

# DEPARTMENT OF MATHEMATICS

## VISION

- To become a centre of excellence in Mathematics.
- To empower students with sound knowledge and investigate new methodologies and applications in research.
- To equip them for better service towards the society.

## MISSION

- To encourage the students to take up student projects to develop their analytical and logical thinking.
- To provide quality education research and consultancy by providing highly skilled mathematical knowledge.
- To provide excellent knowledge of mathematical sciences for suitable career and groom them for National recognition.
- To enable the students as mathematical thinkers and become life-long learners in their chosen profession.

## PROGRAMME OUTCOMES

**PO1** Capable of demonstrating computational ability in solving a wide array of mathematical problems.

**PO2** Capability to utilize mathematical skills to solve theoretical and applied problems.

**PO3** Capacity to identify applications of mathematics in various disciplines and society.

**PO4** Ability to become successful professionals by demonstrating logical and analytical thinking.

**PO5** Ability to provide systematic and understanding of the concepts and theories of mathematics and enhance carrier prospects in a huge array of fields.

**PO6** Ability to analyze, interpret and draw conclusions from quantitative / qualitative data; and critically evaluate ideas from reasoned perspective.

**PO7** Ability to work independently, identify and manage a project and to acquire knowledge skills, including “learning how to learn”, through self-placed and self-directed learning aimed at personal development, meeting economic, social and cultural objectives.

## PROGRAMME EDUCATIONAL OBJECTIVES

**PEO1** Provide students with a thorough knowledge of fundamental mathematical facts and good knowledge in analytical, algebraic structures, applied mathematics and statistics.

**PEO2** Students should develop the ability to apply the acquired knowledge to solve the real-life problems.

**PEO3** Students will become leaders in their associated organization with team building and managing capabilities.

## PROGRAMME SPECIFIC OUTCOMES

**PSO1** Acquire good knowledge and understanding to solve specific theoretical & applied problems in different area of mathematics & statistics.

**PSO2** Understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields.

**PSO3** To prepare the students who will demonstrate respectful engagement with other’s ideas, behaviours, beliefs and apply diverse frames of references to decisions and actions. To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate start-ups and high potential organizations.

## **GRADUATE ATTRIBUTES**

### **1) Computational ability**

Demonstrate a computational ability in solving a wide array of mathematical problems.

### **2) Problem Solving**

Utilize mathematical skill to solve theoretical and applied problems. Identify and analyze the problem and formulate solution for problems using principles of mathematics.

### **3) Applied Learning**

Identify application of mathematics in various disciplines and society to apply disciplinary or inter discipline learning across multiple context.

### **4) Professional Development**

Become successful professionals by demonstrating logical and analytical thinking. To develop on self professionally and to critically improve on self with a view to taking appropriate decision in diverse professional environment.

### **5) Career Prospects**

Provide a systematic understanding of the concepts and theories of mathematics and enhance career prospects in huge array of fields.

### **6) Ethical and Moral Understanding**

To make the students with moral and ethical reasoning and to trigger their self-confidences and to excel their quality of life.

### **7) Contemporary Skill**

To explain the knowledge of contemporary issues in the field of mathematical and applied science.

