURSHIP	
<b>COURSE OBJECTIVES:</b>				
<ul style="list-style-type: none"> <li>• To understand the principles of statics.</li> <li>• To apply laws of statics.</li> <li>• To learn about the motion of a particle in an angle</li> <li>• To compare about the static and dynamic properties of a particle.</li> <li>• To calculate the loss of energy during impact of two bodies.</li> </ul>				
<b>Unit: I</b>				15
Forces acting at a point – Resultant and components – Parallelogram law of forces-Triangle law of forces-Perpendicular Triangle of Forces – Converse of triangle law of forces-Lami’s theorem.				
<b>Unit: II</b>				15
Resolution of a force- Components of a force - Theorems of Resolved parts – Resultant of any number of coplanar forces – Conditions of equilibrium.				
<b>Unit: III</b>				15
Projectiles: Definitions- Two fundamental Principles- Characteristics of the motion of a projectile - Path of the projectile is a parabola				
<b>Unit: IV</b>				15
Range on an inclined plane- Greatest distance- Time of Flight-Motion on the surface of a smooth inclined plane.				
<b>Unit: V</b>				15
Direct Impact of two smooth spheres- Loss of kinetic energy due to direct impact and Oblique impact- Dissipation of energy due to impact				
<b>Total Lecture Hours</b>				<b>75</b>
<b>Books for Study:</b>				
<b>Text Book 1:</b> M. K. Venkataraman, <b>Statics</b> , Agasthiyar Publications, Trichy, Seventeenth Edition, July 2014.				
<b>Text Book 2:</b> M. K. Venkataraman, <b>Dynamics</b> , Agasthiyar Publications, Trichy, Eighteenth Edition, January 2017.				
Unit I : (Text Book 1) Chapter 2: Section 2.1 to 2.9				
Unit II : (Text Book 1) Chapter 2: 2.11 to 2.16				
Unit III: (Text Book 2) Chapter 6: Section 6.1 to 6.6				
Unit IV : (Text Book 2) Chapter 6: Section 6.12 to 6.16				
Unit V: (Text Book 2) Chapter 8 : Section 8.5 to 8.9				
<b>Books for References:</b>				
1. Duraipandian.P, Laxmi Duraipandian and Muthamizh Jayaprakash, <b>Mechanics</b> , Chand and Company Pvt Ltd, New Delhi- 110055, 2014.				
2. Khanna M.L, <b>Statics</b> , Jai Prakash Nath and co, Meerut, Fifteenth Edition, 2011.				

3. SL.Loney, **The elements of Statics and Dynamics**, Arihant Publications, 2016.

**Web Resources**

1. [https://www.researchgate.net/publication/322738790\\_Engineering\\_Mechanics\\_-\\_Statics\\_Lecture\\_Notes\\_Handwritten](https://www.researchgate.net/publication/322738790_Engineering_Mechanics_-_Statics_Lecture_Notes_Handwritten)
2. <https://www.freebookcentre.net/physics-books-download/Lecture-Notes-on-the-Dynamics-of-Particles-and-Rigid-Bodies.html>
3. <https://people.maths.bris.ac.uk/~maxmr/Mechanics1/intro.pdf>

COURSE OUTCOMES		K Level
<b>On the successful completion of the course, the students will be able to</b>		
CO1:	Apply the basic laws of forces and friction	K3
CO2:	Explain various theorems on forces acting on a body	K4
CO3:	List the characteristics of the projectiles	K4
CO4:	Analyse the motion on the surface of an inclined plane.	K4
CO5:	Solve the direct and oblique impact	K3

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	1	2	-	-
CO 2	3	2	1	1	-	-
CO 3	3	3	2	1	1	1
CO 4	3	3	2	1	1	-
CO 5	3	3	2	1	1	1

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

UNIT	SUBJECT NAME	Hrs	Pedagogy
I	Forces acting at a point – Resultant and components – Parallelogram law of forces-Triangle law of forces-Perpendicular Triangle of Forces – Converse of triangle law of forces-Lami’s theorem.	15	Chalk & Talk
II	Resolution of a force- Components of a force - Theorems of Resolved parts – Resultant of any number of coplanar forces – Conditions of equilibrium.	15	Chalk & Talk
III	Projectiles: Definitions, Two fundamental Principles, Characteristics of the motion of a projectile , To prove that the path of the projectile is a parabola	15	Chalk & Talk
IV	Range on an inclined plane, Greatest distance, Time of Flight, Motion on the surface of a smooth inclined plane.	15	Chalk & Talk
V	Direct Impact of two smooth spheres, Loss of kinetic energy due to direct impact and Oblique impact, Dissipation of energy due to impact	15	Chalk & Talk

**Course Designed by:** Dr. P. Chitradevi, Assistant Professor & Dr. S. Andal, Assistant Professor

**Learning Outcome Based Education & Assessment (LOBE)  
Formative Examination - Blue Print  
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Upto K3	2	K1& K2	1	K1	2	1
AI	CO2	Upto K4	2	K1& K2	2	K2	2	1
CI	CO3	Upto K4	2	K1 & K2	1	K2	2	1
AII	CO4	Upto K4	2	K1 & K2	2	K2	2	1
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

**Distribution of Marks with K Level CIA I & CIA II**

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K3	2	K1&K2	1	K1	2(K2&K2)	1(K3)
2	CO2	Upto K4	2	K1&K2	1	K1	2(K3&K3)	1(K4)
3	CO3	Upto K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
4	CO4	Upto K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
5	CO5	Upto K3	2	K1 & K2	1	K2	2(K2&K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
<b>(Figures in parenthesis denotes, questions should be asked with the given K level)</b>								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D ( Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	33
K2	5	6	20		31	25.8	
K3			30	20	50	41.7	42
K4				30	30	25	25
Marks	10	10	50	50	120	100	100
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.</b>							

**Summative Examinations - Question Paper – Format**

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K2	
20) b	CO5	K2	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K3	
22	CO2	K4	
23	CO3	K4	
24	CO4	K4	
25	CO5	K3	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>TRIGONOMETRY AND VECTOR CALCULUS</b>			
<b>Course Code</b>	<b>21UMTC32</b>	<b>L</b>	<b>P</b>	<b>C</b>
<b>Category</b>	<b>Core</b>	4	-	4
<b>Nature of course:</b>	<b>EMPLOYABILITY</b>	✓	<b>SKILL ORIENTED</b>	<b>ENTREPRENURSHIP</b>
<b>COURSE OBJECTIVES:</b>				
<ul style="list-style-type: none"> <li>▪ To familiarize the trigonometrical function</li> <li>▪ To develop the capability of finding standard expansions of Trigonometric function.</li> <li>▪ To introduce the various types of hyperbolic functions and its inverse.</li> <li>▪ To learn the basic concepts in vector differentiation.</li> <li>▪ To introduce the line and surface integrals.</li> </ul>				
<b>Unit: I</b>				12
Expression for Trigonometrical functions - $\sin n\theta$ , $\cos n\theta$ , $\tan n\theta$ , $\sin^n\theta$ , $\cos^n\theta$ and Expression of $\sin \theta$ , $\cos \theta$ , $\tan \theta$ in powers of $\theta$ .				
<b>Unit: II</b>				12
Hyperbolic functions and Inverse hyperbolic functions – Problems.				
<b>Unit: III</b>				12
Vector Differentiation- Vector Algebra- Differentiation of vectors- Gradient – Equation of Tangent plane and Normal line- Equation of Tangent line and Normal plane				
<b>Unit: IV</b>				12
Vector Differentiation – Divergence – Curl – Theorems and Problems				
<b>Unit: V</b>				12
Vector Integration – Line integrals- Surface Integrals- Problems				
<b>Total Lecture Hours</b>				60
<b>Books for Study:</b>				
<ol style="list-style-type: none"> <li>1. Dr. S. Arumugam and Prof. A. Thangapandi Isaac, <b>Trigonometry</b>, New Gamma Publishing House, Tirunelveli, 2012.</li> <li>2. Dr. Arumugam. S and A. Thangapandi Isaac, <b>Analytical Geometry of three Dimensions and Vector Calculus</b>, New Gamma Publications, Reprint 2017, Palayamkottai.            Unit I – Chapter 1.1 to 1.3( Book 1)            Unit II – Chapter 2.1 , 2.2 ( Book 1)            Unit III – Chapter 5.1 to 5.3 ( Book 2)            Unit IV – Chapter 5.4 ( Book 2)            Unit V – Chapter 7.1 ,7.2 ( Book 2)</li> </ol>				
<b>Books for References:</b>				
<ol style="list-style-type: none"> <li>1. S. Narayanan and T.K. Manicavachagam Pillai, S. Viswanathan, <b>Trigonometry</b> (Printers &amp; Publishers) Pvt. Ltd, (1997)</li> <li>2. S.L.Loney, <b>Plane Trigonometry-Part-I&amp;II</b>(6<sup>th</sup>Edition), Arihant Publications, 2016.</li> <li>3. Manicka Vasagam Pillai and Natarajan, <b>Analytical Geometry of three Dimensions and Vector Calculus</b>, Viswanathan. S, Printers and Publishers Pvt. Ltd., Reprint 2001, Chennai.</li> </ol>				
<b>Web Resources</b>				

1. [https://mate.unipv.it/moiola/ReaDG/VC2016/VectorCalculus\\_LectureNotes\\_2016.pdf](https://mate.unipv.it/moiola/ReaDG/VC2016/VectorCalculus_LectureNotes_2016.pdf)
2. <https://nptel.ac.in/courses/111/107/111107108/>
3. [https://www.whitman.edu/mathematics/calculus\\_online/chapter16.html](https://www.whitman.edu/mathematics/calculus_online/chapter16.html)

COURSE OUTCOME		K Level
<b>On the successful completion of the course, the students will be able to</b>		
CO1:	Simplify expressions for trigonometrical functions using trigonometric identities.	K4
CO2:	Solve problem based on hyperbolic functions	K3
CO3:	Develop the solution related to Gradient, equation of tangent plane/ line, normal plane/ line	K3
CO4:	Explain Divergence, Curl and vector differentiation problems	K4
CO5:	Simplify line and surface integrals	K4

**CO & PO Mappings:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	1	2	-	1
CO 2	3	3	1	2	1	-
CO 3	3	3	2	2	-	-
CO 4	3	3	1	2	-	-
CO 5	3	3	2	2	1	2

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

UNIT	SUBJECT NAME	Hrs	Pedagogy
I	Expression for Trigonometrical functions - $\sin n\theta$ , $\cos n\theta$ , $\tan n\theta$ , $\sin^n\theta$ , $\cos^n\theta$ and Expression of $\sin \theta$ , $\cos \theta$ , $\tan \theta$ in powers of $\theta$ .	12	Chalk & Talk
II	Hyperbolic functions and Inverse hyperbolic functions – Problems.	12	Chalk & Talk
III	Vector Differentiation- Vector Algebra- Differentiation of vectors- Gradient – Equation of Tangent plane and Normal line- Equation of Tangent line and Normal plane	12	Chalk & Talk, PPT
IV	Vector Differentiation – Divergence – Curl – Theorems and Problems	12	Chalk & Talk
V	Vector Integration – Line integrals- Surface Integrals- Problems	12	Chalk & Talk, PPT

**Course Designed by:** Dr. S. Andal, Assistant Professor & Mrs. S. Ragavi, Assistant Professor

**Learning Outcome Based Education & Assessment (LOBE)  
Formative Examination - Blue Print  
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Upto K4	2	K1&K2	1	K1	2	1
AI	CO2	Upto K3	2	K1&K2	2	K2	2	1
CI	CO3	Upto K3	2	K1&K2	1	K2	2	1
AII	CO4	Upto K4	2	K1&K2	2	K2	2	1
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

**Distribution of Marks with K Level CIA I & CIA II**

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K4	2	K1&K2	1	K1	2(K3&K3)	1(K4)
2	CO2	Upto K3	2	K1&K2	1	K1	2(K2&K2)	1(K3)
3	CO3	Upto K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
4	CO4	Upto K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
5	CO5	Upto K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
<b>(Figures in parenthesis denotes, questions should be asked with the given K level)</b>								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D ( Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	33
K2	5	6	20		31	25.8	
K3			30	20	50	41.7	42
K4				30	30	25	25
Marks	10	10	50	50	120	100	100
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.</b>							

Summative Examinations - Question Paper – Format

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K2	
18) b	CO3	K2	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K4	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>OPERATIONS RESEARCH</b>				
<b>Course Code</b>	<b>21UMTA31</b>	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	<b>ALLIED</b>	5	-	5	
<b>Nature of course:</b>	<b>EMPLOYABILITY</b>	✓	<b>SKILL ORIENTED</b>	<b>ENTREPRENURSHIP</b>	
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To illustrate linear problem, special forms and game theory.</li> <li>• To evaluate game theory and linear problems.</li> <li>• To compare different types of methods in solving linear problem</li> <li>• To solve linear programming problem.</li> <li>• To design real life problem into a linear problem.</li> </ul>					
<b>Unit: I</b>					15
Linear Programming Problem - Mathematical formulation of the problem – Solution by Graphical Method, The Simplex method and Method of penalty (Big M Method only).					
<b>Unit: II</b>					15
Duality – Dual Simplex Method- Problems.					
<b>Unit: III</b>					15
Transportation problem – Mathematical form – Initial solutions by all methods – MODI method for both balanced and unbalanced TP- The Assignment Problem.					
<b>Unit: IV</b>					15
Game theory – Two Person Zero Sum Game – saddle point – Game with saddle point – Solution of game by using formula, Graphical method, Method of Dominance and LPP method.					
<b>Unit: V</b>					15
Sequencing – Replacement Problem					
<b>Total Lecture Hours</b>					<b>75</b>
<b>Books for Study:</b>					
Kanti Swarup , P.K. Gupta and Man Mohan, <b>Operations Research</b> Sultan Chand and Sons Publications, New Delhi, Reprint 2006.					
Unit I - Chapter 2 Section 2.2 Chapter 3 Section 3.1 to 3.5 Chapter 4 Section 4.1 to 4.4					
Unit II - Chapter 5: Section 5.1 to 5.4 and 5.7					
Unit III - Chapter 10: Section 10.1 to 10.5, 10.8 to 10.11 and 10.14					

Chapter11: Section 11.1 to 11.4  
 Unit IV - Chapter17: Section 17.1 to 17.7  
 Unit V - Chapter 12: Section 12.1 to 12.5  
 Chapter 18: Section 18.1 & 18.2

**Books for References:**

1. Dr.S.Arumugam and ISAAC, **Topics in Operations Research -Linear Programming**, New Gamma Publishing House, Palayamkottai, June 2012.
2. P.R.Vital and V.Malini, **Operations Research**, Margham Publications, Chennai, 2002.
3. Hamdy A.Taha – **Operations Research, An Introduction**, 8<sup>th</sup> Edition , Prentice-Hall India ,2006.

**Web Resources**

1. [https://mrcet.com/downloads/digital\\_notes/ME/IV%20year/Operations%20Research.pdf](https://mrcet.com/downloads/digital_notes/ME/IV%20year/Operations%20Research.pdf)
2. [http://lipas.uwasa.fi/~tsottine/lecture\\_notes/or.pdf](http://lipas.uwasa.fi/~tsottine/lecture_notes/or.pdf)
3. [https://mrcet.com/downloads/digital\\_notes/ME/IV%20year/Operations%20Research.pdf](https://mrcet.com/downloads/digital_notes/ME/IV%20year/Operations%20Research.pdf)

COURSE OUTCOME		K Level
<b>On the successful completion of the course, the students will be able to</b>		
<b>CO1:</b>	Solve linear programming problems by various methods	<b>K3</b>
<b>CO2:</b>	Analyze different environments that needs decision using duality concepts to find solution.	<b>K4</b>
<b>CO3:</b>	Develop the solution to Transportation and Assignment Problem	<b>K3</b>
<b>CO4:</b>	Explain the game theory problems	<b>K4</b>
<b>CO5:</b>	Solve replacement and sequencing problem	<b>K3</b>

**CO & PO Mappings:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
<b>CO 1</b>	3	3	2	2	1	1
<b>CO 2</b>	3	3	2	2	1	1
<b>CO 3</b>	3	3	2	2	1	-
<b>CO 4</b>	3	3	2	2	1	1
<b>CO 5</b>	3	3	2	2	1	-

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

UNIT	SUBJECT NAME	Hrs	Pedagogy
I	Linear Programming Problem - Mathematical formulation of the problem – Solution by Graphical Method, The Simplex method and Method of penalty (Big M Method only).	15	Chalk & Talk
II	Duality – Dual simplex method- Problems.	15	Chalk & Talk
III	Transportation problem – Mathematical form – Initial solutions by all methods – MODI method for both balanced and unbalanced TP- The assignment problem.	15	Chalk & Talk
IV	Game theory – Two person zero sum game – saddle point – Game with saddle point – Solution of game by using formula, graphical method, method of dominance and LPP method.	15	Chalk & Talk
V	Sequencing – Replacement Problem	15	Chalk & Talk

**Course Designed by:**

**Dr. A. Arivuchelvam, Assistant Professor & Dr, P. Chitradevi, Assistant Professor**

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Upto K3	2	K1&K2	1	K1	2	1
AI	CO2	Upto K4	2	K1&K2	2	K2	2	1
CI	CO3	Upto K3	2	K1&K2	1	K2	2	1
AII	CO4	Upto K4	2	K1&K2	2	K2	2	1
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	5	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K3	2	K1&K2	1	K1	2(K2&K2)	1(K3)
2	CO2	Upto K4	2	K1&K2	1	K1	2(K3&K3)	1(K4)
3	CO3	Upto K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
4	CO4	Upto K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
5	CO5	Upto K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

**(Figures in parenthesis denotes, questions should be asked with the given K level)**

**Distribution of Marks with K Level**

<b>K Level</b>	<b>Section A (Multiple Choice Questions)</b>	<b>Section B (Short Answer Questions)</b>	<b>Section C (Either/ or Choice)</b>	<b>Section D ( Open Choice)</b>	<b>Total Marks</b>	<b>% of (Marks without choice)</b>	<b>Consolidated %</b>
K1	5	4			9	7.5	<b>42</b>
K2	5	6	30		41	34.1	
K3			20	30	50	41.7	<b>42</b>
K4				20	20	16.7	<b>16</b>
Marks	10	10	50	50	120	100	<b>100</b>

**NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.**

**Summative Examinations - Question Paper – Format**

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K2	
18) b	CO3	K2	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K2	
20) b	CO5	K2	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K3	
22	CO2	K4	
23	CO3	K3	
24	CO4	K4	
25	CO5	K3	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
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<b>Course Name</b>	<b>TRANSFORM TECHNIQUES</b>				
<b>Course Code</b>	<b>21UMTS31</b>	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	<b>Skill</b>	2	-	2	
<b>Nature of course:</b>	EMPLOYABILITY	<b>SKILL ORIENTED</b>	✓	ENTREPRENURSHIP	
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To Learn Laplace transforms and Z-transforms</li> <li>• To Understand properties of Laplace transforms</li> <li>• To find inverse Laplace Transforms and inverse Z-transforms.</li> <li>• To Examine the Laplace transforms in periodic function</li> <li>• To Identify the properties of Z-transforms</li> </ul>					
<b>Unit: I</b>					6
Laplace Transforms –Definitions -Piecewise continuity – Sufficient conditions for the existence of the Laplace transform- Laplace transform of periodic functions					
<b>Unit: II</b>					6
Some general Theorems on Laplace Transforms – Problems – Evaluation of integrals.					
<b>Unit: III</b>					6
The Inverse Laplace Transforms – Examples–Results- Method of Partial fractions					
<b>Unit: IV</b>					6
Z Transforms – Introduction – Proprieties – Z Transforms of some basic functions – Problems.					
<b>Unit: V</b>					6
Inverse Z Transforms –Use of Z – Transforms to solve finite Difference Equations – problems.					
<b>Total Lecture Hours</b>					30
<b>Books for Study:</b>					
1. S.Narayanan and T.K.Manicka Vasagam Pillay, <b>Differential equations and its Applications</b> , S.Viswanathan Publications , Chennai, 2006.					
2. T.Veerarajan, <b>Engineering Mathematics</b> , Tata McGraw Hill Publishing Company Limited, New Delhi, 2000					
Unit I (Book 1) - Chapter 9: Section 1 to 3					
Unit II (Book 1) - Chapter 9: Section 4 and 5					
Unit III (Book 1) - Chapter 9: Section 6 to 7					
Unit IV (Book 2) - Chapter 5 sections 5.1 to 5.3					
Unit V (Book 2) - Chapter 5 sections 5.4 and 5.5					
<b>Books for References:</b>					
1. Dr. M.D. Raisinghania, <b>Advanced Differential Equations</b> , S. Chand and Company PVT.LTD, New Delhi, Reprint, 2012.					
2. George yankovsky, <b>Differential and Integral Calculus (Volume II)</b> , MIR Publishers, Moscow, 1974.					
3. BS.Grewal, <b>Higher Engineering Mathematics 43<sup>rd</sup> Edition</b> , Khanna Publications, 2020.					