**PROGRAMME STRUCTURE FOR B.Sc. MATHEMATICS**  
(For those admitted from the academic year 2023-24 and onwards)

Category	Course Type	Course Code	Course Title	Contact Hours	Exam Hours	Marks			Credits
						CIA	ESE	Total Marks	
<b>Semester-I</b>									
PART-I	Language	U23TA1L1	Tamil-I	6	3	25	75	100	3
PART-II	English	U23EN1L1	English-I	6	3	25	75	100	3
PART-III	Core-1	U23MA101	Algebra and Trigonometry	4	3	25	75	100	4
	Core-2	U23MA102	Differential Calculus	4	3	25	75	100	4
	Elective Generic-1 (Allied)	U23PH1A1	Allied Physics-I	4	3	25	75	100	3
	Elective Generic Lab-1 (Allied Lab)	U23PH1AP	Allied Physics Lab-I	2	3	40	60	100	1
PART-IV	Skill Enhancement Course SEC1 (NME-1)	U23MA1S1	Mathematics for Competitive Exam-I	2	-	50	-	50	2
	Foundation Course	U23MAFC1	Basics for Higher Mathematics	2	-	50	-	50	2
<b>TOTAL</b>				<b>30</b>				<b>700</b>	<b>22</b>
<b>Semester-II</b>									
PART-I	Language	U23TA2L2	Tamil-II	6	3	25	75	100	3
PART-II	English	U23EN2L2	English-II	6	3	25	75	100	3
PART-III	Core-3	U23MA203	Analytical Geometry (two and three Dimensions)	4	3	25	75	100	4
	Core-4	U23MA204	Integral Calculus	4	3	25	75	100	4
	Elective Generic-2 (Allied)	U23PH2A2	Allied Physics-II	4	3	25	75	100	3
	Elective Generic Lab – 2 (Allied Lab)	U23PH2AP	Allied Physics Lab-II	2	3	40	60	100	1
	Comprehension-(Self Study Course- Online exam)	U23MA2C1	Comprehension in Mathematics-I	-	1	-	50	50	1
PART-IV	Skill Enhancement Course SEC2 (NME-2)	U23MA2S2	Mathematics for Competitive Exam-II	2	-	50	-	50	2
	Skill Enhancement Course SEC3 (DSC)	U23MA2S3	Computing Skills (Office Automation)	2	2	-	50	50	2
<b>TOTAL</b>				<b>30</b>				<b>750</b>	<b>23</b>

<b>Semester-III</b>									
PART-I	Language	U23TA3L3	Tamil-III	6	3	25	75	100	3
PART-II	English	U23EN3L3	English-III	6	3	25	75	100	3
PART-III	Core-5	U23MA305	Vector Calculus and its Applications	4	3	25	75	100	4
	Core-6	U23MA306	Differential Equations and its Applications	4	3	25	75	100	4
	Elective Generic-3 (Allied)	U23MA3A3	Mathematical Statistics	4	3	25	75	100	3
	Elective Generic Lab-3 (Allied Lab)	U23MA3AP	Statistics with R Programming	2	3	40	60	100	1
PART-IV	Skill Enhancement Course SEC4 (DSC)	U23MA3SP1	MATLAB	2	-	50	-	50	2
	Ability Enhancement Course-I	U23AE301	Environmental Studies	2	-	50	-	50	2
<b>TOTAL</b>				<b>30</b>				<b>700</b>	<b>22</b>
<b>Semester-IV</b>									
PART-I	Language	U23TA4L4	Tamil-IV	6	3	25	75	100	3
PART-II	English	U23EN4L4	English-IV	6	3	25	75	100	3
PART-III	Core-7	U23MA407	Industry Module- Industrial Statistics	4	3	25	75	100	4
	Core-8	U23MA408	Elements of Mathematical Analysis	4	3	25	75	100	4
	Elective Generic-4 (Allied)	U23MA4A4	Programming Language with C	4	3	25	75	100	3
	Elective Generic Lab-4 (Allied Lab)	U23MA4AP	Programming Language with C lab	2	3	40	60	100	1
	Comprehension -II (Self Study Course-Online Exam)	U23MA4C2	Comprehension in Mathematics-II	-	1	-	50	50	1
PART-IV	Skill Enhancement Course SEC5 (DSC)	U23MA4S5	Mathematics for Competitive Exam	2	2	-	50	50	2
	Ability Enhancement Compulsory Course-II	U23AE402	Yoga & Value Education	2	-	50	-	50	2

	Internship/ Institutional Training/ Mini Project (Carried out during Second Year Summer Vacation)	U23MA5IT	Internship/ Institutional Training/ Mini Project	-	-	-	-	-	Comple tion	
<b>TOTAL</b>				<b>30</b>				<b>750</b>	<b>23</b>	
<b>Semester-V</b>										
PART-III	Core-9	U23MA509	Abstract Algebra	5	3	25	75	100	5	
	Core-10	U23MA510	Real Analysis	5	3	25	75	100	5	
	Core-11	U23MA511	Transform Techniques	5	3	25	75	100	5	
	Core-12 Major Project	U23MA5MP	Major Group Project with Viva-Voce	6	3	40	60	100	5	
	Core Elective-1	U23MA5E1A	Combinatorial Mathematics							
		U23MA5E1B	Discrete Mathematics	4	3	25	75	100	3	
		U23MA5E1C	Operations Research - I							
	Core Elective -2	U23MA5E2A	Numerical Methods							
U23MA5E2B		Fourier Transforms	3	3	25	75	100	2		
U23MA5E2C		Astronomy								
PART-IV	Skill Enhancement Course SEC6 (DSC)	U23MA5SP2	Object oriented Programming with C++ Practical	2	2	-	50	50	1	
	Internship/ Institutional Training/ Mini Project	U23MA5IT	Internship/ Institutional Training/ Mini Project	-	-	40	60	100	2	
	Proficiency Enhancement Courses (Self-Study Course - Online)	U23GS5SS	General Studies	-	-	-	-	Com pletio n	2	
		MOOC - Spoken Tutorial		-	-	-	-	Com pletio n	2	
<b>TOTAL</b>				<b>30</b>				<b>750</b>	<b>32</b>	
<b>Semester-VI</b>										
	Core-13	U23MA613	Linear Algebra	6	3	25	75	100	5	
	Core-14	U23MA614	Complex Analysis	6	3	25	75	100	5	

PART-III	Core-15	U23MA615	Mechanics	6	3	25	75	100	5
	Core Elective-3	U23MA6E3A	Number Theory	5	3	25	75	100	3
		U23MA6E3B	Mathematical Modelling						
		U23MA6E3C	Fuzzy Sets & its Applications						
	Core Elective-4	U23MA6E4A	Graph Theory and its Applications	5	3	25	75	100	3
U23MA6E4B		Operations Research-II							
U23MA6E4C		Introduction to Machine Learning							
Comprehension-III (Self Study Course-Online Exam)	U23MA6C3	Comprehension in Mathematics-III	-	1	-	50	50	1	
PART-IV	Professional Competency Skill(SEC7)	U23MA6SP3	Introduction to GeoGebra	2	2	-	50	50	2
	Extra Department Course open Elective-Self Study Course	To be selected from the courses offered by other departments		-	3	-	100	100	3
PART-V	Extension Activities-NSS/ YRC/ Physical Education			-	-	-	-	Completion	1
	NCC*			-	-	-	-	-	
<b>TOTAL</b>				<b>30</b>				<b>700</b>	<b>28</b>
<b>GRAND TOTAL</b>								<b>4350</b>	<b>150</b>

\*As per UGC Norms, for those students who opt NCC under extension activities will be studying the prescribed syllabus of the UGC which will include theory, practical and camp components. Such students who qualify the prescribed requirements will earn an additional 24 credits.

## Part-III B.Sc. Mathematics / Semester – III /

### Core-5: VECTOR CALCULUS AND ITS APPLICATIONS (U23MA305)

<b>Lecture Hours</b>	<b>:55</b>	<b>Tutorial Hours : 5</b>
<b>Practical Hours</b>	<b>: -</b>	<b>No. of Credits : 4</b>
<b>Contact Hours per Semester</b>	<b>: 60</b>	
<b>Contact hours per Week</b>	<b>: 4</b>	
<b>Internal Marks</b>	<b>: 25</b>	
<b>External Marks</b>	<b>: 75</b>	
<b>Total Marks</b>	<b>: 100</b>	

#### Objectives of the Course

This Course provides

- knowledge about differentiation of vectors, differential operators and derivatives of vector functions.
- the skills for evaluating line, surface and volume integrals.
- the ability to analyze the physical applications of derivatives of vectors.

#### Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the Course, the students will be able to

**CO1** find the derivative of vector and sum of vectors, product of scalar and vector point function and to determine derivatives of scalar and vector products.

**CO2** apply the operator 'del' and to find solenoidal and irrotational vectors.

**CO3** solve simple line integrals.

**CO4** solve surface integrals and volume integrals.

**CO5** verify the theorems of Gauss, Stokes and Greens (Two Dimension).

#### CO - PO and PSO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	2	1	2	1	2	1	2	2
<b>CO2</b>	3	2	2	3	1	1	2	1	2	1
<b>CO3</b>	3	3	3	2	2	2	3	2	3	2
<b>CO4</b>	3	3	3	3	2	3	3	2	3	2
<b>CO5</b>	3	3	3	1	2	3	3	3	3	2
<b>Total Contribution of Cos to POs</b>	<b>15</b>	<b>13</b>	<b>13</b>	<b>10</b>	<b>9</b>	<b>10</b>	<b>13</b>	<b>9</b>	<b>13</b>	<b>9</b>
<b>Weighted Percentage of Cos contribution to POs</b>	<b>100</b>	<b>86.67</b>	<b>100</b>	<b>66.67</b>	<b>60</b>	<b>66.67</b>	<b>86.67</b>	<b>60</b>	<b>86.67</b>	<b>60</b>

0-No Correlation

1-Weak

2-Moderate

3-Strong

## Course Content

### Unit I Vector Differentiation (L – 11hrs; T – 1 hr)

Vector point function - Scalar point function - Derivative of a vector and derivative of a sum of vectors - Derivative of a product of a scalar and a vector point function - Derivative of a scalar product and vector product.