<b>Web Resources</b>	
<ol style="list-style-type: none"> <li><a href="https://nptel.ac.in/courses/111/105/111105035/">https://nptel.ac.in/courses/111/105/111105035/</a></li> <li><a href="https://nptel.ac.in/courses/111/105/111105123/">https://nptel.ac.in/courses/111/105/111105123/</a></li> <li><a href="http://sertoz.bilkent.edu.tr/courses/math206/2004/transformations.pdf">http://sertoz.bilkent.edu.tr/courses/math206/2004/transformations.pdf</a></li> </ol>	
<b>COURSE OUTCOME</b>	<b>K Level</b>
<b>On the successful completion of the course, the students will be able to</b>	
<b>CO1:</b>	Demonstrate the understanding of Laplace transforms definitions and periodic functions <b>K2</b>
<b>CO2:</b>	Explain general Theorems on Laplace Transforms and problems involving integrals <b>K2</b>
<b>CO3:</b>	Show that the inverse Laplace transforms <b>K2</b>
<b>CO4:</b>	List the definitions, examples of Z Transforms and its Properties <b>K2</b>
<b>CO5:</b>	Summarize the inverse Z Transforms <b>K1</b>

**CO & PO Mappings:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	1	2	2
CO 2	3	3	2	2	1	1
CO 3	3	3	2	2	2	2
CO 4	3	3	2	2	2	2
CO 5	3	3	2	2	1	2

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

UNIT	SUBJECT NAME	Hrs	Pedagogy
<b>I</b>	Laplace Transforms –Definitions -Piecewise continuity – Sufficient conditions for the existence of the Laplace transform- Laplace transform of periodic functions	<b>6</b>	<b>Chalk &amp; Talk , PPT</b>
<b>II</b>	Some general Theorems on Laplace Transforms – Problems – Evaluation of integrals.	<b>6</b>	<b>Chalk &amp; Talk , PPT</b>
<b>III</b>	The Inverse Laplace Transforms – Examples–Results- Method of Partial fractions	<b>6</b>	<b>Chalk &amp; Talk , PPT</b>
<b>IV</b>	Z Transforms – Introduction – Properties – Z Transforms of some basic functions – Problems.	<b>6</b>	<b>Chalk &amp; Talk</b>
<b>V</b>	Inverse Z Transforms –Use of Z – Transforms to solve finite Difference Equations – problems.	<b>6</b>	<b>Chalk &amp; Talk</b>

**Course Designed by:**

**Dr. M. Saravanan**, Assistant Professor & **Mrs. R. Sumathi**, Assistant Professor



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>MATHEMATICS FOR COMPETITIVE EXAMINATION – I</b>			
<b>Course Code</b>	<b>21UMTN31</b>	<b>L</b>	<b>P</b>	<b>C</b>
<b>Category</b>	<b>Non – Major Elective</b>	2	-	2
<b>Nature of course:</b>	<b>EMPLOYABILITY</b>	<b>SKILL ORIENTED</b>	ENTREPRENURSHIP	
<b>COURSE OBJECTIVES:</b>				
<ul style="list-style-type: none"> <li>• To improve the ability to face the competitive examinations.</li> <li>• To solve numbers, percentage, ratio.</li> <li>• To identify the exact method to problems.</li> <li>• To apply the concepts in Competitive Examinations.</li> <li>• To understand about numbers divisibility.</li> </ul>				
<b>Unit: I</b>				6
Number system – Decimals - Fractions.				
<b>Unit: II</b>				6
Operation on numbers – Divisibility – Arithmetic Progression – Geometric Progression.				
<b>Unit: III</b>				6
HCF Factorization method – Division method –Factorization method of finding LCM – Common Division method – Comparison of fractions.				
<b>Unit: IV</b>				6
Concept of percentage- Results on population – Results on Depreciation.				
<b>Unit: V</b>				6
Comparison of ratios - Compounded ratio - Variation.				
<b>Total Lecture Hours</b>				30
<b>Books for Study:</b>				
Text Material will be supplied by the Department.				
<b>Books for References:</b>				
<ol style="list-style-type: none"> <li>1. Aggarwal. R.S, <b>Quantitative Aptitude for Competitive Examinations</b>, S.Chand and Company Ltd, Reprint 2011, New Delhi.</li> <li>2. Abhigit Guha, <b>Quantitative Aptitude</b>, fourth edition, Tata MC Graw Hill Publication, 2011, New Delhi.</li> <li>3. Mohan Rao. U, <b>Quantitative Aptitude</b>, Scitech Publications, Reprint, 2013, Chennai.</li> </ol>				
<b>Web Resources</b>				
<ol style="list-style-type: none"> <li>1. <a href="https://www.mahendraguru.com/p/quantitative-aptitude-video-lectures.html">https://www.mahendraguru.com/p/quantitative-aptitude-video-lectures.html</a></li> <li>2. <a href="https://www.wiziq.com/tutorials/quantitative-aptitude">https://www.wiziq.com/tutorials/quantitative-aptitude</a></li> <li>3. <a href="https://byjus.com/govt-exams/quantitative-aptitude/#:~:text=Quantitative%20aptitude%20is%20an%20inseparable,skills%20by%20solving%20these%20questions">https://byjus.com/govt-exams/quantitative-aptitude/#:~:text=Quantitative%20aptitude%20is%20an%20inseparable,skills%20by%20solving%20these%20questions</a></li> </ol>				

COURSE OUTCOME		K Level
<b>On the successful completion of the course, the students will be able to</b>		
<b>CO1:</b>	Recall the concepts of numbers and decimals	K1
<b>CO2:</b>	Demonstrate the understanding of divisibility and their properties	K2
<b>CO3:</b>	Classify the factors in finding LCM and HCF	K2
<b>CO4:</b>	Explain the percentage related problems	K2
<b>CO5:</b>	Illustrate the problems on ratios	K2

**CO & PO Mappings:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	2	3	3	3	3
CO 2	2	3	2	3	2	3
CO 3	3	2	3	2	3	3
CO 4	3	2	3	2	2	3
CO 5	2	3	3	3	2	2

\*3 – Advanced Application; 2 – Intermediate Development; 1 – Introductory Level

**LESSON PLAN**

UNIT	SUBJECT NAME	Hrs	Pedagogy
I	Number system – Decimals - Fractions.	6	Chalk & Talk
II	Operation on numbers – Divisibility – Arithmetic Progression – Geometric Progression.	6	Chalk & Talk
III	HCF Factorization method – Division method –Factorization method of finding LCM – Common Division method – Comparison of fractions.	6	Chalk & Talk
IV	Concept of percentage- Results on population – Results on Depreciation.	6	Chalk & Talk
V	Comparison of ratios - Compounded ratio - Variation.	6	Chalk & Talk

**Course Designed by:**

**Dr. P. Chitradevi**, Assistant Professor & **Mrs. S. Ragavi**, Assistant Professor

# FOURTH SEMESTER



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>MODERN ALGEBRA</b>			
<b>Course Code</b>	<b>21UMTC41</b>	<b>L</b>	<b>P</b>	<b>C</b>
<b>Category</b>	<b>Core</b>	5	-	5
<b>Nature of course:</b>	<b>EMPLOYABILITY</b>	SKILL ORIENTED	ENTREPRENURSHIP	
<b>COURSE OBJECTIVES:</b>				
<ul style="list-style-type: none"> <li>• To understand the basic algebraic structures</li> <li>• To familiarize the various type of groups.</li> <li>• To write the proofs in a clear and logical manner effectively.</li> <li>• To analyze the relationships between various algebraic structures</li> <li>• To solve the problems by using various theorems</li> </ul>				
<b>Unit: I</b>				15
Permutation groups – Cycles and transpositions – Even permutations – Theorems on Permutations - Subgroups – Theorems on subgroups-Cyclic groups- Generators–Number of generators of Cyclic groups– Theorems- Problems				
<b>Unit: II</b>				15
Order of an element–Cosets– Theorems on cosets, Lagrange’s theorem, problems using Lagrange’s Theorem – Euler’s, Fermat’s Theorems.				
<b>Unit: III</b>				15
Normal subgroups – Theorems on Normal subgroups – Quotient group- Isomorphisms- Cayley’s Theorem – Automorphism- Problems and theorems.				
<b>Unit: IV</b>				15
Homomorphisms – Types of homomorphisms – Theorems on Homomorphisms – Fundamental theorem of Homomorphism -Rings – Problems				
<b>Unit: V</b>				15
Elementary properties – Isomorphism - Types of rings – Integral domains, Fields – Zero divisors – Theorems on Integral domains and Fields, Characteristic of a ring.				
<b>Total Lecture Hours</b>				75
<b>Books for Study:</b>				
Dr. S. Arumugam and Isaac , <b>Modern Algebra</b> , Scitech Publication, Chennai, Reprint, June 2019.				
Unit I - Section 3.4 to 3.6				
Unit II - Section 3.7 to 3.8				
Unit III - Section 3.9 to 3.10				
Unit IV - Section 3.11, 4.1				
Unit V - Section 4.2 to 4.5				
<b>Books for References:</b>				
1. M.L Santiago, <b>Modern Algebra</b> , Tata MC Graw Hill Publication, New Delhi,1988.				
2. K.Sivasubramaniam, A.S.Kumaraswamy and K.Sitaraman, <b>Modern Algebra</b> , S.Chand and Company Ltd, New Delhi,1979.				
3. <b>Basic ModernAlgebra with Applications</b> , Adhikari, MahimaRanjan,				

Adhikari, Avishek, Springer,2014.

**Web Resources**

1. <https://nptel.ac.in/courses/106/104/106104149/>
2. <https://nptel.ac.in/courses/111/106/111106113/>
3. <https://thebookee.net/mo/modern-algebra-pdf-by-arumugam>

COURSE OUTCOME		K Level
On the successful completion of the course, the students will be able to		
CO1:	Explain the basic concepts of algebraic structures	K4
CO2:	Construct the mathematical proofs for the theorems related to groups.	K4
CO3:	Examine the properties of various groups	K3
CO4:	Analyze the Lagrange’s, Euler’s, Fermat’s and Cayley’s Theorems in solving the problems.	K4
CO5:	Apply the characteristics of various algebraic structures.	K3

**CO & PO Mappings:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	2	3	2	1
CO 2	3	3	2	2	2	2
CO 3	2	2	1	2	2	1
CO 4	3	3	2	2	2	1
CO 5	3	2	2	2	1	1

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

UNIT	SUBJECT NAME	Hrs	Pedagogy
I	Permutation groups – Cycles and transpositions – Even permutations – Theorems on Permutations - Subgroups – Theorems on subgroups- Cyclic groups- Generators – Number of generators of Cyclic groups – Theorems- Problems	18	Chalk & Talk
II	Order of an element –Cosets – Theorems on cosets, Lagrange’s theorem, problems using Lagrange’s Theorem – Euler’s, Fermat’s Theorems.	18	Chalk & Talk
III	Normal subgroups – Theorems on Normal subgroups – Quotient group- Isomorphisms- Cayley’s Theorem – Automorphism- Problems and theorems.	18	Chalk & Talk
IV	Homomorphisms – Types of homomorphisms – Theorems on Homomorphisms – Fundamental theorem of Homomorphism -Rings – Problems	18	Chalk & Talk
V	Elementary properties – Isomorphism - Types of rings – Integral domains, Fields – Zero divisors – Theorems on Integral domains and Fields, Characteristic of a ring.	18	Chalk & Talk

**Course Designed by:**

**Dr. P. Chitradevi, Assistant Professor & Dr. A. Arivuchelvam, Assistant Professor**

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Upto K4	2	K1&K2	1	K1	2	1
AI	CO2	Upto K4	2	K1&K2	2	K2	2	1
CI	CO3	Upto K3	2	K1&K2	1	K2	2	1
AII	CO4	Upto K4	2	K1&K2	2	K2	2	1
Question Pattern CIA I & II	No. of Questions to be asked		4		3		4	2
	No. of Questions to be answered		4		3		2	1
	Marks for each question		1		2		5	10
	Total Marks for each section		4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5** will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K4	2	K1&K2	1	K1	2(K3&K3)	1(K4)
2	CO2	Upto K4	2	K1&K2	1	K1	2(K3&K3)	1(K4)
3	CO3	Upto K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
4	CO4	Upto K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
5	CO5	Upto K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
<b>(Figures in parenthesis denotes, questions should be asked with the given K level)</b>								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D ( Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	33
K2	5	6	20		31	25.8	
K3			30	20	50	41.7	42
K4				30	30	25	25
Marks	10	10	50	50	120	100	100
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.</b>							

Summative Examinations - Question Paper – Format

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K2	
18) b	CO3	K2	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K2	
20) b	CO5	K2	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K4	
22	CO2	K4	
23	CO3	K3	
24	CO4	K4	
25	CO5	K3	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>SEQUENCES AND SERIES</b>			
<b>Course Code</b>	<b>21UMTC42</b>	<b>L</b>	<b>P</b>	<b>C</b>
<b>Category</b>	<b>Core</b>	4	-	4
<b>Nature of Course:</b>	<b>EMPLOYABILITY</b>	SKILL ORIENTED	ENTREPRENURSHIP	
<b>COURSE OBJECTIVES:</b>				
<ul style="list-style-type: none"> <li>• To learn about sequences through examples.</li> <li>• To discuss the convergence of sequence.</li> <li>• To introduce infinite series and alternative series.</li> <li>• To familiarize the application of series in Trigonometry.</li> <li>• To understand how the elementary functions can be defined by power series.</li> </ul>				
<b>Unit: I</b>				12
Sequences – Bounded Sequences – Bounded above Sequences– Bounded below Sequences- Monotonic Sequences – Monotonic Increasing Sequences – Monotonic decreasing Sequences.				
<b>Unit: II</b>				12
Convergent Sequences – limit of the sequence – Theorems – Divergent and Oscillating Sequences – Diverging sequences - Finitely Oscillating Sequences –Infinitely Oscillating Sequences – Algebra of limits – Theorems.				
<b>Unit: III</b>				12
Subsequences – Limit points – Cauchy sequences – Theorems – The Upper and Lower limits of a sequence – Theorems and Problems.				
<b>Unit: IV</b>				12
Infinite series – Comparison test – Theorems (Statement only) and Problems.				
<b>Unit: V</b>				12
Kummer's Test –D' Alembert's ratio test –Raabe's Test – De Morgan and Bertrand's test - Gauss's Test – Cauchy's Root test and Cauchy's Condensation test – Theorems (Statement only) and Problems.				
<b>Total Lecture Hours</b>				60
<b>Books for Study:</b>				
Arumugam.S and Issac, <b>Sequences and Series</b> , New Gamma Publishing House, 2017, Palayamkottai.				
Unit I	Chapter 3: Section 3.1 to 3.3			
Unit II	Chapter 3 Section 3.4 to 3.6.			
Unit III	Chapter 3 Section 3.9 to 3.12.			
Unit IV	Chapter 4: Section 4.1 to 4.2			
Unit V	Chapter 4: Section 4.3 & 4.4.			
<b>Books for Reference:</b>				
1. Arumugam .S and Thangapandi Issac, <b>Classical Algebra</b> , New Gamma Publications, Edition 2003, Palayamkottai.				
2. Chandra Sekara Rao. K and K.S.Narayanan, <b>Real Analysis</b> , Volume –I, Viswanathan. S Pvt.Ltd, 2008, Chennai.				
3. Jain. M.L, Sequence & Series, Jeevanson's Publications, 2016.				

<b>Web Resources</b>	
1. <a href="https://nptel.ac.in/courses/111/101/111101134/">https://nptel.ac.in/courses/111/101/111101134/</a>	
2. <a href="http://www.ijernigan.com/172/ConvergenceDivergenceNotes.pdf">http://www.ijernigan.com/172/ConvergenceDivergenceNotes.pdf</a>	
3. <a href="https://www3.cs.stonybrook.edu/~cse547/ch2slides.pdf">https://www3.cs.stonybrook.edu/~cse547/ch2slides.pdf</a>	
<b>COURSE OUTCOME</b>	<b>K Level</b>
<b>On the successful completion of the course, the students will be able to</b>	
<b>CO1:</b> Explain the concepts of sequences	<b>K4</b>
<b>CO2:</b> Examine the convergence of the sequences	<b>K4</b>
<b>CO3:</b> Identify the limit points of the sequence	<b>K3</b>
<b>CO4:</b> Classify the various forms of series	<b>K4</b>
<b>CO5:</b> Apply most appropriate test to check the convergence of series	<b>K3</b>

**CO & PO Mappings:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	1	2	-	-
CO 2	3	2	2	2	1	1
CO 3	3	3	1	1	1	-
CO 4	3	2	2	2	-	-
CO 5	3	3	2	1	1	1

\*3 – Advanced Application; 2 – Intermediate Development; 1 – Introductory Level

**LESSON PLAN**

UNIT	SUBJECT NAME	Hrs	Pedagogy
<b>I</b>	Sequences – Bounded Sequences – Bounded above Sequences– Bounded below Sequences- Monotonic Sequences – Monotonic Increasing Sequences – Monotonic decreasing Sequences.	12	<b>Chalk &amp; Talk</b>
<b>II</b>	Convergent Sequences – limit of the sequence – Theorems – Divergent and Oscillating Sequences – Sequences diverging to $\infty$ - Sequences diverging to $-\infty$ - Finitely Oscillating Sequences –Infinitely Oscillating Sequences – Algebra of limits – Theorems.	12	<b>Chalk &amp; Talk</b>
<b>III</b>	Subsequences – Limit points – Cauchy sequences – Theorems – The Upper and Lower limits of a sequence – Theorems and Problems.	12	<b>Chalk &amp; Talk</b>
<b>IV</b>	Infinite series – Comparison test – Theorems (Statement only) and Problems.	12	<b>Chalk &amp; Talk</b>
<b>V</b>	Kummer’s Test –D’ Alembert’s ratio test –Raabe’s Test – De Morgan and Bertrand’s test- Gauss’s Test – Cauchy’s Root test and Cauchy’s Condensation test – Theorems (Statement only) and Problems.	12	<b>Chalk &amp; Talk</b>

**Course Designed by: Dr. A. Hamarichoudhi, Associate Professor &Mrs. S. Ragavi, Assistant Professor**

**Learning Outcome Based Education & Assessment (LOBE)  
Formative Examination - Blue Print  
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Upto K4	2	K1&K2	1	K1	2	1
AI	CO2	Upto K4	2	K1&K2	2	K2	2	1
CI	CO3	Upto K3	2	K1&K2	1	K2	2	1
AII	CO4	Upto K4	2	K1&K2	2	K2	2	1
Question Pattern CIA I & II	No. of Questions to be asked		4		3		4	2
	No. of Questions to be answered		4		3		2	1
	Marks for each question		1		2		5	10
	Total Marks for each section		4		6		10	10

**Distribution of Marks with K Level CIA I & CIA II**

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K4	2	K1&K2	1	K1	2(K3&K3)	1(K4)
2	CO2	Upto K4	2	K1&K2	1	K1	2(K3&K3)	1(K4)
3	CO3	Upto K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
4	CO4	Upto K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
5	CO5	Upto K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
<b>(Figures in parenthesis denotes, questions should be asked with the given K level)</b>								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D ( Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	33
K2	5	6	20		31	25.8	
K3			30	20	50	41.7	42
K4				30	30	25	25
Marks	10	10	50	50	120	100	100
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.</b>							

Summative Examinations - Question Paper – Format

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K2	
18) b	CO3	K2	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K2	
20) b	CO5	K2	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K4	
22	CO2	K4	
23	CO3	K3	
24	CO4	K4	
25	CO5	K3	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>PROGRAMMING IN C++</b>				
<b>Course Code</b>	<b>21UMTA41</b>	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	<b>Allied</b>	3	-	3	
<b>Nature of course:</b>	<b>EMPLOYABILITY</b>	<b>SKILL ORIENTED</b>	ENTREPRENURSHIP		
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To understand basic concepts in C++ programming with OOP.</li> <li>• To develop skills in advanced concepts like Control structures, functions.</li> <li>• To improve the capability on using arrays and classes.</li> <li>• To develop the concepts of Constructors and operators.</li> <li>• To study about inheritance.</li> </ul>					
<b>Unit: I</b>					9
Basic Concepts of Object Oriented Programming – Benefits of OOP – Structure of C++ program – Tokens- Keywords – Identifiers and Constants- Basic data type – User defined data type - Derived data types.					
<b>Unit: II</b>					9
Control structures-The Main Functions – Function prototyping – Call by Reference – Return by Reference – Inline functions– Default arguments – Function overloading.					
<b>Unit: III</b>					9
Specifying a Class – Defining member functions – Static data members – Static member functions – Array of Objects –Friendly functions					
<b>Unit: IV</b>					9
Constructors – Parameterized Constructors – Destructors- Defining Operator overloading – Overloading unary operators – Overloading binary operators – Rules for overloading operator.					
<b>Unit: V</b>					9
Inheritance – Defining Derived classes – Single Inheritance – Multilevel Inheritance – Multiple inheritance- Hierarchical Inheritance – Hybrid Inheritance.					
<b>Total Lecture Hours</b>					45
<b>Books for Study:</b>					
E. Balagurusamy, <b>Object Oriented Programming with C++</b> , Tata McGraw Hill, New Delhi, Fifth Edition, 2011.					
<b>Unit I -</b>	Chapter 1: Sections : 1.5, 1.6 Chapter 2: Section : 2.6 Chapter 3: Sections : 3.2 – 3.6, 3.8				
<b>Unit II -</b>	Chapter 3: Sections : 3.24 Chapter 4: Sections : 4.2 – 4.7, 4.10				
<b>Unit III -</b>	Chapter 5: Sections : 5.3 – 5.4, 5.11 – 5.13, 5.15				
<b>Unit IV -</b>	Chapter 6: Sections : 6.2 , 6.3, 6.11 Chapter 7: Sections : 7.2- 7.4 , 7.7				
<b>Unit V -</b>	Chapter 8: Sections : 8.1 – 8.3, 8.5 – 8.8				
<b>Books for References:</b>					
1. Bjarne Stroustrup, <b>The C++ Programming Language</b> , Addison-Wesley, New York, 1999.					

2. Robert Lafore, **Object-Oriented Programming in Microsoft C++**, Galgotia Publications, New Delhi, 2000
3. D. Ravichandran, **Programming with C++**, Tata McGraw Hill Education (India) Private Limited, New Delhi, Sixth Reprint, 2005.