### Unit II Gradient (L – 11hrs; T – 1 hr)

The vector operator 'del', The gradient of a scalar point function – Divergence of a vector - Curl of a vector – solenoidal and irrotational vectors – simple applications.

### Unit III Line integrals (L – 11hrs; T – 1 hr)

Laplacian operator - Line integral - simple problems.

### Unit IV Surface and Volume Integral (L – 11hrs; T – 1 hr)

Surface integral - Volume integral – Applications.

### Unit V Applications (L – 11hrs; T – 1 hr)

Gauss divergence Theorem, Stokes Theorem, Green's Theorem in two dimensions – Applications to real life situations.

### Recommended Text

1. Arumugam S and Others, *Analytical Geometry 3D and Vector Calculus*, New Gamma Publications, Palayamkottai, 2008.
2. Raisinghania.M.D., Saxena.H.C., Dass.H.K., *Vector Calculus*, S.Chand publications, 1999.

### Reference Books

1. Susan J.C, *Vector Calculus*, (4<sup>th</sup> Edn.), Pearson Education, Boston, 2012.
2. Gorguis A, *Vector Calculus for College Students*, Xilbius Corporation, 2014.
3. Marsden J.E and Tromba A, *Vector Calculus*, (5<sup>th</sup>edn.) W.H. Freeman, New York, 1988.

### Website and E-learning Sources

1. <https://nptel.ac.in>
2. [https://mate.unipv.it/moiola/ReaDG/VC2016/VectorCalculus\\_LectureNotes\\_2016.pdf](https://mate.unipv.it/moiola/ReaDG/VC2016/VectorCalculus_LectureNotes_2016.pdf)



**Part-III B.Sc. Mathematics / Semester – III /**

**Core-6: DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS**

**(U23MA306)**

<b>Lecture Hours</b>	<b>: 55</b>	<b>Tutorial Hours: 5</b>
<b>Practical Hours</b>	<b>: -</b>	<b>No. of Credits : 4</b>
<b>Contact Hours per Semester</b>	<b>: 60</b>	
<b>Contact hours per Week</b>	<b>: 4</b>	
<b>Internal Marks</b>	<b>: 25</b>	
<b>External Marks</b>	<b>: 75</b>	
<b>Total Marks</b>	<b>: 100</b>	

**Objectives of the Course**

This Course provides

- knowledge about the methods of solving Ordinary and Partial Differential Equations.
- the knowledge to understand how differential equations can be used as a powerful tool in solving problems in science.

**Course Learning Outcomes (for Mapping with POs and PSOs)**

On completion of the Course, the students will be able to

- CO1** remember and understand the concepts of ordinary differential equation and partial differential equations.
- CO2** demonstrate first order higher degree equations, second order linear equations, homogenous equations, formation of PDE and application of differential equations.
- CO3** analyze the simultaneous differential equations, differential equation with constant coefficient, linear equations with variable coefficient, different solutions of PDE, growth and decay problems.
- CO4** evaluate the solutions of differential equations using different forms, standard form of PDE, linear equations, particular integral and simultaneous differential equation.
- CO5** solve simultaneous differential equation, homogeneous equation, Lagrange’s equation, Brochistocrone problem.

**CO - PO and PSO Mapping (Course Articulation Matrix)**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PSO 1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	3	2	2	2	3	2	1	2	2	2
<b>CO2</b>	3	2	2	2	2	1	3	2	2	2
<b>CO3</b>	3	3	3	2	1	3	2	2	2	2
<b>CO4</b>	3	1	3	1	2	2	2	1	1	2
<b>CO5</b>	3	3	3	2	1	2	2	2	2	2
<b>Total Contribution of Cos to POs</b>	<b>15</b>	<b>11</b>	<b>13</b>	<b>9</b>	<b>9</b>	<b>10</b>	<b>10</b>	<b>9</b>	<b>9</b>	<b>10</b>
<b>Weighted Percentage of Cos contribution to POs</b>	<b>100</b>	<b>73.33</b>	<b>86.67</b>	<b>60</b>	<b>60</b>	<b>66.67</b>	<b>66.67</b>	<b>60</b>	<b>60</b>	<b>66.67</b>