**Web Resources**

1. <https://nptel.ac.in/courses/106/105/106105151/>
2. <https://www.classcentral.com/course/swayam-programming-in-c-6704>
3. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-096-introduction-to-c-january-iap-2011/lecture-notes/>

COURSE OUTCOME		K Level
<b>On the successful completion of the course, the students will be able to</b>		
<b>CO1:</b>	Explain object-oriented features in C++.	<b>K4</b>
<b>CO2:</b>	Point out the programs in C++ using control structure, function prototyping, inline functions and function overloading.	<b>K4</b>
<b>CO3:</b>	Make use of classes and member functions.	<b>K3</b>
<b>CO4:</b>	Differentiate overload functions and operators in C++.	<b>K4</b>
<b>CO5:</b>	Construct C++ using inheritances.	<b>K3</b>

**CO & PO Mappings:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	2	2	-	1
CO 2	3	3	2	2	-	1
CO 3	3	3	3	2	1	1
CO 4	3	3	3	2	1	1
CO 5	3	3	3	2	1	1

\*3 – Advanced Application; 2 – Intermediate Development; 1 – Introductory Level

**LESSON PLAN**

UNIT	SUBJECT NAME	Hrs	Pedagogy
<b>I</b>	Basic Concepts of Object Oriented Programming – Benefits of OOP – Structure of C++ program – Tokens- Keywords – Identifiers and Constants- Basic data type – User defined data type - Derived data type	9	<b>Chalk &amp; Talk</b>
<b>II</b>	Control structures-The Main Functions – Function prototyping – Call by References – Return by References – Inline functions– Default arguments – Function overloading.	9	<b>Chalk &amp; Talk, PPT</b>
<b>III</b>	Specifying a Class – Defining member functions – Static data members – Static member functions – Array of Objects –Friendly functions	9	<b>Chalk &amp; Talk</b>
<b>IV</b>	Constructors – Parameterized Constructors – Destructors- Defining Operator overloading – Overloading unary operators – Overloading binary operators – Rules for overloading operator.	9	<b>Chalk &amp; Talk</b>
<b>V</b>	Inheritance – Defining Derived class –Single Inheritance – Multilevel Inheritance – Multiple inheritance- Hierarchical Inheritance – Hybrid Inheritance.	9	<b>Chalk &amp; Talk, PPT</b>

**Course Designed by: Dr. S. Andal, Assistant Professor & Mrs. S. Ragavi, Assistant Professor**

**Learning Outcome Based Education & Assessment (LOBE)  
Formative Examination - Blue Print  
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Upto K4	2	K1&K2	1	K1	2	1
AI	CO2	Upto K4	2	K1&K2	2	K2	2	1
CI	CO3	Upto K3	2	K1&K2	1	K2	2	1
AII	CO4	Upto K4	2	K1&K2	2	K2	2	1
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

**Distribution of Marks with K Level CIA I & CIA II**

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K4	2	K1&K2	1	K1	2(K3&K3)	1(K4)
2	CO2	Upto K4	2	K1&K2	1	K1	2(K3&K3)	1(K4)
3	CO3	Upto K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
4	CO4	Upto K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
5	CO5	Upto K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
<b>(Figures in parenthesis denotes, questions should be asked with the given K level)</b>								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D ( Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	33
K2	5	6	20		31	25.8	
K3			30	20	50	41.7	42
K4				30	30	25	25
Marks	10	10	50	50	120	100	100
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.</b>							

## Summative Examinations - Question Paper – Format

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
Q.No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
Q.No	CO	K Level	Questions
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K2	
18) b	CO3	K2	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K2	
20) b	CO5	K2	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
Q.No	CO	K Level	Questions
21	CO1	K4	
22	CO2	K4	
23	CO3	K3	
24	CO4	K4	
25	CO5	K3	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>PROGRAMMING IN C++ LAB</b>				
<b>Course Code</b>	<b>21UMTAP1</b>	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	<b>Practical</b>	-	2	1	
<b>Nature of course:</b>	<b>EMPLOYABILITY</b>	<b>SKILL ORIENTED</b>	ENTREPRENURSHIP		
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To learn the fundamental programming concepts and methodologies which are essential to building good C++ programs.</li> <li>• To practice the C++ programming language via laboratory experiences.</li> <li>• To code, document, test, and implement a well-structured, robust computer program using the C++ programming language.</li> <li>• To write reusable modules (collections of functions).</li> <li>• To create and call functions that use parameter passing and return values</li> </ul>					
<b>List of Programs in C++</b>					
<ol style="list-style-type: none"> <li>1. Write a C++ program for In-line function.</li> <li>2. Write a C++ program for Function overloading</li> <li>3. Write a C++ program for Functions using Default arguments.</li> <li>4. Write a C++ program using Static member functions</li> <li>5. Write a C++ program for Constructors.</li> <li>6. Write a C++ program for Unary Operator overloading.</li> <li>7. Write a C++ program using Binary Operator overloading.</li> <li>8. Write a C++ program in Friend function.</li> <li>9. Write a C++ program using Single inheritance.</li> <li>10. Write a C++ program using recursive function.</li> </ol>					
				<b>Total Hours</b>	30
<b>Books for Study:</b>					
<ol style="list-style-type: none"> <li>1. E. Balagurusamy, Object Oriented Programming with C++, Tata McGraw Hill, New Delhi, Fifth Edition, 2011.</li> </ol>					
<b>Books for References:</b>					
<ol style="list-style-type: none"> <li>1. LesHanCock, Morris Kringer, <b>C Primer</b>, McGraw Hill , 1997.</li> <li>2. Robert Lafore, <b>Object-Oriented Programming in Microsoft C++</b>, Galgotia Publications, New Delhi, 2000.</li> <li>3. Bjarne Stroustrup, <b>The C++ Programming Language</b>, Addison-Wesley, New York, 1999.</li> </ol>					
<b>Web Resources</b>					
<ol style="list-style-type: none"> <li>1. <a href="https://nptel.ac.in/courses/106/104/106104128/">https://nptel.ac.in/courses/106/104/106104128/</a></li> <li>2. <a href="https://nptel.ac.in/courses/106/105/106105171/">https://nptel.ac.in/courses/106/105/106105171/</a></li> <li>3. <a href="https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-096-introduction-to-c-january-iap-2011/lecture-notes/">https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-096-introduction-to-c-january-iap-2011/lecture-notes/</a></li> </ol>					
<b>COURSE OUTCOME</b>				<b>K Level</b>	
<b>On the successful completion of the course, the students will be able to</b>					
<b>CO1:</b>	Illustrate the appropriate use of data types.			<b>K2</b>	
<b>CO2:</b>	Demonstrate the understanding of algorithms in the problem-solving process.			<b>K2</b>	
<b>CO3:</b>	Develop programs using conditional, iterative, and functions.			<b>K3</b>	

<b>CO4:</b>	Explain control structures for a given programming task.	<b>K2</b>
<b>CO5:</b>	Apply fundamental syntax rules for identifiers, declarations, expressions and functions.	<b>K3</b>

**CO & PO Mappings:**

<b>COS</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>
<b>CO 1</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>-</b>	<b>1</b>
<b>CO 2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>-</b>	<b>1</b>
<b>CO 3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>
<b>CO 4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>
<b>CO 5</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>

**\*3** – Advanced Application; **2** – Intermediate Development; **1** - Introductory Level

**Course Designed by:**

**Dr. S. Andal**, Assistant Professor & **Mrs. S. Ragavi**, Assistant Professor



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>FOURIER SERIES AND FOURIER TRANSFORM</b>			
<b>Course Code</b>	<b>21UMTS41</b>	<b>L</b>	<b>P</b>	<b>C</b>
<b>Category</b>	<b>Skill</b>	2	-	2
<b>Nature of course:</b>	<b>EMPLOYABILITY</b>	<b>SKILL ORIENTED</b>	ENTREPRENURSHIP	
<b>COURSE OBJECTIVES:</b>				
<ul style="list-style-type: none"> <li>• To have a sound knowledge of Fourier series and transform.</li> <li>• To solve Fourier series, Fourier Transform and inverse Fourier Transform.</li> <li>• To expand periodic function as a series of sines and cosines.</li> <li>• To apply Fourier Transform and its properties for solving Partial Differential equations.</li> <li>• To study finite Fourier transform and its properties.</li> </ul>				
<b>Unit: I</b>				6
Periodic functions – Trigonometric series – Fourier series and Fourier coefficient theorem – finite discontinuity - Even and odd functions.				
<b>Unit: II</b>				6
Half range Fourier cosine series and Fourier sine series – Change of interval – Change of period Complex form of Fourier series - Parseval's Identity.				
<b>Unit: III</b>				6
Infinite Fourier Transform – Fourier Sine Transform – Fourier Cosine transform – Relationship between Fourier Transform and Laplace Transform – Properties of Fourier transform – Convolution theorem.				
<b>Unit: IV</b>				6
Simple results related to Fourier Transform – integral equation – Cosine and sine Transform				
<b>Unit: V</b>				6
Finite Fourier Sine Transform – Finite Fourier Cosine Transform – Fourier Integral theorem – Parseval's Identity.				
<b>Total Lecture Hours</b>				<b>30</b>
<b>Books for Study:</b>				
J.K.Goyal, K.P. Gupta, <b>Laplace and Fourier Transform</b> , Pragati Prakashan Educational Publisher, Meerut, 2019 Ed.,				
Unit 1: Chapter 3, Section 1 to 6				
Unit 2: Chapter 3, Section 7 to 11				
Unit 3: Chapter 2, Section 2.1 to 2.5				
Unit 4: Chapter 2, Section 2.6 to 2.8				
Unit 5: Chapter 2, Part II full.				
<b>Books for References:</b>				
1. Dr.S. Arumugam and Issac, Sequence & Series and Fourier Series, New Gamma Publishing House, Palayamkottai, 2006.				
2. P.R. Vittal, Differential Equations, Fourier and Laplace Transforms, Probability – Year of Publication 2000, Margham Publications, 24, Rameshwaram Road, T.Nagar, Chennai – 600 017				
3. Grewal, B.S., "Higher Engineering Mathematics" (35th Edition), Khanna Publishers, Delhi, 2000.				
<b>Web Resources</b>				

- <https://nptel.ac.in/courses/111/105/111105035/>
- [https://www.youtube.com/playlist?list=PLs7oDAL8\\_ouJ5w8wCPtKnK2i09MIKC6kP](https://www.youtube.com/playlist?list=PLs7oDAL8_ouJ5w8wCPtKnK2i09MIKC6kP)
- <https://math.mit.edu/~gs/cse/websections/cse41.pdf>

COURSE OUTCOME		K Level
<b>On the successful completion of the course, the students will be able to</b>		
<b>CO1:</b>	Demonstrate the understanding of Fourier Series and Fourier transforms.	<b>K1</b>
<b>CO2:</b>	Analyze Half range Fourier cosine series and Fourier sine series	<b>K2</b>
<b>CO3:</b>	Examine the convergence of Fourier series.	<b>K1</b>
<b>CO4:</b>	Use the Fourier transform in periodic function	<b>K2</b>
<b>CO5:</b>	List the properties of Fourier transforms.	<b>K1</b>

**CO & PO Mappings:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	2	2	2	2	1
CO 2	2	2	2	2	2	1
CO 3	3	2	2	2	2	1
CO 4	2	2	1	2	2	1
CO 5	2	3	2	2	2	1

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

UNIT	SUBJECT NAME	Hrs	Pedagogy
<b>I</b>	Periodic functions – Trigonometric series – Fourier series and Fourier coefficient theorem – finite discontinuity - Even and odd functions.	<b>6</b>	<b>Chalk &amp; Talk</b>
<b>II</b>	Half range Fourier cosine series and Fourier sine series – Change of interval – Change of period Complex form of Fourier series - Parseval’s Identity.	<b>6</b>	<b>Chalk &amp; Talk</b>
<b>III</b>	Infinite Fourier Transform – Fourier Sine Transform – Fourier Cosine transform – Relations ship between Fourier Transform and Laplace Transform – Properties of Fourier transform – Convolution theorem.	<b>6</b>	<b>Chalk &amp; Talk</b>
<b>IV</b>	Simple results related to Fourier Transform – integral equation – Cosine and sine Transform	<b>6</b>	<b>Chalk &amp; Talk</b>
<b>V</b>	Finite Fourier Sine Transform – Finite Fourier Cosine Transform – Fourier Integral theorem – Parseval’s Identity.	<b>6</b>	<b>Chalk &amp; Talk</b>

**Course Designed by:**

**Dr. V. Ramachandran**, Assistant Professor & **Dr. M. Saravanan**, Assistant Professor



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>MATHEMATICS FOR COMPETITIVE EXAMINATIONS – II</b>			
<b>Course Code</b>	<b>21UMTN41</b>	<b>L</b>	<b>P</b>	<b>C</b>
<b>Category</b>	<b>Non-Major Elective</b>	2	-	2
<b>Nature of course:</b>	<b>EMPLOYABILITY</b>	<b>SKILL ORIENTED</b>	ENTREPRENURSHIP	
<b>COURSE OBJECTIVES:</b>				
<ul style="list-style-type: none"> <li>• To improve the ability to face the competitive examinations</li> <li>• To identify the exact method to problems</li> <li>• To apply the concepts in Competitive Examinations.</li> <li>• To familiarize the concepts of Profit &amp; Loss, Interest on money, Rules of alligation.</li> <li>• To identify verbal and non – verbal problems</li> </ul>				
<b>Unit: I</b>				6
Cost Price- Selling price – Profit or Gain – Loss – Profit and Loss Percentage.				
<b>Unit: II</b>				6
Alligation – Mean price - Rule of alligation.				
<b>Unit: III</b>				6
Principal – Interest – Simple Interest – Compound Interest.				
<b>Unit: IV</b>				6
Non Verbal Reasoning – Completion of Figures – Completion of Series.				
<b>Unit: V</b>				6
Calendar – Leap Year – Non Leap Year – Number of Days between Dates				
<b>Total Lecture Hours</b>				30
<b>Books for Study:</b>				
Text Material will be supplied by the Department.				
<b>Books for References:</b>				
<ol style="list-style-type: none"> <li>1. Aggarwal. R.S, <b>Quantitative Aptitude for Competitive Examinations</b>, S.Chand and Company Ltd, Reprint 2011, New Delhi.</li> <li>2. AbhigitGuha, <b>Quantitative Aptitude</b>, fourth edition, Tata MCGraw Hill Publication, 2011, New Delhi.</li> <li>3. BS Sijwali, Indu Sijwali, <b>Non -Verbal Reasoning</b>, Arihant Publications (India) LTD., New Delhi.</li> </ol>				
<b>Web Resources</b>				
<ol style="list-style-type: none"> <li>1. <a href="https://www.khanacademy.org/math/in-in-class-7th-math-cbse/x939d838e80cf9307:comparing-quantities/x939d838e80cf9307:profit-or-loss-as-a-percentage/v/finding-profit-percent-comparing-quantities-class-7-india-math-khan-academy">https://www.khanacademy.org/math/in-in-class-7th-math-cbse/x939d838e80cf9307:comparing-quantities/x939d838e80cf9307:profit-or-loss-as-a-percentage/v/finding-profit-percent-comparing-quantities-class-7-india-math-khan-academy</a></li> <li>2. <a href="https://www.toppr.com/guides/maths/compairing-quantities/profit-and-loss/">https://www.toppr.com/guides/maths/compairing-quantities/profit-and-loss/</a></li> <li>3. <a href="http://accioneduca.org/admin/archivos/clases/material/interest-rates_1564084248.pdf">http://accioneduca.org/admin/archivos/clases/material/interest-rates_1564084248.pdf</a></li> </ol>				
<b>COURSE OUTCOME</b>				<b>K Level</b>
<b>On the successful completion of the course, the students will be able to</b>				
<b>CO1:</b>	Explain the concepts the profit and loss	<b>K2</b>		
<b>CO2:</b>	Recall the rules of alligation	<b>K1</b>		
<b>CO3:</b>	Demonstrate the understanding of the compound and simple interest	<b>K2</b>		

<b>CO4:</b>	Classify the non-verbal reasoning problems	<b>K2</b>
<b>CO5:</b>	Illustrate the concepts related to calendar	<b>K2</b>

**CO & PO Mappings:**

<b>COS</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>
<b>CO 1</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>CO 2</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>3</b>
<b>CO 3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>
<b>CO 4</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>
<b>CO 5</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>

\*3 – Advanced Application; 2 – Intermediate Development; 1 – Introductory Level

**LESSON PLAN**

<b>UNIT</b>	<b>SUBJECT NAME</b>	<b>Hrs</b>	<b>Pedagogy</b>
<b>I</b>	Cost Price- Selling price – Profit or Gain – Loss – Profit and Loss Percentage.	<b>6</b>	<b>Chalk &amp; Talk</b>
<b>II</b>	Alligation – Mean price - Rule of alligation.	<b>6</b>	<b>Chalk &amp; Talk</b>
<b>III</b>	Principal – Interest – Simple Interest – Compound Interest.	<b>6</b>	<b>Chalk &amp; Talk</b>
<b>IV</b>	Non Verbal Reasoning – Completion of Figures – Completion of Series.	<b>6</b>	<b>Chalk &amp; Talk</b>
<b>V</b>	Calendar – Leap Year – Non Leap Year – Number of Days between Dates	<b>6</b>	<b>Chalk &amp; Talk</b>

**Course Designed by:**

**Dr. P. Chitradevi**, Assistant Professor & **Mrs. S. Ragavi**, Assistant Professor

# FIFTH SEMESTER



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>LINEAR ALGEBRA</b>			
<b>Course Code</b>	<b>21UMTC51</b>	<b>L</b>	<b>P</b>	<b>C</b>
<b>Category</b>	<b>Core</b>	6	-	4
<b>NATURE OF COURSE:</b>	EMPLOYABILITY	<b>SKILL ORIENTED</b>	✓	ENTREPRENURSHIP
<b>COURSE OBJECTIVES:</b>				
<ul style="list-style-type: none"> <li>• To exhibit vector space, inner product space, span of a set and understand the fundamental theorem of homomorphism.</li> <li>• To have a sound knowledge of matrices and its properties.</li> <li>• To analyze orthogonality, rank and nullity.</li> <li>• To illustrate Eigen values and Eigen vectors</li> <li>• To familiarize the concepts of Bilinear forms</li> </ul>				
<b>Unit: I</b>				<b>18</b>
Vector Spaces – Definition and examples – Subspaces – Linear Transformation – Fundamental theorem of Homomorphism.				
<b>Unit: II</b>				<b>18</b>
Span of a set – Linear independence – Basis and Dimension – Rank and Nullity – Matrix of Linear Transformations.				
<b>Unit: III</b>				<b>18</b>
Inner Product Spaces – Orthogonality – Orthogonal complement-Problems and Theorems.				
<b>Unit: IV</b>				<b>18</b>
Theory of Matrices –Algebra of Matrices –Types –Inverse-Elementary Transformation- Rank of a Matrix– Simultaneous Linear equations – Characteristic equation and Cayley Hamilton theorem – Eigen values and Eigen Vectors.				
<b>Unit: V</b>				<b>18</b>
Bilinear forms – Matrix of a Bilinear form – Quadratic forms – Reduction to Quadratic forms.				
<b>Total Lecture Hours</b>				<b>90</b>
<b>Books for Study:</b>				
Dr.S.Arumugam and Issac A.T, <b>Modern algebra</b> , Scitech Publications, Chennai, Reprint July 2014.				
UnitI - Chapter 5: Section 5.0 to5.3				
UnitII - Chapter 5: Section 5.4 to5.8				
Unit III - Chapter 6: Section 6.0 to6.3				
Unit IV - Chapter 7: Section 7.0 to7.8				
UnitV - Chapter 8: Section 8.0 to 8.2				
<b>Books for References:</b>				

1. Leadership Project Committee, University of Bombay, **Books for Study of Algebra**, Tata McGraw Hill Publication, New Delhi, 1985.
2. V.Krishnamurthy, V.P.Mainra & J.L.Arora, **An Introduction to Linear Algebra**, Affiliated East – West press Pvt Ltd, New Delhi, 1990.
3. Manicavasagam Pillai .T.K and others – **Modern algebra**, S. Viswanathan Publishers, Chennai 1993.

**Web Resources**

1. <https://nptel.ac.in/courses/111/105/111105035/>
2. <https://nptel.ac.in/courses/111/106/111106135/>
3. <https://webspaces.maths.qmul.ac.uk/p.j.cameron/notes/linalg.pdf>

COURSE OUTCOME		K Level
On the successful completion of the course, the students will be able to		
<b>CO1:</b>	Demonstrate the understanding of the basic concepts of vector space, subspace and linear transformation.	<b>K2</b>
<b>CO2:</b>	Identify spanning set, linear independent set and basis to predict the dimension of a vector space.	<b>K3</b>
<b>CO3:</b>	Explain Inner Product Space, orthogonality and its complement	<b>K4</b>
<b>CO4:</b>	Compute Eigen values, Eigen vectors and inverse, higher powers of a given matrix using Cayley Hamilton Theorem	<b>K4</b>
<b>CO5:</b>	Change quadratic form to diagonal form.	<b>K3</b>

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
<b>CO 1</b>	3	2	3	2	2	1
<b>CO 2</b>	2	3	2	3	2	1
<b>CO 3</b>	3	2	3	2	2	1
<b>CO 4</b>	3	3	2	2	2	1
<b>CO 5</b>	2	3	2	3	2	1

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

UNIT	SUBJECT NAME	Hrs	Pedagogy
I	Vector Spaces – Definition and examples – Subspaces – Linear Transformation – Fundamental theorem of Homomorphism.	18	Chalk & Talk
II	Span of a set – Linear independence – Basis and Dimension – Rank and Nullity – Matrix and Linear Transformations.	18	Chalk & Talk
III	Inner Product Spaces – Orthogonality – Orthogonal complement-Problems and Theorems.	18	Chalk & Talk
IV	Theory of Matrices –Algebra of Matrices –Types –Inverse-Elementary Transformation- Rank of a Matrix– Simultaneous Linear equations – Characteristic equation and Cayley Hamilton theorem – Eigen values and Eigen Vectors.	18	Chalk & Talk
V	Bilinear forms – Matrix of a Bilinear form – Quadratic forms – Reduction to Quadratic forms.	18	Chalk & Talk

**Course Designed by : Dr.V. Ramachandran & Dr.P.Chitra devi**

**Learning Outcome Based Education & Assessment (LOBE)  
Formative Examination - Blue Print  
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of. Questions	K - Level	No. of. Questions	K - Level		
CI	CO1	Upto K2	2	K1&K2	1	K1	2 (K2 &K2)	1 (K2)
AI	CO2	Upto K3	2	K1&K2	2	K2	2 (K3 &K3)	1 (K3)
CI	CO3	Upto K4	2	K1&K2	1	K2	2 (K3 &K3)	1 (K4)
AII	CO4	Upto K4	2	K1&K2	2	K2	2 (K3 &K3)	1 (K4)
Question Pattern CIA I & II	No. of Questions to be asked		4		3		4	2
	No. of Questions to be answered		4		3		2	1
	Marks for each question		1		2		5	10
	Total Marks for each section		4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	40
	K2	2	4	10		16	32	
	K3			10		10	20	20
	K4				20	20	40	40
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5** will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K2	2	K1&K2	1	K1	2(K1&K1)	1(K2)
2	CO2	Upto K3	2	K1&K2	1	K1	2(K3&K3)	1(K3)
3	CO3	Upto K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
4	CO4	Upto K4	2	K1&K2	1	K2	2(K4&K4)	1(K4)
5	CO5	Upto K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

**Distribution of Marks with K Level**

<b>K Level</b>	<b>Section A (Multiple Choice Questions)</b>	<b>Section B (Short Answer Questions)</b>	<b>Section C (Either/ or Choice)</b>	<b>Section D ( Open Choice)</b>	<b>Total Marks</b>	<b>% of (Marks without choice)</b>	<b>Consolidated %</b>
K1	5	4	10		19	15.9	41.7
K2	5	6	10	10	31	25.8	
K3			20	20	40	33.3	33.3
K4			10	20	30	25	25
Marks	10	10	50	50	120	100	100

**NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.**

Summative Examinations - Question Paper – Format

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K4	
18) b	CO3	K4	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K3	
20) b	CO5	K3	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K3	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>REAL ANALYSIS</b>			
<b>Course Code</b>	<b>21UMTC52</b>	<b>L</b>	<b>P</b>	<b>C</b>
<b>Category</b>	<b>Core</b>	6	-	4
<b>NATURE OF COURSE:</b>	EMPLOYABILITY	<b>SKILL ORIENTED</b>	✓	ENTREPRENURSHIP
<b>COURSE OBJECTIVES:</b>				
<ul style="list-style-type: none"> <li>• To define the least upper bounds and the triangle inequality.</li> <li>• To introduce the various types of sequences.</li> <li>• To recognize convergent, conditionally and absolutely convergent series.</li> <li>• To determine the different types of metric space.</li> <li>• To identify the different types of functions in a metric space</li> </ul>				
<b>Unit: I</b>				<b>18</b>
Limit of a function on the real line- Metric spaces – Limits in metric spaces.				
<b>Unit: II</b>				<b>18</b>
Functions continuous at a point on the real line – Reformulation – Functions continuous on a metric space.				
<b>Unit: III</b>				<b>18</b>
Open sets- Closed sets- Discontinuous functions on $\mathbb{R}^1$ .				
<b>Unit: IV</b>				<b>18</b>
Connected sets- Bounded sets and totally bounded sets- Complete metric spaces.				
<b>Unit: V</b>				<b>18</b>
Compact metric spaces – Continuous functions on Compact metric spaces- Continuity of the inverse function- Uniform Continuity.				
<b>Total Lecture Hours</b>				<b>90</b>
<b>Books for Study:</b>				
Richard R. Goldberg, <b>Methods of Real Analysis</b> , Oxford and IBH Publishing Pvt. Ltd, New Delhi, 1970, Reprint 2019.				
Unit I - Chapter 4: Sections 4.1-4.3 Unit II - Chapter 5: Sections 5.1-5.3 Unit III - Chapter 5: sections 5.4- 5.6 Unit IV - Chapter 6: Sections 6.2-6.4 Unit V - Chapter 6: Sections 6.5–6.8				
<b>Books for References:</b>				
1. Dr.S.Arumugam, Mr. A.Thangapandi Isaac, Dr.A.Somasundaram, <b>Modern Analysis</b> , Yes Dee Publishing PvtLtd. 2. Tom M.Apostol, <b>Mathematical Analysis</b> , II Edition, Narosa Publishing House, New Delhi (Unit I), 1997. 3. M K Singal, Asha Rani Singal, <b>A First Course In Real Analysis</b> , R Chand & CO, 2020.				
<b>Web Resources</b>				
1. <a href="https://nptel.ac.in/courses/111/101/111101134/">https://nptel.ac.in/courses/111/101/111101134/</a> 2. <a href="https://nptel.ac.in/courses/111/105/111105069/">https://nptel.ac.in/courses/111/105/111105069/</a>				

3. <https://s2pnd-matematika.fkip.unpatti.ac.id/wp-content/uploads/2019/03/Real-Analysis-4th-Ed-Royden.pdf>

COURSE OUTCOME		K Level
On the successful completion of the course, the students will be able to		
CO1:	explain the basic concepts of countable , uncountable sets and metric space.	K4
CO2:	analyse the completeness of the metric space.	K4
CO3:	examine whether a function on a metric space is continuous, discontinuous, or uniformly continuous.	K4
CO4:	construct the logical arguments evolving the theory behind connected sets.	K3
CO5:	construct mathematical proofs of basic results in compact metric space	K3

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	2	2	2
CO 2	2	1	2	2	1	1
CO 3	2	2	2	2	2	1
CO 4	2	2	2	2	1	1
CO 5	2	2	2	2	1	1

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

UNIT	SUBJECT NAME	Hrs	Pedagogy
I	Limit of a function on the real line- Metric spaces – Limits in metric spaces.	18	Chalk & Talk
II	Functions continuous at a point on the real line – Reformulation – Functions continuous on a metric space.	18	Chalk & Talk
III	Open sets- Closed sets- Discontinuous functions on $\mathbb{R}^1$ .	18	Chalk & Talk
IV	Connected sets- Bounded sets and totally bounded sets- Complete metric spaces.	18	Chalk & Talk
V	Compact metric spaces – Continuous functions on Compact metric spaces- Continuity of the inverse function- Uniform Continuity.	18	Chalk & Talk

**Course Designed by: Mrs.S.Ragavi & Mrs.R.Sumathi**

**Learning Outcome Based Education & Assessment (LOBE)  
Formative Examination - Blue Print  
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI AI	CO1	Upto K4	2	K1&K2	1	K1	2 (K3 &K3)	1 (K4)
	CO2	Upto K4	2	K1&K2	2	K2	2 (K3 &K3)	1 (K4)
CI AII	CO3	Upto K4	2	K1&K2	1	K2	2 (K3 &K3)	1 (K4)
	CO4	Upto K3	2	K1&K2	2	K2	2 (K3 &K3)	1 (K3)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

**Distribution of Marks with K Level CIA I & CIA II**

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			20		20	40	40
	K4				20	20	40	40
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			20	10	30	60	60
	K4				10	10	20	20
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

<b>Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)</b>								
S.No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	<b>Upto K4</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K1</b>	<b>2(K2&amp;K2)</b>	<b>1(K4)</b>
2	CO2	<b>Upto K4</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K1</b>	<b>2(K3&amp;K3)</b>	<b>1(K4)</b>
3	CO3	<b>Upto K4</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K2</b>	<b>2(K3&amp;K3)</b>	<b>1(K4)</b>
4	CO4	<b>Upto K3</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K2</b>	<b>2(K3&amp;K3)</b>	<b>1(K3)</b>
5	CO5	<b>Upto K3</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K2</b>	<b>2(K2&amp;K2)</b>	<b>1(K3)</b>
No. of Questions to be Asked			<b>10</b>		<b>5</b>		<b>10</b>	<b>5</b>
No. of Questions to be answered			<b>10</b>		<b>5</b>		<b>5</b>	<b>3</b>
Marks for each question			<b>1</b>		<b>2</b>		<b>5</b>	<b>10</b>
Total Marks for each section			<b>10</b>		<b>10</b>		<b>25</b>	<b>30</b>
<b>(Figures in parenthesis denotes, questions should be asked with the given K level)</b>								

<b>Distribution of Marks with K Level</b>							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D ( Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	33.3
K2	5	6	20		31	25.8	
K3			30	20	50	41.7	41.7
K4				30	30	25	25
Marks	10	10	50	50	120	100	100
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.</b>							

Summative Examinations - Question Paper – Format

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>( 5x2=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K4	
22	CO2	K4	
23	CO3	K4	
24	CO4	K3	
25	CO5	K3	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>DIFFERENTIAL EQUATIONS</b>			
<b>Course Code</b>	21UMTC53	<b>L</b>	<b>P</b>	<b>C</b>
<b>Category</b>	Core	6	-	4
<b>NATURE OF COURSE:</b>	<b>EMPLOYABILITY</b>	✓	SKILL ORIENTED	ENTREPRENURSHIP
<b>COURSE OBJECTIVES:</b>				
<ul style="list-style-type: none"> <li>To understand the first order and second order differential equations</li> <li>To apply suitable method for solving linear differential equations</li> <li>To solve simultaneous linear differential equations</li> <li>To form the partial differential equation</li> <li>To apply appropriate methods for solving partial differential equations</li> </ul>				
<b>Unit: I</b>				<b>18</b>
Exact differential equations of first order but of higher degree – Equations solvable for y – Equations solvable for x – Clairaut’s form – Equation that do not contain x,y explicitly, Equation homogeneous in x and y.				
<b>Unit: II</b>				<b>18</b>
Linear Equations with constant coefficients and variable coefficients - Equations reducible to the linear homogeneous equations.				
<b>Unit: III</b>				<b>18</b>
Simultaneous Linear differential equations – Linear Equations of the second order – Reduction to the normal form – Change of independent variables – Variation of parameters.				
<b>Unit: IV</b>				<b>18</b>
Partial differential equation of the first order – Formation of PDEs – Elimination of arbitrary constants and functions - Derivation of partial differential equation – Lagrange method of solving linear equations				
<b>Unit: V</b>				<b>18</b>
Standard forms – Equations reducible to the standard forms – Charpit’s method.				
<b>Total Lecture Hours</b>				<b>90</b>
<b>Books for Study:</b>				
T.K.Manickavasagam Pillai and S.Narayanan, <b>Differential equations and its Applications</b> , S.Viswanathan Publication, Chennai,2014.				
UnitI - Chapter 1: Section 6.1, 6.3and				

		Chapter 4: Section 1, 2, 3& 4
Unit II	-	Chapter 5: Section 4, 5 &6
Unit III	-	Chapter 6: Section 5, 6and
		Chapter 8: Section 1, 2, 3, &4
Unit IV	-	Chapter 12: Section 1, 2, 3&4
UnitV	-	Chapter 12: Section 5,6

**Books for References:**

1. Dr. M.D. Raisinghania, **Advanced Differential Equations**, S.Chand and Company Pvt. Ltd, New Delhi, Reprint,2012
2. Dr.S. Arumugam and Issac, **Differential equations and its Applications**, New Gamma Publications, Palayamkottai,2011.
3. Kandasamy. P. and K. Thilagavathi, **Mathematics for B.Sc.**, Vol III – 2004 – S.Chand and Co., New Delhi.

**Web Resources**

1. <https://www.digimat.in/nptel/courses/video/111108081/L02.html>
2. [https://www.whitman.edu/mathematics/calculus\\_online/section17.01.html](https://www.whitman.edu/mathematics/calculus_online/section17.01.html)
3. <https://www.math.hkust.edu.hk/~machas/differential-equations.pdf>

**COURSE OUTCOME**

**K Level**

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

<b>CO1:</b>	Choose the appropriate method for solving ordinary differential equation.	<b>K3</b>
<b>CO2:</b>	Apply suitable method for solving linear differential equations.	<b>K3</b>
<b>CO3:</b>	Solve the Simultaneous differential equations using various methods.	<b>K3</b>
<b>CO4:</b>	Solve the partial differential equation by Lagrange’s method.	<b>K3</b>
<b>CO5:</b>	Analyse various forms of partial differential equations	<b>K4</b>

**CO & PO Mapping:**

<b>COS</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>
<b>CO 1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>
<b>CO 2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>
<b>CO 3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>
<b>CO 4</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>1</b>
<b>CO 5</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>2</b>

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

UNIT	SUBJECT NAME	Hrs	Pedagogy
I	Exact differential equations of first order but of higher degree – Equations solvable for y – Equations solvable for x – Clairaut’s form – Equation that do not contain x,y explicitly, Equation homogeneous in x and y.	18	Chalk & Talk
II	Linear Equations with constant coefficients and variable coefficients - Equations reducible to the linear homogeneous equations.	18	Chalk & Talk
III	Simultaneous Linear differential equations – Linear Equations of the second order – Reduction to the normal form – Change of independent variables – Variation of parameters.	18	Chalk & Talk
IV	Partial differential equation of the first order – Formation of PDEs – Elimination of arbitrary constants and functions - Derivation of partial differential equation – Lagrange method of solving linear equations	18	Chalk & Talk
V	Standard forms – Equations reducible to the standard forms – Charpit’s method.	18	Chalk & Talk

**Course Designed by: Dr.A.Arivu Chelvam & Dr.S.Andal**

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Upto K3	2	K1&K2	1	K1	2 (K2 & K2)	1 (K3)
AI	CO2	Upto K3	2	K1&K2	2	K2	2(K3 & K3)	1 (K3)
CI	CO3	Upto K3	2	K1&K2	1	K2	2(K3 & K3)	1(K3)
AII	CO4	Upto K3	2	K1&K2	2	K2	2 (K2 & K2)	1(K3)
Question Pattern CIA I & II	No. of Questions to be asked		4		3		4	2
	No. of Questions to be answered		4		3		2	1
	Marks for each question		1		2		5	10
	Total Marks for each section		4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	40
	K2	2	4	10		16	32	
	K3			10	20	30	60	60
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	40
	K2	2	4	10		16	32	
	K3			10	20	30	60	60
	K4							
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5** will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K3	2	K1&K2	1	K1	2(K2&K2)	1(K3)
2	CO2	Upto K3	2	K1&K2	1	K1	2(K3&K3)	1(K3)
3	CO3	Upto K3	2	K1&K2	1	K2	2(K3&K3)	1(K3)
4	CO4	Upto K3	2	K1&K2	1	K2	2(K3&K3)	1(K3)
5	CO5	Upto K4	2	K1&K2	1	K2	2(K2&K2)	1(K4)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

**Distribution of Marks with K Level**

<b>K Level</b>	<b>Section A (Multiple Choice Questions)</b>	<b>Section B (Short Answer Questions)</b>	<b>Section C (Either/ or Choice)</b>	<b>Section D ( Open Choice)</b>	<b>Total Marks</b>	<b>% of (Marks without choice)</b>	<b>Consolidated %</b>
K1	5	4			9	7.5	33.4
K2	5	6	20		31	25.9	
K3			30	40	70	58.3	58.3
K4				10	10	8.3	8.3
Marks	10	10	50	50	120	100	100

**NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.**

**Summative Examinations - Question Paper – Format**

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
Q.No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
Q.No	CO	K Level	Questions
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
Q.No	CO	K Level	Questions
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K3	
25	CO5	K4	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
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<b>Course Name</b>	<b>STATISTICS – I</b>				
<b>Course Code</b>	<b>21UMTE51</b>	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	<b>Elective</b>	5	-	5	
<b>NATURE OF COURSE:</b>	<b>EMPLOYABILITY</b>	✓	<b>SKILL ORIENTED</b>	<b>ENTREPRENURSHIP</b>	
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To know probability, random variables, sampling.</li> <li>• To apply problems on probability and sampling.</li> <li>• To solve problems in different environments that needs decision.</li> <li>• To learn about fitting of curves</li> <li>• To find the relationship between two variables.</li> </ul>					
<b>Unit: I</b>					<b>15</b>
Measures of Dispersion – Arithmetic Mean – Median– Quartile Deviation – Mode – Geometric Mean – Harmonic Mean – Measures of dispersion – Standard Deviation					
<b>Unit: II</b>					<b>15</b>
Curve fitting – Principle of least squares – Fitting a Straight line – Fitting a second degree Parabola – Type of curves of the form $y = bx^a$ , $y = ab^x$ , $y = ae^{bx}$ .					
<b>Unit: III</b>					<b>15</b>
Correlation – Correlation Co efficient – Problems – Rank Correlation – Regression – Equation of Regression lines – Regression Coefficients – Angle between Regression lines.					
<b>Unit: IV</b>					<b>15</b>
Theory of Attributes – Positive class frequencies - Negative class frequencies – Ultimate class frequencies- Consistency of data – Independence and Association of data- Coefficient of Association- Coefficient of Colligation.					
<b>Unit: V</b>					<b>15</b>
Index Numbers- Aggregate Method- Average of Price relatives Method- Weighted Index numbers- Laspeyre’s Index numbers- Paasche’s Index numbers- Marshall – Edgeworth’s Index numbers- Bowley’s Index numbers- Fischer’s Index numbers- Kelly’s Index numbers- Ideal Index Numbers – Consumer price Index numbers.					
<b>Total Lecture Hours</b>					<b>75</b>
<b>Books for Study:</b>					

Dr. S. Arumugam and Isaac, **Statistics**, New Gamma Publications, Palayamkottai, Reprint 2012.

- UnitI - Chapter 3
- UnitII - Chapter 5
- UnitIII - Chapter 6
- UnitIV - Chapter 8
- UnitV - Chapter 9

**Books for References:**

1. T. Sankara Narayanan and A. Mangaldoss, **Statistics and its Application**, Preist Publications, New Delhi, 1994.
2. R.S.N.Pillai and Bagavathi, **Practical Statistics**, ,S.Chand and Company Pvt Ltd, New Delhi, 1987.
3. Bhat B.R, Srivenkataramana T and Rao Madhava K.S.: **Statistics: A Beginner s Text, Vol. I**, New Age International (P)Ltd, 1996.

**Web Resources**

1. <https://nptel.ac.in/courses/111/105/111105041/>
2. <https://nptel.ac.in/courses/103/106/103106120/>
3. <https://sesricdiag.blob.core.windows.net/oicstatcom/TEXTBOOK-CORRELATION-AND-REGRESSION-ANALYSIS-EGYPT-EN.pdf>

COURSE OUTCOME		K Level
<b>On the successful completion of the course, the students will be able to</b>		
<b>CO1:</b>	Analyze statistical techniques to interpret the data.	<b>K4</b>
<b>CO2:</b>	Construct the functional relationship between the variables.	<b>K3</b>
<b>CO3:</b>	Compute the coefficient of correlation and the line of best fit for the bivariate data.	<b>K4</b>
<b>CO4:</b>	Examine the qualitative characteristics of population using theory of attributes.	<b>K4</b>
<b>CO5:</b>	Compute the index numbers for the given phenomenon.	<b>K3</b>

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
<b>CO 1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>
<b>CO 2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>
<b>CO 3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>
<b>CO 4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>
<b>CO 5</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

<b>UNIT</b>	<b>SUBJECT NAME</b>	<b>Hrs</b>	<b>Pedagogy</b>
<b>I</b>	Measures of averages – Arithmetic Mean – Median – Median – Quartile Deviation – Mode – Geometric Mean – Harmonic Mean – Measures of dispersion – Standard Deviation	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>II</b>	Curve fitting – Principle of least squares – Fitting a Straight line – Fitting a second degree Parabola – Type of curves of the form $y = bx^a$ , $y = ab^x$ , $y = ae^{bx}$ .	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>III</b>	Correlation – Correlation Co efficient – Problems – Rank Correlation – Regression – Equation of Regression lines – Regression Coefficients – Angle between Regression lines.	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>IV</b>	Theory of Attributes – Positive class frequencies - Negative class frequencies – Ultimate class frequencies- Consistency of data – Independence and Association of data- Coefficient of Association- Coefficient of Colligation.	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>V</b>	Index Numbers- Aggregate Method- Average of Price relatives Method- Weighted Index numbers- Laspeyre’s Index numbers- Paasche’s Index numbers- Marshall – Edgeworth’s Index numbers- Bowley’s Index numbers- Fischer’s Index numbers- Kelly’s Index numbers- Ideal Index Numbers – Consumer price Index numbers	<b>15</b>	<b>Chalk &amp; Talk</b>

**Course Designed by: Dr.A.Hamari Choudhi & Dr.R.Bhavani**

**Learning Outcome Based Education & Assessment (LOBE)  
Formative Examination - Blue Print  
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Upto K4	2	K1&K2	1	K1	2 (K3&K3)	1 K4
AI	CO2	Upto K3	2	K1&K2	2	K2	2 (K2&K2)	1 K3
CI	CO3	Upto K4	2	K1&K2	1	K2	2(K3&K3)	1 K4
AII	CO4	Upto K4	2	K1&K2	2	K2	2(K3&K3)	1 K4
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

**Distribution of Marks with K Level CIA I & CIA II**

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	40
	K2	2	4	10		16	32	
	K3			10	10	20	40	40
	K4				10	10	20	20
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	40
	K2	2	4	10		16	32	
	K3			10		10	20	20
	K4				20	20	40	40
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5** will be allotted for individual Assignment which carries five marks as part of CIA component.

<b>Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)</b>								
S.No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	<b>Upto K4</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K1</b>	<b>2(K2&amp;K2)</b>	<b>1(K4)</b>
2	CO2	<b>Upto K3</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K1</b>	<b>2(K3&amp;K3)</b>	<b>1(K3)</b>
3	CO3	<b>Upto K4</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K2</b>	<b>2(K3&amp;K3)</b>	<b>1(K4)</b>
4	CO4	<b>Upto K4</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K2</b>	<b>2(K4&amp;K4)</b>	<b>1(K4)</b>
5	CO5	<b>Upto K3</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K2</b>	<b>2(K2&amp;K2)</b>	<b>1(K3)</b>
No. of Questions to be Asked			<b>10</b>		<b>5</b>		<b>10</b>	<b>5</b>
No. of Questions to be answered			<b>10</b>		<b>5</b>		<b>5</b>	<b>3</b>
Marks for each question			<b>1</b>		<b>2</b>		<b>5</b>	<b>10</b>
Total Marks for each section			<b>10</b>		<b>10</b>		<b>25</b>	<b>30</b>
<b>(Figures in parenthesis denotes, questions should be asked with the given K level)</b>								

<b>Distribution of Marks with K Level</b>							
<b>K Level</b>	<b>Section A (Multiple Choice Questions)</b>	<b>Section B (Short Answer Questions)</b>	<b>Section C (Either/ or Choice)</b>	<b>Section D ( Open Choice)</b>	<b>Total Marks</b>	<b>% of (Marks without choice)</b>	<b>Consolidated %</b>
K1	5	4			9	7.4	37.4
K2	5	6	20		36	30	
K3			20	20	40	33.3	33.3
K4			10	30	40	33.3	33.3
Marks	10	10	50	50	120	100	100
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.</b>							

Summative Examinations - Question Paper – Format

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K2	
20) b	CO5	K2	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K4	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K3	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	ASTRONOMY				
<b>Course Code</b>	21UMTE52	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	Elective	5	-	5	
<b>NATURE OF COURSE:</b>	<b>EMPLOYABILITY</b>	✓	SKILL ORIENTED	ENTREPRENURSHIP	
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To derive various results associated with planetary motion.</li> <li>• To list the types of calendars and discuss different time zone</li> <li>• To discuss the various characteristics of the moon</li> <li>• To know about the effects of dip on Earth</li> <li>• To understand the various systems of coordinates</li> </ul>					
<b>Unit: I</b>					<b>15</b>
Spherical trigonometry – formulae only – celestial sphere – diurnal motion – sidereal day – different systems of coordinates – equinoxes, solstices, apparent annual motion of the sun – ecliptic – latitude of a place – hour angle of a star at rising – circumpolar star.					
<b>Unit: II</b>					<b>15</b>
Earth – dip – definition and effects – twilight – duration					
<b>Unit: III</b>					<b>15</b>
Refraction – tangent and Cassini’s formula – effects of refraction on right ascension, declination, small vertical and horizontal arcs and on dip					
<b>Unit: IV</b>					<b>15</b>
Moon – Introduction – phases of moon – sidereal and synodic month-lunar day and lunar time –the tides.					
<b>Unit: V</b>					<b>15</b>
Eclipses – solar and lunar – occurrences – conditions for the occurrences – ecliptic limits – maximum and minimum number of eclipses in a year					
<b>Total Lecture Hours</b>					<b>75</b>
<b>Books for Study:</b>					
S.Kumaravelu and Susheela Kumaravelu, <b>Astronomy</b> , Reprinted, Sri Vishnu Arts, 2004.					
Unit I : Chapter 2;					
Unit II : Chapter 3;					

Unit III : Chapter 4;	
Unit IV: Chapter 12;	
Unit V : Chapter 13	
<b>Books for References:</b>	
1. Robert .H. Baker, <b>Introduction in Astronomy</b> , 6th Edition, D. Van Nostrand Company	
2. <b>Denison Olmsted</b> ,An Introduction to Astronomy,Collins & Brother, Publishers,Newyork.	
3. Pankaj Jain, <b>An Introduction to Astronomy and Astrophysics</b> , CRC Press, Taylor & Fransis,2015.	
<b>Web Resources</b>	
1. <a href="https://www.amazon.in/Introduction-Astronomy-Cosmology-Ian-Morison/dp/0470033347">https://www.amazon.in/Introduction-Astronomy-Cosmology-Ian-Morison/dp/0470033347</a>	
2. <a href="https://bookriot.com/astronomy-books-for-beginners/">https://bookriot.com/astronomy-books-for-beginners/</a>	
3. <a href="https://link.springer.com/book/9783662646366">https://link.springer.com/book/9783662646366</a>	
<b>COURSE OUTCOME</b>	<b>K Level</b>
<b>On the successful completion of the course, the students will be able to</b>	
<b>CO1:</b>	Sketch the various systems associated with celestial sphere <b>K3</b>
<b>CO2:</b>	Compute the duration of twilight on earth <b>K3</b>
<b>CO3:</b>	Analyze the refraction <b>K4</b>
<b>CO4:</b>	Explain the phases and tides of the moon <b>K4</b>
<b>CO5:</b>	find the number of occurrences of solar and lunar eclipses in a year and prove related results <b>K3</b>

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	1	1	2	3	2
CO 2	3	1	1	2	2	2
CO 3	3	1	1	2	2	2
CO 4	3	1	1	2	2	1
CO 5	3	1	1	2	2	2

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

UNIT	SUBJECT NAME	Hrs	Pedagogy
I	Spherical trigonometry – formulae only – celestial sphere – diurnal motion – sidereal day – different systems of coordinates – equinoxes, solstices, apparent annual motion of the sun – ecliptic – latitude of a place – hour angle of a star at rising – circumpolar star.	15	Chalk & Talk
II	Earth – dip – definition and effects – twilight – duration	15	Chalk & Talk
III	Refraction – tangent and Cassini’s formula – effects of refraction on right ascension, declination, small vertical and horizontal arcs and on dip	15	Chalk & Talk
IV	Moon – Introduction – phases of moon – sidereal and synodic month-lunar day and lunar time –the tides	15	Chalk & Talk
V	Eclipses – solar and lunar – occurrences – conditions for the occurrences – ecliptic limits – maximum and minimum number of eclipses in a year.	15	Chalk & Talk

Course Designed by: Mrs.S.Ragavi & Dr.P.Chitra devi

**Learning Outcome Based Education & Assessment (LOBE)  
Formative Examination - Blue Print  
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Upto K3	2	K1&K2	1	K1	2(K2&(K2))	1(K3)
AI	CO2	Upto K3	2	K1&K2	2	K2	2(K3&(K3))	1(K3)
CI	CO3	Upto K4	2	K1&K2	1	K2	2(K3&(K3))	1(K4)
AII	CO4	Upto K4	2	K1&K2	2	K2	2(K3&(K3))	1(K4)
Question Pattern CIA I & II	No. of Questions to be asked		4		3		4	2
	No. of Questions to be answered		4		3		2	1
	Marks for each question		1		2		5	10
	Total Marks for each section		4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	40
	K2	2	4	10		16	32	
	K3			10	20	30	60	60
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			20		20	40	40
	K4				20	20	40	40
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5** will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S. No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Up to K3	2	K1&K2	1	K1	2(K2&K2)	1(K3)
2	CO2	Up to K3	2	K1&K2	1	K1	2(K3&K3)	1(K3)
3	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
4	CO4	Up to K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
5	CO5	Up to K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

**Distribution of Marks with K Level**

<b>K Level</b>	<b>Section A (Multiple Choice Questions)</b>	<b>Section B (Short Answer Questions)</b>	<b>Section C (Either/ or Choice)</b>	<b>Section D ( Open Choice)</b>	<b>Total Marks</b>	<b>% of (Marks without choice)</b>	<b>Consolidated %</b>
K1	5	4			9	7.5	33.4
K2	5	6	20		31	25.9	
K3			30	30	60	50	50
K4				20	20	16.6	16.6
Marks	10	10	50	50	120	100	100

**NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.**

Summative Examinations - Question Paper – Format

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K3	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K3	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>OPTIMIZATION TECHNIQUES</b>				
<b>Course Code</b>	<b>21UMTE53</b>	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	<b>Elective</b>	5	-	5	
<b>NATURE OF COURSE:</b>	<b>EMPLOYABILITY</b>	✓	<b>SKILL ORIENTED</b>	<b>ENTREPRENURSHIP</b>	
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To solve games</li> <li>• To give the policy of equipment replacement</li> <li>• To learn various queue models</li> <li>• To determine EOQ of inventory problems</li> <li>• To calculate critical path and PERT</li> </ul>					
<b>Unit: I</b>					<b>15</b>
Markov Process- Introduction- State Transition Matrix – Transition Diagram – Construction of a State – Transition Matrix- n step Transition Probabilities					
<b>Unit: II</b>					<b>15</b>
Decision Analysis – Introduction – Decision making problems – Decision making process- Decision making environment- Decision under uncertainty- Decisions under risk.					
<b>Unit: III</b>					<b>15</b>
The inventory decisions – costs associated with inventories – factors affecting inventory control – economic order quantity (EOQ) – deterministic inventory problems with no shortages – deterministic inventory problem with shortages.					
<b>Unit: IV</b>					<b>15</b>
Queueing system – elements of queueing system – operating characteristics of queueing system – probability distribution in queueing systems – classification of queueing models – definition of transient and steady states – Poisson queueing system.					
<b>Unit: V</b>					<b>15</b>
Network and basic components – logical sequencing – rules of network construction – critical path analysis – probability consideration in PERT.					
<b>Total Lecture Hours</b>					<b>75</b>
<b>Books for Study:</b>					
Mohan, M., Swarup, K., and Gupta, P.K. (2003). <b>Operations Research</b> , New Delhi: Sultan Chand & Sons. Print.					
Unit I: Chapter: 15 (15.1 – 15.6)					
Unit II: Chapter 16 (16.1 – 16.6)					
Unit III: Chapter 19 (19.1-19.7),					
Unit IV: Chapter 20 (20.1 – 20.8).					
Unit V: Chapter 21 (21.1-21.6).					
<b>Books for References:</b>					
1. Gupta, P.K., Mohan, M. (2003). <b>Problems in Operations Research</b> , New Delhi: Sultan Chand & sons. Print.					
2. Hamdy, A.T. (1987), <b>Operations Research</b> , New York: Macmillan Publishing Company. Print					

3. P.Rama Murthy, **Operations Research**, New Age International Limited, Publishers,2007.

**Web Resources**

1. <https://youtu.be/2nYCpIoJi9E>
2. <https://www.bbau.ac.in/dept/UIET/EME-601%20Operation%20Research.pdf>
3. <https://easyengineering.net/operations-research-p-ramamurthy/>

COURSE OUTCOME		K Level
<b>On the successful completion of the course, the students will be able to</b>		
<b>CO1:</b>	identify the optimal strategies for the players in a two person zero sum game	<b>K2</b>
<b>CO2:</b>	justify the replacement of an equipment that deteriorates gradually	<b>K3</b>
<b>CO3:</b>	compare the various queueing situations	<b>K4</b>
<b>CO4:</b>	solve the inventory problems with and without the shortages	<b>K3</b>
<b>CO5:</b>	determine the minimum time for completion of projects	<b>K3</b>

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	3	2	3	1
CO 2	3	3	2	2	2	1
CO 3	3	3	3	2	3	1
CO 4	3	3	2	2	2	1
CO 5	3	3	3	2	3	1

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

<b>UNIT</b>	<b>SUBJECT NAME</b>	<b>Hrs</b>	<b>Pedagogy</b>
<b>I</b>	Two-person zero sum games – basic terms – maximin-minimax principle – games without saddle point – mixed strategies – graphic solution of 2 x n and m x 2 games – dominance property – general solution of m x n rectangular games.	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>II</b>	Replacement of equipment / asset that deteriorates gradually – replacement policy when value of money does not change with time – replacement policy when value of money changes with time.	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>III</b>	Queueing system – elements of queueing system – operating characteristics of queueing system – probability distribution in queueing systems – classification of queueing models – definition of transient and steady states – Poisson queueing system – Models: (M/M/1): (infinity/FIFO) – (M/M/1):(N/FIFO) – (M/M/C): (infinity/FIFO).	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>IV</b>	The inventory decisions – costs associated with inventories – factors affecting inventory control – economic order quantity (EOQ) – deterministic inventory problems with no shortages – deterministic inventory problem with shortages	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>V</b>	Network and basic components – logical sequencing – rules of network construction – critical path analysis – probability consideration in PERT. Experiential Learning: Problems involving PERT/CPM	<b>15</b>	<b>Chalk &amp; Talk</b>

**Course Designed by: Dr. M. Saravanan & Mrs. S. Ragavi**

**Learning Outcome Based Education & Assessment (LOBE)  
Formative Examination - Blue Print  
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Up to K2	2	K1&K2	1	K1	2(K2&(K2))	1(K2)
AI	CO2	Up to K3	2	K1&K2	2	K2	2(K3&(K3))	1(K3)
CI	CO3	Up to K4	2	K1&K2	1	K2	2(K3&(K3))	1(K4)
AI	CO4	Up to K3	2	K1&K2	2	K2	2(K3&(K3))	1(K3)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

**Distribution of Marks with K Level CIA I & CIA II**

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			20	10	30	60	60
	K4				10	10	20	20
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

<b>Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)</b>								
S.No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	<b>Upto K2</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K1</b>	<b>2(K2&amp;K2)</b>	<b>1(K2)</b>
2	CO2	<b>Upto K3</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K1</b>	<b>2(K3&amp;K3)</b>	<b>1(K3)</b>
3	CO3	<b>Upto K4</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K2</b>	<b>2(K3&amp;K3)</b>	<b>1(K4)</b>
4	CO4	<b>Upto K3</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K2</b>	<b>2(K3&amp;K3)</b>	<b>1(K3)</b>
5	CO5	<b>Upto K3</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K2</b>	<b>2(K2&amp;K2)</b>	<b>1(K3)</b>
No. of Questions to be Asked			<b>10</b>		<b>5</b>		<b>10</b>	<b>5</b>
No. of Questions to be answered			<b>10</b>		<b>5</b>		<b>5</b>	<b>3</b>
Marks for each question			<b>1</b>		<b>2</b>		<b>5</b>	<b>10</b>
Total Marks for each section			<b>10</b>		<b>10</b>		<b>25</b>	<b>30</b>
<b>(Figures in parenthesis denotes, questions should be asked with the given K level)</b>								

<b>Distribution of Marks with K Level</b>							
<b>K Level</b>	<b>Section A (Multiple Choice Questions)</b>	<b>Section B (Short Answer Questions)</b>	<b>Section C (Either/ or Choice)</b>	<b>Section D ( Open Choice)</b>	<b>Total Marks</b>	<b>% of (Marks without choice)</b>	<b>Consolidated %</b>
K1	5	4			9	7.5	41.7
K2	5	6	20	10	41	34.2	
K3			30	30	60	50	50
K4				10	10	8.3	8.3
Marks	10	10	50	50	120	100	100
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.</b>							

Summative Examinations - Question Paper – Format

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K2	
20) b	CO5	K2	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K3	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>NUMERICAL METHODS</b>				
<b>Course Code</b>	<b>21UMTE54</b>	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	<b>Elective</b>	5	-	5	
<b>NATURE OF COURSE:</b>	<b>EMPLOYABILITY</b>		<b>SKILL ORIENTED</b>		<b>ENTREPRENURSHIP</b>
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To develop the skills in solving algebraic, transcendental, difference equations.</li> <li>• To solve differential equations numerically.</li> <li>• To solve integral equations numerically.</li> <li>• To lay foundation of computational mathematics for post graduate courses.</li> <li>• To learn theory and applications of numerical methods in a large number.</li> </ul>					
<b>Unit: I</b>					<b>15</b>
Numerical solutions of Algebraic and Transcendental equations – Iteration method – Newton method of false positions – Solutions of Simultaneous linear equations- Gauss method – Gauss’ Jordan method – Iteration method –Gauss Jacobi method.					
<b>Unit: II</b>					<b>15</b>
Finite differences – Forward difference and backward differences – Finite differences - operators – relations – properties – Finding missing terms – Inverse operators.					
<b>Unit: III</b>					<b>15</b>
Interpolation and Newton’s forward and backward formulae – divided differences and properties – Newton’s divided differences formula – Gauss formula Sterling formula - Bessel formula – Laplace Everest’s formula - Lagrange formula – Simple problems – inverse interpolation using Lagrange formulation.					
<b>Unit: IV</b>					<b>15</b>
Numerical differentiation – Finding the first and second derivatives – Maximum and Minimum values of a function for a given data.					
<b>Unit: V</b>					<b>15</b>
Numerical Integration – Newton’s Cote’s formula – Trapezoidal Rule – Simpson’s one third rule – Simpson’s three eighth rule – Weddle’s rule.					
<b>Total Lecture Hours</b>					<b>75</b>
<b>Books for Study:</b>					
Dr. S. Arumugam, Thangapandi Issac and A.Somasundaram, <b>Numerical Analysis</b> , New Gamma Publications, Palayamkottai, Edition2006.					
Unit I - Chapter 1: Section 1.0, 1.2, 1.5 &					

Chapter 2: Section 2.0, 2.1, 2.4, 2.6

Unit II - Chapter 3: Section 3.1, 3.2

Unit III - Chapter 4: Section 4.0 to 4.6

Unit IV - Chapter 5: Section 5.1, 5.2 & 5.4

Unit V - Chapter 6: Section 6.0 to 6.6

**Books for References:**

1. Prasun KrNayak, **Numerical Analysis** (Theory and Application) ,Second Edition, Asian Books Private Limited, New Delhi,2012.
2. S.S Sastry, **Introductory Methods of Numerical Analysis**, ThirdEdition, Prentice Hall of India Pvt Ltd, New Delhi,1998.
3. Kandasamy, P. K. Thilagavathy, and K. Gunavathy - "**Numerical Methods**", S.Chand& Company Ltd., Edn. 2006.

**Web Resources**

1. <https://nptel.ac.in/courses/122/102/122102009/>
2. <https://nptel.ac.in/courses/111/107/111107105/>
3. [https://www.mathcity.org/ media/msc/notes/numerical-analysis-m-usman-hamid.pdf](https://www.mathcity.org/media/msc/notes/numerical-analysis-m-usman-hamid.pdf)

COURSE OUTCOME		K Level
<b>On the successful completion of the course, the students will be able to</b>		
<b>CO1:</b>	Solve transcendental equation by using various methods.	<b>K3</b>
<b>CO2:</b>	Apply difference operators for equal and unequal intervals	<b>K3</b>
<b>CO3:</b>	Construct the linear interpolation equations.	<b>K4</b>
<b>CO4:</b>	Apply numerical differentiation for finding maximum and minimum of a function	<b>K3</b>
<b>CO5:</b>	Analyse various rules in numerical integration	<b>K4</b>

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
<b>CO 1</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>1</b>
<b>CO 2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>
<b>CO 3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>1</b>
<b>CO 4</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>
<b>CO 5</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>1</b>

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

UNIT	SUBJECT NAME	Hrs	Pedagogy
I	Numerical solutions of Algebraic and Transcendental equations – Iteration method – Newton method of false positions – Solutions of Simultaneous linear equations- Gauss method – Gauss’ Jordan method – Iteration method –Gauss Jacobi method.	15	Chalk & Talk
II	Finite differences – Forward difference and backward differences – Finite differences - operators – relations – properties – Finding missing terms – Inverse operators.	15	Chalk & Talk
III	Interpolation and Newton’s forward and backward formulae – divided differences and properties – Newton’s divided differences formula – Gauss formula Sterling formula - Bessel formula – Laplace Everest’s formula - Lagrange formula – Simple problems – inverse interpolation using Lagrange formulation.	15	Chalk & Talk
IV	Numerical differentiation – Finding the first and second derivatives – Maximum and Minimum values of a function for a given data.	15	Chalk & Talk
V	Numerical Iteration – Newton’s Cote’s formula – Trapezoidal Rule – Simpson’s one third rule – Simpson’s three eighth rule – Weddle’s rule .	15	Chalk & Talk

**Course Designed by: Dr. M.Saravanan & Mrs. S. Ragavi**

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Up to K3	2	K1&K2	1	K1	2(K3&K3)	1 (K3)
AI	CO2	Up to K3	2	K1&K2	2	K2	2(K2&K2)	1(K3)
CI	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
AII	CO4	Up to K3	2	K1&K2	2	K2	2(K2&K2)	1 (K3)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	40
	K2	2	4	10		16	32	
	K3			10	20	30	60	60
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	40
	K2	2	4	10		16	32	
	K3			10	10	20	40	40
	K4				10	10	20	20
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5** will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S. No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Up to K3	2	K1&K2	1	K1	2(K2&K2)	1(K3)
2	CO2	Up to K3	2	K1&K2	1	K1	2(K3&K3)	1(K3)
3	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
4	CO4	Up to K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
5	CO5	Up to K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

**Distribution of Marks with K Level**

<b>K Level</b>	<b>Section A (Multiple Choice Questions)</b>	<b>Section B (Short Answer Questions)</b>	<b>Section C (Either/ or Choice)</b>	<b>Section D ( Open Choice)</b>	<b>Total Marks</b>	<b>% of (Marks without choice)</b>	<b>Consolidated %</b>
K1	5	4			9	7.5	33.4
K2	5	6	20		31	25.9	
K3			30	30	60	50	50
K4				20	20	16.6	16.6
Marks	10	10	50	50	120	100	100

**NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.**

**Summative Examinations - Question Paper – Format**

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K2	
19) b	CO4	K2	
20) a	CO5	K3	
20) b	CO5	K3	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K3	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K4	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>MATHEMATICAL MODELING</b>				
<b>Course Code</b>	<b>21UMTE55</b>	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	<b>Elective</b>	5	-	5	
<b>NATURE OF COURSE:</b>	<b>EMPLOYABILITY</b>	✓	<b>SKILL ORIENTED</b>	<b>ENTREPRENURSHIP</b>	
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• .To understand basic definitions from mathematical modeling through ordinary differential equations of first order</li> <li>• To understand simple models through difference equations</li> <li>• To know simple models through difference equations</li> <li>• To apply problems in Economics , Finance, Genetics, etc.,</li> <li>• To learn models in Graphs</li> </ul>					
<b>Unit: I</b>					<b>15</b>
First Order Differential Equations in Mathematical Modeling: Through Ordinary Differential Equations of First Order- Linear Growth and Decay Models –Non-Linear Growth and Decay Models– Compartment Models.					
<b>Unit: II</b>					<b>15</b>
Geo metrical Problems: Mathematical Modeling through Systems of Ordinary Differential Equations of First Order: Dynamic problems – Geometrical problems- Population Dynamics – Epidemics – Compartment Models.					
<b>Unit: III</b>					<b>15</b>
Applications: Mathematical Modeling through Systems of Ordinary Differential Equations of First Order in Economics – Medicine, Arms Race, Battles and International Trade– Dynamics.					
<b>Unit: IV</b>					<b>15</b>
Mathematical Modeling through Difference Equations: Simple Models – Basic Theory of Linear Difference Equations with Constant Coefficients– Economics and Finance– Population Dynamics and Genetics.					
<b>Unit: V</b>					<b>15</b>
Mathematical Modeling: Mathematical Modeling through Graphs: Solutions that can be modeled through Graphs –Mathematical Modeling in Terms of Directed Graphs, Signed Graphs, Weighted Digraphs and Un oriented Graphs.					
<b>Total Lecture Hours</b>					<b>75</b>
<b>Books for Study:</b>					
Kapur, J.N., “ <b>Mathematical Modelling</b> ”, Wiley Eastern Limited, New Delhi, 1988.					
Unit 1: Chap 2, Sec2.1– 2.4					

Unit 2: Chap 2, Sec2.5–2.6 Chap3, Sec3.1 – 3.3

Unit 3: Chap 3, Sec3.4–3.6

Unit 4: Chap 5, Sec5.1–5.5

Unit 5: Chap 7, Sec7.1–7.5

**Books for References:**

1. Kapur J.N., **Mathematical Models in biology and Medicine**—, EWP, New Delhi, 1985.
2. Michael Alder, **An Introduction to Mathematical Modeling**, Heaven for Books.com, 2001
3. Frank R. Giordano, Maurice D. Weir and William P. Fox, **A First Course in Mathematical Modeling**, Thomson Learning, London and New York, 2003.

**Web Resources**

1. <https://www.pdfdrive.com/mathematical-modeling-handbook-e6506152.html>
2. <https://repository.ung.ac.id/get/kms/16993/referensi-mata-kuliah-an-introduction-to-mathematical-modelling.pdf>
3. <https://www.math.colostate.edu/~gerhard/MATH331/331book.pdf>

COURSE OUTCOME		K Level
<b>On the successful completion of the course, the students will be able to</b>		
<b>CO1:</b>	Explain various Growth & Decay and Compartment models	<b>K2</b>
<b>CO2:</b>	Solve geometric problems	<b>K3</b>
<b>CO3:</b>	Apply mathematical modeling through ordinary differential equations of first order to applications	<b>K3</b>
<b>CO4:</b>	Choose models for various fields like economics, Genetics, etc.,	<b>K3</b>
<b>CO5:</b>	Analyse models through Graphs	<b>K4</b>

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
<b>CO 1</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>
<b>CO 2</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>
<b>CO 3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>
<b>CO 4</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>
<b>CO 5</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

<b>UNIT</b>	<b>SUBJECT NAME</b>	<b>Hrs</b>	<b>Pedagogy</b>
<b>I</b>	First Order Differential Equations in Mathematical Modeling: Through Ordinary Differential Equations of First Order- Linear Growth and Decay Models –Non-Linear Growth and Decay Models–Compartment Models	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>II</b>	Geometrical Problems: Mathematical Modeling through Systems of Ordinary Differential Equations of First Order: Dynamic problems – Geometrical problems- Population Dynamics – Epidemics – Compartment Models	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>III</b>	Mathematical Modeling through Systems of Ordinary Differential Equations of First Order in Economics – Medicine, Arms Race, Battles and International Trade– Dynamics.	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>IV</b>	Mathematical Modeling through Difference Equations: Simple Models – Basic Theory of Linear Difference Equations with Constant Coefficients– Economics and Finance– Population Dynamics and Genetics.	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>V</b>	Mathematical Modeling: Mathematical Modeling through Graphs: Solutions that can be modeled through Graphs –Mathematical Modeling in Terms of Directed Graphs, Signed Graphs, Weighted Digraphs and Unoriented Graphs	<b>15</b>	<b>Chalk &amp; Talk</b>

**Course Designed by: Mrs. R. Sumathi & Dr .M. Saravanan**

**Learning Outcome Based Education & Assessment (LOBE)  
Formative Examination - Blue Print  
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Up to K2	2	K1&K2	1	K1	2(K2&K2)	1(K2)
AI	CO2	Up to K3	2	K1&K2	2	K2	2(K3&K3)	1(K3)
CI	CO3	Up to K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
AII	CO4	Up to K3	2	K1&K2	2	K2	2(K3&K3)	1(K3)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

**Distribution of Marks with K Level CIA I & CIA II**

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	40
	K2	2	4	10		16	32	
	K3			10	20	30	60	60
	K4							
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

<b>Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)</b>								
S. No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Up to K2	2	K1&K2	1	K1	2(K2&K2)	1(K2)
2	CO2	Up to K3	2	K1&K2	1	K1	2(K3&K3)	1(K3)
3	CO3	Up to K3	2	K1&K2	1	K2	2(K3&K3)	1(K3)
4	CO4	Up to K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
5	CO5	Up to K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

<b>Distribution of Marks with K Level</b>							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D ( Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	41.7
K2	5	6	20	10	41	34.2	
K3			30	30	60	50	50
K4				10	10	8.3	8.3
Marks	10	10	50	50	120	100	100
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.</b>							

Summative Examinations - Question Paper – Format

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K2	
19) b	CO4	K2	
20) a	CO5	K3	
20) b	CO5	K3	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K3	
25	CO5	K4	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>COMBINATORICS</b>				
<b>Course Code</b>	21UMTE56	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	Elective	5	-	5	
<b>NATURE OF COURSE:</b>	<b>EMPLOYABILITY</b> ✓	SKILL ORIENTED		ENTREPRENURSHIP	
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To demonstrate effectively the addition and multiplication principles</li> <li>• To use generating functions</li> <li>• To model recurrence relations using different techniques for real time counting problems</li> <li>• To know various special counting numbers</li> <li>• To design a new counting principle called inclusion and exclusion principle</li> </ul>					
<b>Unit: I</b>					<b>15</b>
Two basic principles – Simple arrangement and selections with or without repetition – Distributions – Binomial coefficients.					
<b>Unit: II</b>					<b>15</b>
Generating functions - Calculating coefficients of generating functions – Exponential generating function – Summation method – Partitions.					
<b>Unit: III</b>					<b>15</b>
Recurrence relations – Divide and conquer relations – Dearrangement – Solution of linear recurrence relation.					
<b>Unit: IV</b>					<b>15</b>
Fibonacci number - Stirling number of first and second kind – Catalan number– Ménage number.					
<b>Unit: V</b>					<b>15</b>
Inclusion and Exclusion principle – Pigeon hole principle – Ramsey theorem					
<b>Total Lecture Hours</b>					<b>75</b>
<b>Books for Study:</b>					
1. Tucker A.W., <b>Applied Combinatorics</b> , Wiley, 2011.					
2. Schaum’s outline series, <b>Combinatorics</b> , Tata McGraw-Hill Publishing Company Ltd 2005. Unit Unit1: Chapter 5 Unit 2: Chapter 6 Unit 3: Chapter 7(sec 7.1 - 7.3). Unit 4: Chapter 8(sec 8.1, 8.2 and Appendix A4). Unit5: Chapter 1(sec 1.112, 1.114, 1.132, 1.134, 1.146, 1.147, 1.148, 1.149, 1.150), Chapter 2 (sec 2.73), Chapter 3 (sec 3.64)					
<b>Books for References:</b>					
1. Cohen D., <b>Combinatorics</b> , Wiley, 1978.					
2. Hall M., <b>Combinatorial Mathematics</b> , McGraw Hill, 1968.					

3. Liu C.L., **Introduction to Combinatorial Mathematics**, McGraw-Hill, Newyork, 1994.

**Web Resources**

1. <https://users.math.msu.edu/users/bsagan/Books/Aoc/final.pdf>
2. [https://www.whitman.edu/mathematics/cgt\\_online/cgt.pdf](https://www.whitman.edu/mathematics/cgt_online/cgt.pdf)
3. <https://newsite.kashanu.ac.ir/Files/IntroductoryCombinatorics.pdf>

COURSE OUTCOME		K Level
<b>On the successful completion of the course, the students will be able to</b>		
<b>CO1:</b>	Use addition and multiplication principles for counting	<b>K2</b>
<b>CO2:</b>	Solve problems by partition	<b>K3</b>
<b>CO3:</b>	Find solutions of real time counting problems	<b>K3</b>
<b>CO4:</b>	outline special counting numbers such as Fibonacci number, Stirling numbers, catalan number and Menage number	<b>K4</b>
<b>CO5:</b>	Solve problems by Inclusion and Exclusion principle	<b>K3</b>

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	2	2	2
CO 2	3	2	3	2	2	2
CO 3	3	2	3	2	2	2
CO 4	3	2	3	2	2	1
CO 5	3	2	3	2	2	1

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

UNIT	SUBJECT NAME	Hrs	Pedagogy
<b>I</b>	Two basic principles – Simple arrangement and selections with or without repetition – Distributions – Binomial coefficients	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>II</b>	Generating functions - Calculating coefficients of generating functions – Exponential generating function – Summation method – Partitions	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>III</b>	Recurrence relations – Divide and conquer relations – Dearrangement – Solution of linear recurrence relation	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>IV</b>	Fibonacci number - Stirling number of first and second kind – Catalan number– Ménage number.	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>V</b>	Inclusion and Exclusion principle – Pigeon hole principle – Ramsey theorem	<b>15</b>	<b>Chalk &amp; Talk</b>

**Course Designed by: Dr.A.Hamari Choudhi & Mrs.R.Sumathi**

**Learning Outcome Based Education & Assessment (LOBE)  
Formative Examination - Blue Print  
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Up to K2	2	K1&K2	1	K1	2(K2&K2)	1(K2)
AI	CO2	Up to K3	2	K1&K2	2	K2	2(K3&K3)	1(K3)
CI	CO3	Up to K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
AII	CO4	Up to K4	2	K1&K2	2	K2	2(K3&K3)	1(K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

**Distribution of Marks with K Level CIA I & CIA II**

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	40
	K2	2	4	10		16	32	
	K3			10	10	20	40	40
	K4				10	10	20	20
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

<b>Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)</b>								
S.No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Up to K2	2	K1&K2	1	K1	2(K2&K2)	1(K2)
2	CO2	Up to K3	2	K1&K2	1	K1	2(K3&K3)	1(K3)
3	CO3	Up to K3	2	K1&K2	1	K2	2(K3&K3)	1(K3)
4	CO4	Up to K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
5	CO5	Up to K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

<b>Distribution of Marks with K Level</b>							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	41.7
K2	5	6	20	10	41	34.2	
K3			30	30	60	50	50
K4				10	10	8.3	8.3
Marks	10	10	50	50	120	100	100
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.</b>							

Summative Examinations - Question Paper – Format

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K2	
20) b	CO5	K2	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K3	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>R LANGUAGE - LAB</b>				
<b>Course Code</b>	<b>21UMTSP2</b>	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	Skill	-	2	2	
<b>NATURE OF COURSE:</b>	<b>EMPLOYABILITY</b>	✓	<b>SKILL ORIENTED</b>	✓	<b>ENTREPRENURSHIP</b>

**COURSE OBJECTIVES:**

- To Install and use R for simple programming
- To Exercise the fundamentals of statistical analysis in R environment
- To analyse data for the purpose of exploration using Descriptive and Inferential Statistics
- To visualize data in R
- To develop program in R

List of Programs:

1. Write a program to find list of even numbers from 1 to n using R-Loops.
2. Write a program to find mean and standard deviation.
3. Write a program to find factorial of a given number.
4. Write a program to find the sum of the first 100 natural numbers.
5. Write a program to add and multiply two matrices.
6. Write a program to create a function to print squares of numbers in sequence.
7. Write a program to join columns and rows in a data frame using cbind() and rbind() in R.
8. Write a program to implement different String Manipulation functions in R.
9. Write a program to implement different data structures in R (Vectors, Lists, Data Frames)
10. Write a program to read a csv file and analyze the data in the file in R.
11. Create pie chart and bar chart using R.
12. Create a data set and do statistical analysis on the data using R.

Books for Study:

1. Norman Matloff, The Art of R Programming, UC Davis 2009
2. R for Everyone, Lander, Pearson.

**Books for References:**

Paul Murrell, R Graphics, Chapman & Hall/CRC, 2006

**Web Resources**

1. <https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf>
2. [https://onlinecourses.nptel.ac.in/noc19\\_ma33/preview](https://onlinecourses.nptel.ac.in/noc19_ma33/preview)
3. [https://onlinecourses.nptel.ac.in/noc21\\_ma75/preview](https://onlinecourses.nptel.ac.in/noc21_ma75/preview)

<b>COURSE OUTCOME</b>		<b>K Level</b>
<b>On the successful completion of the course, the students will be able to</b>		
<b>CO1:</b>	Use R software for simple programming	<b>K3</b>
<b>CO2:</b>	Manipulate data in efficient way using appropriate techniques	<b>K3</b>
<b>CO3:</b>	Develop programs using add-on packages	<b>K3</b>
<b>CO4:</b>	Analyze data sets using R – programming capabilities	<b>K4</b>
<b>CO5:</b>	Use R Graphics to visualize the result obtained from statistical operations	<b>K3</b>

**CO & PO Mapping:**

<b>COS</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>
<b>CO 1</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>
<b>CO 2</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>2</b>
<b>CO 3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>
<b>CO 4</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>
<b>CO 5</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**Course Designed by: Mrs. R. Sumathi & Dr. R. Bhavani**

# SIXTH SEMESTER



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>COMPLEX ANALYSIS</b>				
<b>Course Code</b>	<b>21UMTC61</b>	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	Core	6	-	4	
<b>NATURE OF COURSE:</b>	EMPLOYABILITY	<b>SKILL ORIENTED</b>	✓	ENTREPRENURSHIP	
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To illustrate the Cauchy-Riemann Equations and various functions</li> <li>• To relate different types of transformations</li> <li>• To apply Cauchy’s Integral formula in Maximum modulus theorem.</li> <li>• To introduce the Taylor’s, Laurent’s series and singularities</li> <li>• To evaluate the definite integrals using residue theorem</li> </ul>					
<b>Unit: I</b>					<b>18</b>
Continuous functions – Differentiability – Cauchy-Riemann Equations – Alternative forms of Cauchy-Riemann equations – Analytic functions – Harmonic functions –Milne-Thompson method.					
<b>Unit: II</b>					<b>18</b>
Elementary transformations: translation, rotations, magnification, inversion – Bilinear Transformation – Cross ratio – Fixed points –Some Special Bilinear Transformation.					
<b>Unit: III</b>					<b>18</b>
Cauchy’s Theorem– Cauchy’s Integral formula -Maximum modulus theorem –Higher derivatives.					
<b>Unit: IV</b>					<b>18</b>
Taylor’s series – Maclaurin’s series – Laurent’s series – Zeros – Singularities – types of singularities – Meromorphic function.					
<b>Unit: V</b>					<b>18</b>
Residues – Cauchy’s residue theorem – Evaluation of definite integrals of standard types – Jordan’s lemma (without proof).					
<b>Total Lecture Hours</b>					<b>90</b>
<b>Books for Study:</b>					
S. Arumugam, A. Thangapandi Isaac and A. Somasundaram, <b>Complex Analysis</b> , Scitech publications, 2019.					

Unit – I: Chapter 2: Section 2.4 to section 2.8

Unit – II: Chapter 3: Section 3.0 to section 3.5

Unit – III: Chapter 6: Section 6.2 to 6.4

Unit IV: Chapter 7

Unit – V: Chapter 8

**Books for References:**

1. S.Ponnusamy, **Foundations of Complex Analysis**, Narosa Publishing House, New Delhi. 2000.
2. L.V Ahlfors, **Complex Analysis**, McGraw Hill Co., New York,1988.
3. Churchill.R.V.and J.W. Brown - "**Complex variables and Applications**" - Fourth Edition - McGraw Hill International Editions.

**Web Resources**

1. <https://nptel.ac.in/courses/111/105/111105035/>
2. <https://nptel.ac.in/courses/111/103/111103070/>
3. <https://www.iitg.ac.in/physics/fac/charu/courses/ph503/book.pdf>

COURSE OUTCOME		K Level
On the successful completion of the course, the students will be able to		
<b>CO1:</b>	Discuss the basic concepts of analytic function with Cauchy Riemann Equations and their properties	<b>K2</b>
<b>CO2:</b>	Apply the bilinear Transformation as composition of elementary transformation.	<b>K3</b>
<b>CO3:</b>	Use Cauchy’s Integral formula and its consequences in theoretical proofs	<b>K3</b>
<b>CO4:</b>	Explain the basic properties of singularities poles, convergence of power series.	<b>K4</b>
<b>CO5:</b>	Evaluate definite integrals of standard types in complex integration	<b>K4</b>

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	2	3	2	1	2
CO 2	3	3	3	2	2	1
CO 3	3	3	2	3	2	2
CO 4	3	3	3	2	2	1
CO 5	3	3	3	2	3	1

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

UNIT	SUBJECT NAME	Hrs	Pedagogy
I	Continuous functions – Differentiability – Cauchy-Riemann Equations – Alternative forms of Cauchy-Riemann equations – Analytic functions – Harmonic functions –Milne-Thompson method.	18	Chalk & Talk
II	Elementary transformations: translation, rotations, magnification, inversion – Bilinear Transformation – cross ratio – Fixed points. –Some Special Bilinear Transformation.	18	Chalk & Talk
III	Cauchy’s Integral formula – Maximum modulus theorem –Higher derivatives.	18	Chalk & Talk
IV	Taylor’s series – Maclaurin’s series – Laurent’s series – Zeros – Singularities – types of singularities – meromorphic function.	18	Chalk & Talk
V	Residues – Cauchy’s residue theorem – Evaluation of definite integrals of standard types – Jordan’s lemma (without proof).	18	Chalk & Talk

Course Designed by: Dr. R. Bhavani & Dr. A. Arivu Chelvam

**Learning Outcome Based Education & Assessment (LOBE)  
Formative Examination - Blue Print  
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K – Level	No. of Questions	K - Level		
CI	CO1	Upto K2	2	K1&K2	1	K1	2(K2&K2)	1(K2)
AI	CO2	Upto K3	2	K1&K2	2	K2	2(K3&K3)	1(K3)
CI	CO3	Upto K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
AII	CO4	Upto K4	2	K1&K2	2	K2	2(K3&K3)	1(K4)
Question Pattern CIA I & II	No. of Questions to be asked		4		3		4	2
	No. of Questions to be answered		4		3		2	1
	Marks for each question		1		2		5	10
	Total Marks for each section		4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	40
	K2	2	4	10		16	32	
	K3			10	10	20	40	40
	K4				10	10	20	20
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5** will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S. No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Up to K2	2	K1&K2	1	K1	2(K2&K2)	1(K2)
2	CO2	Up to K3	2	K1&K2	1	K1	2(K3&K3)	1(K3)
3	CO3	Up to K3	2	K1&K2	1	K2	2(K3&K3)	1(K3)
4	CO4	Up to K4	2	K1&K2	1	K2	2(K4&K4)	1(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D ( Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	33.3
K2	5	6	10	10	31	25.8	
K3			30	20	50	41.7	41.7
K4			10	20	30	25	25
Marks	10	10	50	50	120	100	100
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.</b>							

Summative Examinations - Question Paper – Format

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K3	
20) b	CO5	K3	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>GRAPH THEORY AND ITS APPLICATIONS</b>				
<b>Course Code</b>	<b>21UMTC62</b>	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	Core	6	-	4	
<b>NATURE OF COURSE:</b>	<b>EMPLOYABILITY</b>		<b>SKILL ORIENTED</b>		<b>ENTREPRENURSHIP</b>
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>▪ To define basic notions in graph theory.</li> <li>▪ To formulate and prove basic theorems about trees, matching, connectivity, colouring and planar graphs.</li> <li>▪ To determine whether the graph is Hamiltonian or Eulerian.</li> <li>▪ To apply the concepts of graph theory in practical problems.</li> <li>▪ To find chromatic polynomial of the graph.</li> </ul>					
<b>Unit: I</b>					<b>18</b>
Graphs- Degrees – Sub graphs, Isomorphism, Ramsey numbers – Independent sets and Coverings –Matrices of graphs - Operation on graphs.					
<b>Unit: II</b>					<b>18</b>
Walks, Trials and Paths – Connectedness and Components – Blocks- Connectivity.					
<b>Unit: III</b>					<b>18</b>
Eulerian graphs – Hamiltonian graphs – Trees – Characterization of trees – Centre of a tree					
<b>Unit: IV</b>					<b>18</b>
Matching – Matching in bipartite graphs - Planar graph and properties – Characterization of Planar graphs.					
<b>Unit: V</b>					<b>18</b>
Chromatic number and Chromatic index – Applications – Connector Problem – Shortest Path Problem.					
<b>Total Lecture Hours</b>					<b>90</b>
<b>Books for Study:</b>					
Dr. S. Arumugam and S. Ramachandran, <b>Invitation to Graph Theory</b> , Scitech Publication, Chennai, 2015.					
UnitI - Chapter 2: Section 2.1 to 2.6 & 2.8 to 2.9					
UnitII - Chapter 4					
UnitIII- Chapter 5, 6					
UnitIV- Chapter 7 & 8					

UnitV - Chapter9: Section 9.1 & Chapter 11: Section 11.1 & 11.2

**Books for References:**

1. Harary, Graph Theory, Narosa Publishing House, New Delhi,2001.
2. S.K.Yadav, Elements of Graph Theory, Ane Books Private Ltd, New Delhi,2010.
3. Narasingh Deo – Graph theory with application to engineering and computer science, Prentice – Hall of india pvt. Ltd., NewDelhi.

**Web Resources**

1. <https://nptel.ac.in/courses/111/106/111106102/>
2. <https://www.digimat.in/nptel/courses/video/106104170/L19.html>
3. [https://books.google.co.in/books?id=ToHHwAEACAAJ&dq=graph+theory++notes&hl=en&newbks=1&newbks\\_redir=1&sa=X&ved=2ahUKEwi85pDa0-v7AhWPAogKHVoCCm4Q6AF6BAgDEAI](https://books.google.co.in/books?id=ToHHwAEACAAJ&dq=graph+theory++notes&hl=en&newbks=1&newbks_redir=1&sa=X&ved=2ahUKEwi85pDa0-v7AhWPAogKHVoCCm4Q6AF6BAgDEAI)

COURSE OUTCOME		K Level
<b>On the successful completion of the course, the students will be able to</b>		
<b>CO1:</b>	Explain the basic concepts in Graph theory	<b>K4</b>
<b>CO2:</b>	Analyse the connectedness of graphs	<b>K4</b>
<b>CO3:</b>	Construct the logical arguments to prove results involving Eulerian graphs, Hamiltonian graphs and Trees	<b>K3</b>
<b>CO4:</b>	Develop proof for theorems in Matching and Planar graphs	<b>K3</b>
<b>CO5:</b>	Apply the appropriate models of graph theory in real life problems	<b>K3</b>

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
<b>CO 1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>
<b>CO 2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>
<b>CO 3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>
<b>CO 4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>
<b>CO 5</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

UNIT	SUBJECT NAME	Hrs	Pedagogy
I	Graphs- Degrees – Sub graphs, Isomorphism, Ramsey numbers – Independent sets and Coverings –Matrices of graphs - Operation on graphs.	18	Chalk & Talk
II	Walks, Trials and Paths – Connectedness and Components – Blocks- Connectivity.	18	Chalk & Talk
III	Eulerian graphs – Hamiltonian graphs – Trees – Characterization of trees – Centre of a tree	18	Chalk & Talk
IV	Matching – Matching in bipartite graphs - Planar graph and properties – Characterization of Planar graphs.	18	Chalk & Talk
V	Chromatic number and Chromatic index – Applications – Connector Problem – Shortest Path Problem.	18	Chalk & Talk

**Course Designed by: Dr.S.Andal & Dr.P.Chitra Devi**

**Learning Outcome Based Education & Assessment (LOBE)  
Formative Examination - Blue Print  
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of. Questions	K - Level	No. of. Questions	K - Level		
CI	CO1	Upto K4	2	K1&K2	1	K1	2(K3&K3)	1(K4)
AI	CO2	Upto K4	2	K1&K2	2	K2	2(K3&K3)	1(K4)
CI	CO3	Upto K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
AII	CO4	Upto K3	2	K1&K2	2	K2	2(K3&K3)	1(K3)
<b>Question Pattern CIA I &amp; II</b>		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			20		20	40	40
	K4				20	20	40	40
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	40
	K2	2	4	10		16	32	
	K3			10	20	30	60	60
	K4							
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5** will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S. No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K4	2	K1&K2	1	K1	2(K3&K3)	1(K4)
2	CO2	Upto K4	2	K1&K2	1	K1	2(K2&K2)	1(K4)
3	CO3	Upto K3	2	K1&K2	1	K2	2(K3&K3)	1(K3)
4	CO4	Upto K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
5	CO5	Upto K3	2	K1&K2	1	K2	2(K3&K3)	1(K3)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

**Distribution of Marks with K Level**

<b>K Level</b>	<b>Section A (Multiple Choice Questions)</b>	<b>Section B (Short Answer Questions)</b>	<b>Section C (Either/ or Choice)</b>	<b>Section D ( Open Choice)</b>	<b>Total Marks</b>	<b>% of (Marks without choice)</b>	<b>Consolidated %</b>
K1	5	4			9	7.5	33.3
K2	5	6	20		31	25.8	
K3			30	30	60	50	50
K4				20	20	16.7	16.7
Marks	10	10	50	50	120	100	100

**NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.**

Summative Examinations - Question Paper – Format

<b>Section A (Multiple Choice Questions)</b>			
Answer All Questions			(10x1=10 marks)
Q. No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
Answer All Questions			(5x2=10 marks)
Q. No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
Answer All Questions			(5 x 5 = 25 marks)
Q. No	CO	K Level	Questions
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K2	
19) b	CO4	K2	
20) a	CO5	K3	
20) b	CO5	K3	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
Answer Any Three questions			(3x10=30 marks)
Q. No	CO	K Level	Questions
21	CO1	K4	
22	CO2	K4	
23	CO3	K3	
24	CO4	K3	
25	CO5	K3	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>PROJECT AND VIVA - VOCE</b>			
<b>Course Code</b>	<b>21UMTPR1</b>	<b>L</b>	<b>P</b>	<b>C</b>
<b>Category</b>	<b>Project</b>	6	-	4
<b>Nature of course:</b>	<b>EMPLOYABILITY</b>	<b>SKILL ORIENTED</b>	ENTREPRENURSHIP	

**Course Objectives:**

- To identify, describe the problem and scope of project
- To collect, analyse and present data into significant form using appropriate tools
- To choose, plan and implement a proper approach in problem solving
- To work with team and ethically
- To present the findings in both oral and written form

**Course Description**

The Project is conducted by the following Course Pattern.

**Internal**

Presentation	}	<b>40</b>
Submission		

**External**

Project Report	}	<b>60</b>
Viva Voce		

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<b>Total</b>	<b>- 100</b>
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COURSE OUTCOMES		
On the successful completion of the course , the students will be able to		
<b>CO1:</b>	Apply the skill of presentation and communication techniques	K3
<b>CO2:</b>	Motive as an individual or in a team in development of projects.	K4
<b>CO3:</b>	Analyze the available resources and to select most appropriate one	K4
<b>CO4:</b>	Make use of the fundamentals of Mathematics to search the related literature survey	K3
<b>CO5:</b>	Explain the real life problems by using Mathematics and its Application.	K4

**Course Designed by:**

**Dr. A. Hamari Choudhi**, Head & Associate Professor & **Dr. R. Bhavani** Assistant Professor

**CO & PO Mappings:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
<b>CO 1</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>3</b>
<b>CO 2</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>1</b>
<b>CO 3</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>1</b>
<b>CO 4</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>2</b>
<b>CO 5</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>STATISTICS – II</b>				
<b>Course Code</b>	<b>21UMTE61</b>	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	Elective	5	-	5	
<b>NATURE OF COURSE:</b>	<b>EMPLOYABILITY</b> ✓	<b>SKILL ORIENTED</b>		<b>ENTREPRENURSHIP</b>	
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• Remember and understanding of statistics and data analysis</li> <li>• Apply various types of distribution</li> <li>• Analyze statistical techniques to interpret the data</li> <li>• Evaluate problems on test of significance and probability functions</li> <li>• Create sampling development and scientific attitude through Statistics</li> </ul>					
<b>Unit: I</b>					<b>15</b>
Theory of probability – Sample space – Probability function – Conditional probability – Boole’s inequality –Baye’s theorem – Problems.					
<b>Unit: II</b>					<b>15</b>
Random variables – Distribution function – Discrete and Continuous random variables – Probability density function – Mathematical expectation(one dimensional only).					
<b>Unit: III</b>					<b>15</b>
Moment generating function – Cumulants – Characteristic function- Theoretical distribution – Binomial – Poisson –Normal					
<b>Unit: IV</b>					<b>15</b>
Test of significance of large samples.					
<b>Unit: V</b>					<b>15</b>
Test of significance of small samples – t-test, F-test and Chi-square test					
<b>Total Lecture Hours</b>					<b>75</b>
<b>Books for Study:</b>					
Dr.S.Arumugam and Isaac, <b>Statistics</b> , New Gamma Publications, Palayamkottai, Reprint 2012.					
UnitI      - Chapter11 UnitII     -Chapter12: Section 12.1 to12.4 UnitIII    -Chapter12: Section 12.5- 12.6 &Chapter13 UnitIV     - Chapter14 UnitV      - Chapter 15,16					

**Books for References:**

1. T. Sankara Narayanan and A.Mangaldoss, **Statistics and its Application**, Preist Publications, New Delhi, 1994.
2. R.S.N.Pillai and Bagavathi, **Practical Statistics**, ,S.Chand and Company Pvt Ltd, New Delhi, 1987.
3. Bhat B.R, Srivenkataramana T and Rao Madhava K.S.(1996): **Statistics: A Beginners Text**, Vol. I, New Age International (P)Ltd.

**Web Resources**

- 1.<https://nptel.ac.in/courses/111/102/111102012/>
- 2.<https://nptel.ac.in/courses/111/104/111104027/>
3. <https://www.hamilton.ie/ollie/Downloads/ProbMain.pdf>

COURSE OUTCOME		K Level
<b>On the successful completion of the course, the students will be able to</b>		
<b>CO1:</b>	Apply the basic concepts of probability in problem solving.	<b>K3</b>
<b>CO2:</b>	Compute mathematical expectation for discrete and continuous random variables	<b>K3</b>
<b>CO3:</b>	Compute the MGF of Binomial, Poisson and Normal distribution	<b>K3</b>
<b>CO4:</b>	Analyze test of significances of large samples.	<b>K4</b>
<b>CO5:</b>	Analyze test of significances of small samples and chi-square distribution.	<b>K4</b>

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	3	2	1
CO 2	3	3	2	3	3	1
CO 3	3	3	3	3	2	2
CO 4	3	3	2	3	3	3
CO 5	3	3	3	3	3	3

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

UNIT	SUBJECT NAME	Hrs	Pedagogy
I	Theory of probability – Sample space – Probability function – Conditional probability – Boole’s inequality –Baye’s theorem – Problem	15	Chalk & Talk
II	Random variables – Distribution function – Discrete and Continuous random variables – Probability density function – Mathematical expectation(one dimensional only).	15	Chalk & Talk
III	Moment generating function – Cumulants – Characteristic function- Theoretical distribution – Binomial – Poisson –Normal.	15	Chalk & Talk
IV	Test of significance of large samples.	15	Chalk & Talk
V	Test of significance of small samples – t-test, F-test and Chi-square test.	15	Chalk & Talk

**Course Designed by: Dr. P. Chitra devi & Dr. A. Arivu Chelvam**

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K – Level	No. of Questions	K - Level		
CI	CO1	Upto K3	2	K1&K2	1	K1	2(K2&K2)	1(K3)
AI	CO2	Upto K3	2	K1&K2	2	K2	2(K3&K3)	1(K3)
CI	CO3	Upto K3	2	K1&K2	1	K2	2(K3&K3)	1(K3)
AI	CO4	Upto K4	2	K1&K2	2	K2	2(K3&K3)	1(K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	40
	K2	2	4	10		16	32	
	K3			10	20	30	60	60
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			20	10	30	60	60
	K4				10	10	20	20
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5** will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S. No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Up to K3	2	K1&K2	1	K1	2(K2&K2)	1(K3)
2	CO2	Up to K3	2	K1&K2	1	K1	2(K3&K3)	1(K3)
3	CO3	Up to K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
4	CO4	Up to K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

**Distribution of Marks with K Level**

<b>K Level</b>	<b>Section A (Multiple Choice Questions)</b>	<b>Section B (Short Answer Questions)</b>	<b>Section C (Either/ or Choice)</b>	<b>Section D ( Open Choice)</b>	<b>Total Marks</b>	<b>% of (Marks without choice)</b>	<b>Consolidated %</b>
K1	5	4			9	7.5	33.3
K2	5	6	20		31	25.8	
K3			30	30	60	50	50
K4				20	20	16.7	16.7
Marks	10	10	50	50	120	100	100

**NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.**

Summative Examinations - Question Paper – Format

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K2	
18) b	CO3	K2	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
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<b>Course Name</b>	<b>DATA STRUCTURES AND ALGORITHMS</b>				
<b>Course Code</b>	<b>21UMTE62</b>	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	<b>Elective</b>	5	-	5	
<b>NATURE OF COURSE:</b>	<b>EMPLOYABILITY</b>	✓	<b>SKILL ORIENTED</b>	<b>ENTREPRENURSHIP</b>	
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To learn basic concepts data types</li> <li>• To know about arrays</li> <li>• To understand the different operations on linked list</li> <li>• To know about stacks</li> <li>• To learn the structure of binary trees using different algorithms</li> </ul>					
<b>Unit: I</b>					<b>15</b>
Algorithmic notation – control structures – complexity of algorithms – other asymptotic notations for complexity of algorithm – sub algorithms – variables – data types.					
<b>Unit: II</b>					<b>15</b>
Linear arrays – representation of linear arrays in memory – traversing linear arrays – inserting and deleting – linear search – binary search – multidimensional arrays – pointers – pointer arrays – sparse matrices – bubble sort – insertion sort – selection sort – merging – merge – sort – radix sort					
<b>Unit: III</b>					<b>15</b>
Linked lists – representation of linked lists in memory – traversing a linked list – searching linked list – memory allocation – garbage collection – insertion into a linked list– deletion from a linked list – header linked lists – two - way lists					
<b>Unit: IV</b>					<b>15</b>
Stacks – array representation of stacks – linked representation of stacks – arithmetic expression – polish notation – quick sort – an application of stacks – recursion –Towers of Hanoi – implementation of recursive procedures by stacks – queues – linked representation of queues – dequeues – priority queues					
<b>Unit: V</b>					<b>15</b>
Binary trees – representation of binary trees in memory – traversing binary trees – traversal algorithms using stacks – binary search trees – searching and inserting in binary search trees – deleting in a binary search tree – heap – heap sort – general trees					
<b>Total Lecture Hours</b>					<b>75</b>
<b>Books for Study:</b>					
Seymour Lipschutz & VijayalakshmiPai G A., (2008). <b>Data Structures</b> , Schaum’s outlines, New Delhi:					

Tata McGraw- Hill Publishing Company Ltd. Print.

(Chapter: 2, 4 (4.1 to 4.10, 4.13 to 4.14), 5, 6, 7 (7.1 to 7.5, 7.7 to 7.9, 7.17, 7.19), 9 ( 9.3 to 9.7).

**Books for References:**

1. Wirth Niklaus, (1985). **Algorithms + Data Structures = Programs**, New Delhi: Prentice Hall Lt. Print. WEBLINK(S): IT Faculty-LIMU.(2020, July 25)
2. Alfred V. Aho, John E. Hopcroft, Jeffrey D.Ullman, **Data Structures and Algorithms**, Pearson Publication.
3. G.A.V.Pai, **Data Structures and Algorithms- Concepts, Techniques and Applications**, Mc Graw Hill Publication

**Web Resources**

1. [https://youtu.be/ KzJfDt5hyE](https://youtu.be/KzJfDt5hyE)
2. <https://www.cs.bham.ac.uk/~jxb/DSA/dsa.pdf>
3. <https://mu.ac.in/wp-content/uploads/2021/05/Data-Structure-Final-.pdf>

COURSE OUTCOME		K Level
<b>On the successful completion of the course, the students will be able to</b>		
<b>CO1:</b>	explain notations and structures involved in algorithms	<b>K2</b>
<b>CO2:</b>	apply suitable algorithms on arrays to produce required result	<b>K3</b>
<b>CO3:</b>	experiment with different operations on linked list	<b>K3</b>
<b>CO4:</b>	apply the concepts of stacks, queues and recursion to develop algorithms	<b>K3</b>
<b>CO5:</b>	investigate the structure of binary trees using different algorithms	<b>K3</b>

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	2	2	2	2
CO 2	3	2	2	2	2	2
CO 3	3	2	2	2	2	2
CO 4	3	2	2	2	2	2
CO 5	3	2	3	2	2	2

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

<b>UNIT</b>	<b>SUBJECT NAME</b>	<b>Hrs</b>	<b>Pedagogy</b>
<b>I</b>	Algorithmic notation – control structures – complexity of algorithms – other asymptotic notations for complexity of algorithm – sub algorithms – variables – data types.	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>II</b>	Linear arrays – representation of linear arrays in memory – traversing linear arrays – inserting and deleting – linear search – binary search – multidimensional arrays – pointers – pointer arrays – sparse matrices – bubble sort – insertion sort – selection sort – merging – merge – sort – radix sort.	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>III</b>	Linked lists – representation of linked lists in memory – traversing a linked list – searching linked list – memory allocation – garbage collection – insertion into a linked list– deletion from a linked list – header linked lists – two - way lists.	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>IV</b>	Binary trees – representation of binary trees in memory – traversing binary trees – traversal algorithms using stacks – binary search trees – searching and inserting in binary search trees – deleting in a binary search tree – heap – heap sort – general trees	<b>15</b>	<b>Chalk &amp; Talk</b>
<b>V</b>	Binary trees – representation of binary trees in memory – traversing binary trees – traversal algorithms using stacks – binary search trees – searching and inserting in binary search trees – deleting in a binary search tree – heap – heap sort – general trees	<b>15</b>	<b>Chalk &amp; Talk</b>

**Course Designed by: Dr. R. Bhavani & Dr. A. Hamari Choudhi**

**Learning Outcome Based Education & Assessment (LOBE)  
Formative Examination - Blue Print  
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Upto K2	2	K1&K2	1	K1	2(K2&K2)	1(K2)
AI	CO2	Upto K3	2	K1&K2	2	K2	2(K3&K3)	1(K3)
CI	CO3	Upto K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
AII	CO4	Upto K3	2	K1&K2	2	K2	2(K3&K3)	1(K3)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

**Distribution of Marks with K Level CIA I & CIA II**

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	40
	K2	2	4	10		16	32	
	K3			10	20	30	60	60
	K4							
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

<b>Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)</b>								
S. No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	<b>Upto K2</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K1</b>	<b>2(K2&amp;K2)</b>	<b>1(K2)</b>
2	CO2	<b>Upto K3</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K1</b>	<b>2(K3&amp;K3)</b>	<b>1(K3)</b>
3	CO3	<b>Upto K3</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K2</b>	<b>2(K2&amp;K2)</b>	<b>1(K3)</b>
4	CO4	<b>Upto K3</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K2</b>	<b>2(K3&amp;K3)</b>	<b>1(K3)</b>
5	CO5	<b>Upto K3</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K2</b>	<b>2(K3&amp;K3)</b>	<b>1(K3)</b>
No. of Questions to be Asked			<b>10</b>		<b>5</b>		<b>10</b>	<b>5</b>
No. of Questions to be answered			<b>10</b>		<b>5</b>		<b>5</b>	<b>3</b>
Marks for each question			<b>1</b>		<b>2</b>		<b>5</b>	<b>10</b>
Total Marks for each section			<b>10</b>		<b>10</b>		<b>25</b>	<b>30</b>
<b>(Figures in parenthesis denotes, questions should be asked with the given K level)</b>								

<b>Distribution of Marks with K Level</b>							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D ( Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	41.7
K2	5	6	20	10	41	34.2	
K3			30	40	70	58.3	58.3
K4							
Marks	10	10	50	50	120	100	100
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.</b>							

Summative Examinations - Question Paper – Format

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K2	
18) b	CO3	K2	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q. No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K3	
25	CO5	K3	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>NUMBER THEORY</b>			
<b>Course Code</b>	<b>21UMTE63</b>	<b>L</b>	<b>P</b>	<b>C</b>
<b>Category</b>	<b>Elective</b>	5	-	5
<b>NATURE OF COURSE:</b>	<b>EMPLOYABILITY</b>	✓	SKILL ORIENTED	ENTREPRENURSHIP
<b>COURSE OBJECTIVES:</b>				
<ul style="list-style-type: none"> <li>• To know the basic concepts in number theory.</li> <li>• To learn arithmetic functions.</li> <li>• To study Euclid's and division algorithm.</li> <li>• To learn basic properties of congruences</li> <li>• To understand the fundamental theorem in number theory.</li> </ul>				
<b>Unit: I</b>				<b>15</b>
Introduction, Divisibility, Greatest common divisor, Prime numbers, The fundamental theorem of arithmetic, The series of reciprocals of the primes, The Euclidean algorithm, The greatest common divisor of more than two numbers. Introduction, The Mobius function $\mu(n)$ , The Euler totient function $\varphi(n)$ , A relation connecting $\varphi$ and $\mu$ , A product formula for $\varphi(n)$ .				
<b>Unit: II</b>				<b>15</b>
The Dirichlet product of arithmetical functions, Dirichlet inverses and the Mobius inversion formula, The Mangoldt function $\Lambda(n)$ , Multiplicative functions, Multiplicative functions and Dirichlet multiplication, The inverse of a completely multiplicative function, Liouville's function $\lambda(n)$ , The divisor function $\sigma_x(n)$ and Generalized convolutions, Formal series, The Bell series of an arithmetical function and Bell series and Dirichlet multiplication, Derivatives of an arithmetical functions, The Selberg identity.				
<b>Unit: III</b>				<b>15</b>
Chebyshev's functions $\psi(x)$ and $\vartheta(x)$ , Relations connecting $\vartheta(x)$ and $\pi(x)$ , Some equivalent forms of the prime number theorem, Inequalities for $\pi(n)$ and $p_n$ , Shapiro's Tauberian theorem, Applications of Shapiro's theorem, An asymptotic formula for the partial sums $\sum_{p \leq x} p$ , The partial sums of the Mobius function, Brief sketch of an elementary proof of the prime number theorem, Selberg's asymptotic formula.				
<b>Unit: IV</b>				<b>15</b>
Definition and basic properties of congruences, Residue classes and complete residue system, Linear Congruences, Reduced residue systems and the Euler-Fermat theorem.				
<b>Unit: V</b>				<b>15</b>
Polynomial congruences module p. Lagrange's theorem, Applications of Lagrange's theorem, Simultaneous linear congruences. The Chinese remainder theorem, Applications of the Chinese remainder theorem, Polynomial congruences with prime power moduli				
<b>Total Lecture Hours</b>				<b>75</b>
<b>Books for Study:</b>				
T.M. Apostol, 1976, <b>Introduction to Analytic Number Theory</b> , Springer Verlag				

**Books for References:**

1. Ivan Nivan and Herberts Zucherman, 1972, **An Introduction to Theory of Numbers**, Third Edition, Wiley Eastern Limited, New Delhi.
2. Kenneth and Rosan, 1968, **Elementary Number Theory and its Applications**, Addison Wesley Publishing Company.
3. Tom M. Apostol, **Introduction to Analytic Number Theory**, Springer International Edition,

**Web Resources**

1. <http://www2.math.uu.se/~lal/kompendier/Talteori.pdf>
2. <https://nptel.ac.in/courses/111/101/111101137/>
3. <https://nptel.ac.in/courses/111/103/111103020/>

COURSE OUTCOME		K Level
<b>On the successful completion of the course, the students will be able to</b>		
<b>CO1:</b>	understand the concept of theory of numbers, some special functions and congruences	<b>K2</b>
<b>CO2:</b>	apply the concept in Divisibility, multiplicative functions, prime number theorem, residue classes, Lagrange’s theorem and Chinese remainder theorem	<b>K3</b>
<b>CO3:</b>	analyze Euclidean algorithm, Bell series, Relations connecting $\vartheta(x)$ and $\pi(x)$ , linear congruences and polynomial congruences	<b>K4</b>
<b>CO4:</b>	Explain the Dirichlet product of arithmetic functions, Dirichlet inverses and Mobius inversion formula.	<b>K4</b>
<b>CO5:</b>	solve the problems in Divisibility, Some Special functions, Chebyshev’s Functions , Congruences and polynomial congruences	<b>K3</b>

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
<b>CO 1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>
<b>CO 2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>
<b>CO 3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>
<b>CO 4</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>
<b>CO 5</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

UNIT	SUBJECT NAME	Hrs	Pedagogy
I	Divisibility, Greatest common divisor, Prime numbers, The fundamental theorem of arithmetic, The series of reciprocals of the primes, The Euclidean algorithm, The greatest common divisor of more than two numbers. Introduction, The Mobius function $\mu(n)$ , The Euler totient function $\varphi(n)$ , A relation connecting $\varphi$ and $\mu$ , A product formula for $\varphi(n)$ .	15	Chalk & Talk
II	The Dirichlet product of arithmetical functions, Dirichlet inverses and the Mobius inversion formula, The Mangoldt function $\Lambda(n)$ , Multiplicative functions, Multiplicative functions and Dirichlet multiplication, The inverse of a completely multiplicative function, Liouville's function $\lambda(n)$ , The divisor function $\sigma_x(n)$ and Generalized convolutions, Formal series, The Bell series of an arithmetical function and Bell series and Dirichlet multiplication, Derivatives of an arithmetical functions, The Selberg identity.	15	Chalk & Talk
III	Chebyshev's functions $\psi(x)$ and $\vartheta(x)$ , Relations connecting $\vartheta(x)$ and $\pi(x)$ , Some equivalent forms of the prime number theorem, Inequalities for $\pi(n)$ and $p_n$ , Shapiro's Tauberian theorem, Applications of Shapiro's theorem, An asymptotic formula for the partial sums $\sum(p)_{p \leq x}$ , The partial sums of the Mobius function, Brief sketch of an elementary proof of the prime number theorem, Selberg's asymptotic formula.	15	Chalk & Talk
IV	Definition and basic properties of congruences, Residue classes and complete residue system, Linear Congruences, Reduced residue systems and the Euler-Fermat theorem.	15	Chalk & Talk
V	Polynomial congruences module $p$ . Lagrange's theorem, Applications of Lagrange's theorem, Simultaneous linear congruences. The Chinese remainder theorem, Applications of the Chinese remainder theorem, Polynomial congruences with prime power moduli	15	Chalk & Talk

**Course Designed by: Dr.A.Arivu Chelvam & Dr.R.Bhavani**

**Learning Outcome Based Education & Assessment (LOBE)  
Formative Examination - Blue Print  
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Upto K2	2	K1&K2	1	K1	2(K2&K2)	1(K2)
AI	CO2	Upto K3	2	K1&K2	2	K2	2(K3&K3)	1(K3)
CI	CO3	Upto K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
AII	CO4	Upto K4	2	K1&K2	2	K2	2(K3&K3)	1(K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

**Distribution of Marks with K Level CIA I & CIA II**

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			20		20	40	40
	K4				20	20	40	40
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5** will be allotted for individual Assignment which carries five marks as part of CIA component.

<b>Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)</b>								
S.No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	<b>Upto K2</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K1</b>	<b>2(K2&amp;K2)</b>	<b>1(K2)</b>
2	CO2	<b>Upto K3</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K1</b>	<b>2(K3&amp;K3)</b>	<b>1(K3)</b>
3	CO3	<b>Upto K4</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K2</b>	<b>2(K3&amp;K3)</b>	<b>1(K4)</b>
4	CO4	<b>Upto K4</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K2</b>	<b>2(K3&amp;K3)</b>	<b>1(K4)</b>
5	CO5	<b>Upto K3</b>	<b>2</b>	<b>K1&amp;K2</b>	<b>1</b>	<b>K2</b>	<b>2(K2&amp;K2)</b>	<b>1(K3)</b>
No. of Questions to be Asked			<b>10</b>		<b>5</b>		<b>10</b>	<b>5</b>
No. of Questions to be answered			<b>10</b>		<b>5</b>		<b>5</b>	<b>3</b>
Marks for each question			<b>1</b>		<b>2</b>		<b>5</b>	<b>10</b>
Total Marks for each section			<b>10</b>		<b>10</b>		<b>25</b>	<b>30</b>
<b>(Figures in parenthesis denotes, questions should be asked with the given K level)</b>								

<b>Distribution of Marks with K Level</b>							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D ( Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	41.6
K2	5	6	20	10	41	34.1	
K3			30	20	50	41.7	41.7
K4				20	20	16.7	16.7
Marks	10	10	50	50	120	100	100
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.</b>							

Summative Examinations - Question Paper – Format

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K2	
20) b	CO5	K2	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K3	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>DISCRETE MATHEMATICS</b>				
<b>Course Code</b>	21UMTE64	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	Elective	5	-	5	
<b>NATURE OF COURSE:</b>	<b>EMPLOYABILITY</b>	✓	SKILL ORIENTED	ENTREPRENURSHIP	
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>▪ To learn logical connectives and prepositions</li> <li>▪ To know about normal forms</li> <li>▪ To apply rules of inference</li> <li>▪ To understand about relations</li> <li>▪ To know about lattices and Boolean algebra</li> </ul>					
<b>Unit: I</b>					<b>15</b>
Mathematical logic: Propositions – Connectives – Conditional and Bi-conditional propositions – Tautology and Contradiction – Equivalence of propositions.					
<b>Unit: II</b>					<b>15</b>
Tautological implication – Normal forms – Disjunctive normal form – Conjunctive normal forms – Principal Disjunctive normal form – Principal Conjunctive normal form					
<b>Unit: III</b>					<b>15</b>
Theory of inference – Rules of inference – Predicate calculus (Quantifiers - Excluded)					
<b>Unit: IV</b>					<b>15</b>
Relations – Types of Relations – Operations of relations – Composition of relations – properties of relations – Equivalence classes – Partition of a set.					
<b>Unit: V</b>					<b>15</b>
Lattices – Principle of duality – Properties of lattices – Boolean Algebra – Properties of Boolean algebra.					
<b>Total Lecture Hours</b>					<b>75</b>
<b>Books for Study:</b>					
T.Veerarajan, <b>Discrete Mathematics with Graph Theory and Combinatorics</b> , The Mc-Graw Hill Publishing company limited, New Delhi. Unit I,II – Chapter 1(Pg 1-26) Unit III – Chapter 1 (Pg 27- 49) (Quantifiers - Excluded) Unit IV – Chapter 2 (Pg 66 - 77)& Problems Unit V – Chapter 2 (Pg 96 – 97,103) & Problems					
<b>Books for References:</b>					
1 Kenneth H. Rosen, <b>Discrete Mathematics and its Applications</b> , Tata MCGraw Hill 2. J. P. Tremblay & Manohar, <b>Discrete Mathematical Structures with applications to Computer</b>					

science, 1st Edition, McGraw Hill Education, 2017.

3.J K Sharma, *Discrete Mathematics*, Macmillan Publishers India Limited, 2004

**Web Resources**

1. <https://home.iitk.ac.in/~aralal/book/mth202.pdf>
2. [https://www.tutorialspoint.com/discrete\\_mathematics/discrete\\_mathematics\\_tutorial.pdf](https://www.tutorialspoint.com/discrete_mathematics/discrete_mathematics_tutorial.pdf)
3. <https://archive.nptel.ac.in/courses/111/107/111107058/>

COURSE OUTCOME		K Level
<b>On the successful completion of the course, the students will be able to</b>		
<b>CO1:</b>	Discuss various connectives of logics	<b>K2</b>
<b>CO2:</b>	Prepare the PDNF and PCNF for the logic statements	<b>K3</b>
<b>CO3:</b>	Analyze the theory of inference in logical statements	<b>K4</b>
<b>CO4:</b>	Classify the relations between the set of elements.	<b>K4</b>
<b>CO5:</b>	Explain lattice and Boolean algebra concepts	<b>K4</b>

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
<b>CO 1</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>
<b>CO 2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>
<b>CO 3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>
<b>CO 4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>
<b>CO 5</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

UNIT	SUBJECT NAME	Hrs	Pedagogy
I	Mathematical logic: Propositions – Connectives – Conditional and Bi-conditional propositions – Tautology and Contradiction – Equivalence of propositions.	15	Chalk & Talk
II	Tautological implication – Normal forms – Disjunctive normal form – Conjunctive normal forms – Principal Disjunctive normal form – Principal Conjunctive normal form.	15	Chalk & Talk
III	Theory of inference – Rules of inference – Predicate calculus (Quantifiers - Excluded)	15	Chalk & Talk
IV	Relations – Types of Relations – Operations of relations – Composition of relations – properties of relations – Equivalence classes – Partition of a set.	15	Chalk & Talk
V	Lattices – Principle of duality – Properties of lattices – Boolean Algebra – Properties of Boolean algebra.	15	Chalk & Talk

**Course Designed by: Dr.M.Saravanan & Dr.V.Ramachandran**

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Upto K2	2	K1&K2	1	K1	2(K2&K2)	1(K2)
AI	CO2	Upto K3	2	K1&K2	2	K2	2(K3&K3)	1(K3)
CI	CO3	Upto K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
AII	CO4	Upto K4	2	K1&K2	2	K2	2(K3&K3)	1(K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			20		20	40	40
	K4				20	20	40	40
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K2	2	K1&K2	1	K1	2(K2&K2)	1(K2)
2	CO2	Upto K3	2	K1&K2	1	K1	2(K2&K2)	1(K3)
3	CO3	Upto K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
4	CO4	Upto K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
5	CO5	Upto K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

**Distribution of Marks with K Level**

<b>K Level</b>	<b>Section A (Multiple Choice Questions)</b>	<b>Section B (Short Answer Questions)</b>	<b>Section C (Either/ or Choice)</b>	<b>Section D ( Open Choice)</b>	<b>Total Marks</b>	<b>% of (Marks without choice)</b>	<b>Consolidated %</b>
K1	5	4			9	7.5	41.67
K2	5	6	20	10	41	34.17	
K3			30	10	40	33.33	33.33
K4				30	30	25	25
Marks	10	10	50	50	120	100	100

**NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.**

Summative Examinations - Question Paper – Format

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K4	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>FUZZY SET THEORY</b>				
<b>Course Code</b>	<b>21UMTE65</b>	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	<b>Elective</b>	5	-	5	
<b>NATURE OF COURSE:</b>	<b>EMPLOYABILITY</b>		SKILL ORIENTED		ENTREPRENURSHIP
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>▪ To understand the concepts of fuzzy sets</li> <li>▪ To Learn Extension Principle for Fuzzy Sets</li> <li>▪ To know about fuzzy operations</li> <li>▪ To understand Fuzzy Arithmetic</li> <li>▪ To know about relations on Fuzzy</li> </ul>					
<b>Unit: I</b>					<b>15</b>
Crisp Sets to Fuzzy Sets: Introduction – Crisp Sets: An Overview – Fuzzy Sets: Basic types – Fuzzy Sets: Basic Concepts.					
<b>Unit: II</b>					<b>15</b>
Fuzzy Sets versus Crisp Sets - Additional properties of $\alpha$ – Cuts - Representation of Fuzzy Sets - Extension Principle for Fuzzy Sets.					
<b>Unit: III</b>					<b>15</b>
Operations on Fuzzy Sets: Types of operations – Fuzzy Complements – Fuzzy Intersection: t-Norms – Fuzzy Unions’ – Conforms - Combinations of Operations- Aggregation Operations					
<b>Unit: IV</b>					<b>15</b>
Fuzzy Arithmetic: Fuzzy Numbers - Linguistic Variables - Arithmetic Operations on Intervals - Arithmetic Operations on Fuzzy Numbers - Lattice of Fuzzy Numbers - Fuzzy Equations.					
<b>Unit: V</b>					<b>15</b>
Fuzzy Relations: Crisp Versus Fuzzy Relations –Projection and Cylindrical Extensions- Binary Fuzzy Relations – Binary Relations on a Single Set – Fuzzy Equivalence Relation- Fuzzy Compatibility Relations – Fuzzy Ordering Relations.					
<b>Total Lecture Hours</b>					<b>75</b>
<b>Books for Study:</b>					
GeorgeJ.Klir and BoYuan , <b>Fuzzy Sets and Fuzzy Logic Theory and Applications</b> , Prentice – Hall of India, 2012.					
UNIT-I: Chapter 1: Sections: 1.1 to 1.4					
UNIT-II: Chapter 2: Sections 2.1 to 2.3					
UNIT-III: Chapter 3: Sections 3.1 to 3.6					

UNIT-IV: Chapter 4: Sections 4.1 to 4.6

UNIT-V: Chapter 5: Sections 5.1 to 5.7

**Books for References:**

1. George J. Klir and Tina, A., Folger, **Fuzzy Sets, Uncertainty and Information**, PHI Learning Private Limited, 2012. New Delhi–110001
2. Ganesh, M., **Introduction to Fuzzy Sets and Fuzzy Logic**, Prentice-Hall of India. 2015
3. Chander Mohan, **An Introduction to Fuzzy Set Theory and Fuzzy Logic**, MV Learning.

**Web Resources**

1. <https://cours.etsmtl.ca/sys843/REFS/Books/ZimmermannFuzzySetTheory2001.pdf>
2. <https://www.pdfdrive.com/fuzzy-sets-and-fuzzy-logic-e33448886.html>
3. <https://www.mdpi.com/books/pdfdownload/book/2133>

COURSE OUTCOME		K Level
<b>On the successful completion of the course, the students will be able to</b>		
<b>CO1:</b>	compare fuzzy sets and crisp sets	<b>K2</b>
<b>CO2:</b>	represent fuzzy sets in terms of $\alpha$ - cuts	<b>K3</b>
<b>CO3:</b>	discuss various operations on fuzzy sets	<b>K4</b>
<b>CO4:</b>	apply arithmetic operations on fuzzy sets	<b>K3</b>
<b>CO5:</b>	Explain fuzzy relations	<b>K4</b>

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	2	2	3	1
CO 2	3	2	2	2	3	1
CO 3	3	2	2	2	2	1
CO 4	3	2	2	2	2	2
CO 5	3	2	2	2	2	2

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

UNIT	SUBJECT NAME	Hrs	Pedagogy
I	Crisp Sets to Fuzzy Sets: Introduction – Crisp Sets: An Overview – Fuzzy Sets: Basic types – Fuzzy Sets: Basic Concepts.	15	Chalk & Talk
II	Fuzzy Sets versus Crisp Sets - Additional properties of $\alpha$ – Cuts - Representation of Fuzzy Sets - Extension Principle for Fuzzy Sets	15	Chalk & Talk
III	Operations on Fuzzy Sets: Types of operations – Fuzzy Complements – Fuzzy Intersection: t- Norms – Fuzzy Unions’ – Conforms - Combinations of Operations- Aggregation Operations	15	Chalk & Talk
IV	Fuzzy Arithmetic: Fuzzy Numbers - Linguistic Variables - Arithmetic Operations on Intervals - Arithmetic Operations on Fuzzy Numbers - Lattice of Fuzzy Numbers - Fuzzy Equations.	15	Chalk & Talk
V	Fuzzy Relations: Crisp Versus Fuzzy Relations –Projection and Cylindrical Extensions- Binary Fuzzy Relations – Binary Relations on a Single Set – Fuzzy Equivalence Relation- Fuzzy Compatibility Relations – Fuzzy Ordering Relations.	15	Chalk & Talk

**Course Designed by: Dr.S.Andal & Dr.A.Arivu Chelvam**

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Upto K2	2	K1&K2	1	K1	2(K2&K2)	1(K2)
AI	CO2	Upto K3	2	K1&K2	2	K2	2(K3&K3)	1(K3)
CI	CO3	Upto K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
AII	CO4	Upto K3	2	K1&K2	2	K2	2(K2&K2)	1(K3)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	40
	K2	2	4	10		16	32	
	K3			10	10	20	40	40
	K4				10	10	20	20
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5** will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K2	2	K1&K2	1	K1	2(K2&K2)	1(K2)
2	CO2	Upto K3	2	K1&K2	1	K1	2(K2&K2)	1(K3)
3	CO3	Upto K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
4	CO4	Upto K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
5	CO5	Upto K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

**Distribution of Marks with K Level**

<b>K Level</b>	<b>Section A (Multiple Choice Questions)</b>	<b>Section B (Short Answer Questions)</b>	<b>Section C (Either/ or Choice)</b>	<b>Section D ( Open Choice)</b>	<b>Total Marks</b>	<b>% of (Marks without choice)</b>	<b>Consolidated %</b>
K1	5	4			9	7.5	50
K2	5	6	30	10	51	42.5	
K3			20	20	40	33.33	33.33
K4				20	20	16.67	16.67
Marks	10	10	50	50	120	100	100

**NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.**

Summative Examinations - Question Paper – Format

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K2	
19) b	CO4	K2	
20) a	CO5	K3	
20) b	CO5	K3	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K4	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>FORMAL LANGUAGES AND AUTOMATA</b>			
<b>Course Code</b>	<b>21UMTE66</b>	<b>L</b>	<b>P</b>	<b>C</b>
<b>Category</b>	<b>Elective</b>	5	-	5
<b>NATURE OF COURSE:</b>	<b>EMPLOYABILITY</b>	✓	<b>SKILL ORIENTED</b>	<b>ENTREPRENURSHIP</b>
<b>COURSE OBJECTIVES:</b>				
<ul style="list-style-type: none"> <li>▪ To define finite automata</li> <li>▪ To inspect the properties of NFA</li> <li>▪ To find monoid of a finite state machine</li> <li>▪ To construct grammars for languages</li> <li>▪ To understand Greibach normal form grammar for a given grammar</li> </ul>				
<b>Unit: I</b>				<b>15</b>
Definition – representation of a finite automaton – acceptability of a string and language accepted by a finite automaton.				
<b>Unit: II</b>				<b>15</b>
Definition – acceptability of a string by NFA – equivalence of FA and NFA – procedure for finding a FA equivalent to a given NFA.				
<b>Unit: III</b>				<b>15</b>
Properties of regular sets – decision algorithms for regular sets –finite state machines – monoid of a finite state machine – machine of a monoid				
<b>Unit: IV</b>				<b>15</b>
Definition and examples – Chomsky hierarchy of languages – derivation trees for context free grammars – normal forms for context free grammars – ambiguity– parsing and polish notation – simple precedence grammar – algorithm.				
<b>Unit: V</b>				<b>15</b>
Construction of a regular grammar – derivation trees for context-free grammars – normal forms for context-free grammars – Greibach normal form.				
<b>Total Lecture Hours</b>				<b>75</b>
<b>Books for Study:</b>				
Venkataraman M.K., Sridharan N. and Chandrasekaran N., (2001). <b>Discrete Mathematics</b> , Chennai:The National Publishing Company. Print.				
Unit-I To V (Chapter XII (1-20)).				
<b>Books for References:</b>				
1. Peter Linz, (2008). <b>An Introduction to Formal Languages and Automata</b> , New Delhi: NarosaPublishing House. Print				
2. Sundaresan V., Ganapathy Subramanian K.S. & Ganesan K., (2001). <b>Discrete Mathematics</b> , Sirkali:				

A.R. Publications. Print.

3. Basavaraj S. Amami, Karibasappa K.G., **Formal Languages and Automata Theory**, Wiley Precise Publications

**Web Resources**

1. <https://www.pdfdrive.com/formal-languages-and-automata-theory-books.html>
2. <https://www.iitg.ac.in/dgoswami/Flat-Notes.pdf>
3. [https://cse4projects.files.wordpress.com/2013/09/theory\\_of\\_computation\\_reference\\_e-book.pdf](https://cse4projects.files.wordpress.com/2013/09/theory_of_computation_reference_e-book.pdf)

COURSE OUTCOME		K Level
<b>On the successful completion of the course, the students will be able to</b>		
<b>CO1:</b>	find the acceptability of a language by a finite automaton	<b>K3</b>
<b>CO2:</b>	convert NFA to FA in terms of algorithms	<b>K3</b>
<b>CO3:</b>	explain the properties of regular sets	<b>K4</b>
<b>CO4:</b>	change context free grammar to various normal forms	<b>K3</b>
<b>CO5:</b>	construct Greibach normal form grammar for a given grammar	<b>K3</b>

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
<b>CO 1</b>	3	2	2	2	2	2
<b>CO 2</b>	3	2	2	2	2	2
<b>CO 3</b>	3	2	2	2	2	3
<b>CO 4</b>	3	1	2	2	2	1
<b>CO 5</b>	3	1	2	3	2	1

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**LESSON PLAN**

UNIT	SUBJECT NAME	Hrs	Pedagogy
I	Definition – representation of a finite automaton – acceptability of a string and language accepted by a finite automaton	15	Chalk & Talk
II	Definition – acceptability of a string by NFA – equivalence of FA and NFA – procedure for finding a FA equivalent to a given NFA.	15	Chalk & Talk
III	Properties of regular sets – decision algorithms for regular sets –finite state machines – monoid of a finite state machine – machine of a monoid	15	Chalk & Talk
IV	Definition and examples – Chomsky hierarchy of languages – derivation trees for context free grammars – normal forms for context free grammars – ambiguity– parsing and polish notation – simple precedence grammar – algorithm	15	Chalk & Talk
V	Construction of a regular grammar – derivation trees for context-free grammars – normal forms for context-free grammars – Greibach normal form.	15	Chalk & Talk

**Course Designed by: Dr.S.Andal & Dr.V.Ramachandran**

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CIA	CO1	Upto K3	2	K1&K2	1	K1	2(K2&K2)	1(K3)
	CO2	Upto K3	2	K1&K2	2	K2	2(K3&K3)	1(K3)
CIAII	CO3	Upto K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
	CO4	Upto K3	2	K1&K2	2	K2	2(K2&K2)	1(K3)
Question Pattern CIA I & II	No. of Questions to be asked		4		3		4	2
	No. of Questions to be answered		4		3		2	1
	Marks for each question		1		2		5	10
	Total Marks for each section		4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	40
	K2	2	4	10		16	32	
	K3			10	20	30	60	60
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	40
	K2	2	4	10		16	32	
	K3			10	10	20	40	40
	K4				10	10	20	20
	Marks	4	6	20	20	50	100	100

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5** will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K3	2	K1&K2	1	K1	2(K2&K2)	1(K3)
2	CO2	Upto K3	2	K1&K2	1	K1	2(K3&K3)	1(K3)
3	CO3	Upto K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
4	CO4	Upto K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
5	CO5	Upto K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D ( Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	41.67
K2	5	6	30		41	34.17	
K3			20	40	60	50	50
K4				10	10	8.33	8.33
Marks	10	10	50	50	120	100	100
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.</b>							

Summative Examinations - Question Paper – Format

<b>Section A (Multiple Choice Questions)</b>			
<b>Answer All Questions</b>			<b>(10x1=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
<b>Section B (Short Answers)</b>			
<b>Answer All Questions</b>			<b>(5x2=10 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
<b>Section C (Either/Or Type)</b>			
<b>Answer All Questions</b>			<b>(5 x 5 = 25 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K2	
19) b	CO4	K2	
20) a	CO5	K2	
20) b	CO5	K2	
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels</b>			
<b>Section D (Open Choice)</b>			
<b>Answer Any Three questions</b>			<b>(3x10=30 marks)</b>
<b>Q.No</b>	<b>CO</b>	<b>K Level</b>	<b>Questions</b>
21	CO1	K3	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K3	



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**  
**DEPARTMENT OF MATHEMATICS**  
 (For those who joined in 2021-2022 and after)

<b>Course Name</b>	<b>SPSS LAB</b>				
<b>Course Code</b>	<b>21UMTSP3</b>		<b>L</b>	<b>P</b>	<b>C</b>
<b>Category</b>	<b>Skill</b>	-	2	2	
<b>NATURE OF COURSE:</b>	<b>EMPLOYABILITY</b>	✓	<b>SKILL ORIENTED</b>	<b>ENTREPRENURSHIP</b>	
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To understand the basic working of SPSS</li> <li>• To provide data handling experience using SPSS.</li> <li>• To familiar with presentation of Statistical output in SPSS software.</li> <li>• To organize and save data in suitable way</li> <li>• To create and edit graphical displays of data</li> </ul>					
<b>List of Programs:</b>					
<ol style="list-style-type: none"> <li>1. Data Aggregation –Sorting, Selecting cases, Splitting file and Listing Cases.</li> <li>2. Frequencies and Descriptive statistics- Measures</li> <li>3. Graphs and diagrams: Pie, bar, line and Histogram</li> <li>4. Correlation coefficient</li> <li>5. Regression Analysis</li> <li>6. One sample t-test</li> <li>7. Chi square test</li> <li>8. ANOVA- One way classification</li> </ol>					
<b>Total Lecture Hours</b>					<b>30</b>
<b>Books for Study:</b>					
Kiran Pandya, Smruti Bulsari and Sanjay Sinha, “ <b>SPSS in Simple Steps</b> ” Published by dreamlech press, New Delhi, 2016.					
<b>Books for References:</b>					
1. Anil Kumar Mishra, “ <b>A Hand Book on SPSS for Research Work</b> ” Himalaya Publishing House, Mumbai, 2019.					
2. A.Rajathi, and P.Chandran “ <b>SPSS for you</b> ” MJP Publishers, Chennai, 2010.					
3. Sabine Landau and Brian S. Everitt “ <b>A Handbook of Statistical Analyses using SPSS</b> ”					

” CHAPMAN & HALL/CRC, Press Company, New York, 2004

**Web Resources:**

1. [https://onlinecourses.swayam2.ac.in/arp19\\_ap77/preview](https://onlinecourses.swayam2.ac.in/arp19_ap77/preview)
2. <https://nptel.ac.in/courses/110/107/110107113/>
3. <https://lo.unisa.edu.au/mod/book/view.php?id=646443&chapterid=106605>

COURSE OUTCOME		K LEVEL
<b>On the successful completion of the course, the students will be able to</b>		
<b>CO1:</b>	Examine Data Aggregation in SPSS	<b>K1</b>
<b>CO2:</b>	Calculate the statistics measures using SPSS	<b>K3</b>
<b>CO3:</b>	Construct Graphs and diagrams using SPSS	<b>K3</b>
<b>CO4:</b>	Determine correlation coefficient and Regression lines using SPSS	<b>K3</b>
<b>CO5:</b>	Analyze t-Test, Chi square test and ANOVA- One way classification using SPSS	<b>K4</b>

**CO & PO Mapping:**

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	1	2	1	2	2
CO 2	3	2	2	2	2	2
CO 3	3	2	3	1	2	2
CO 4	3	2	2	2	2	2
CO 5	3	2	2	2	2	2

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

**Course Designed by: Dr.V.Ramachandran & Dr.S.Andal**