**0-No Correlation**

**1-Weak**

**2-Moderate**

**3-Strong**

## Course Content

### Unit I First order Higher Degree Equations (L-11 hrs; T- 1 hr)

First order higher degree equations – solvable for  $x$ ,  $y$ ,  $p$  and Clairaut's form – Simultaneous differential equations of the form  $f_1(D)x + g_1(D)y = h_1(t)$ ,  $f_1(D)x + g_2(D)y = h_2(t)$ .

Chapter IV - Sections: 1 – 4 & 6.

### Unit II Ordinary differential Equations (L-11 hrs; T-1 hr)

Ordinary differential equation, second order linear differential equations with constant coefficients – Find the P.I for functions of the form  $e^{ax}f(x)$  and  $x^n f(x)$ .

Chapter V - Sections: 1 – 4.

### Unit III Linear Equations (L-11 hrs; T- 1 hr)

Linear equations of second order with variable coefficients – Homogeneous equations – Equation reducible to homogeneous equation.

Chapter V - Sections: 5, 6.

### Unit IV Partial differential Equations (L-11 hrs; T-1 hr)

Partial differential equations Formation of equations by elimination of arbitrary constants and functions – Definition of general, particular and complete solutions – solving standard forms  $f(p, q) = 0$ ,  $f(x, p, q) = 0$ ,  $f(y, p, q) = 0$ ,  $f(z, p, q) = 0$ ,  $f(x, p) = f(y, q)$ ,  $z = px + qy + f(p, q)$  – Lagrange's differential equations  $Pp + Qq = R$ .

Chapter XII - Sections: 1 - 4 & 5.1 - 5.4.

### Unit V Application of Differential Equations (L-11 hrs; T-1 hr)

Application of differential equations – Growth and Decay – chemical reaction - Newton's law of cooling – Brochistocrone problem – simple electric circuits.

Chapter III - Sections: 1, 4, 6.

## Recommended Text

1. Narayanan S and Manickavachagam Pillai T.K, *Differential equations and its applications*, S. Viswanathan Printers, Chennai, 2003.
2. Arumugam S & Thangapandi Isaac. A, *Differential Equation and Applications*, New Gamma Publication House, Palayamkottai, 2003.

## Reference Books

1. Kandasamy P and Thilagavathi K, *Mathematics for B.Sc, Vol. III*, S.Chand and Co, New Delhi, 2004.
1. Braun M, III edition, *Differential Equations and their applications*, Springer Verlag, New York, 1983.
2. Viorel Barbu, *Differential Equations*, Springer, 2016.

## Website and E-learning Sources

1. <https://www.math.ust.hk/~machas/differential-equations.pdf>
2. <https://link.springer.com/content/pdf/bbm%3A978-0-387-29903-7%2F1.pdf>

**Part-III B.Sc. Mathematics / Semester – III /**

**Elective Generic-3(Allied): MATHEMATICAL STATISTICS  
(U23MA3A3)**

<b>Lecture Hours</b>	<b>: 55</b>	<b>Tutorial Hours: 05</b>
<b>Practical Hours</b>	<b>: -</b>	<b>No. of Credits : 3</b>
<b>Contact Hours per Semester</b>	<b>: 60</b>	
<b>Contact hours per Week</b>	<b>: 4</b>	
<b>Internal Marks</b>	<b>: 25</b>	
<b>External Marks</b>	<b>: 75</b>	
<b>Total Marks</b>	<b>: 100</b>	

**Objectives of the Course**

The Course provides

- the knowledge of statistical tools to analyze and interpret the data.

**Course Learning Outcomes (for Mapping with POs and PSOs)**

On completion of the Course, the students will be able to

**CO1** remember and understand the concepts of Moments, Skewness, Kurtosis, Correlation, Regression, Theory of Attributes, Random variables and some special distribution functions.

**CO2** calculate Moments, Skewness, Kurtosis, Correlation, Regression, consistency of data. Apply the least square principle for fitting straight lines, theorems on expectations and the properties of some special distribution functions.

**CO3** analyze Moments, Skewness, Kurtosis, the properties of Correlation and Regression, criteria for independent, theory of attributes, random variables and some special distribution functions.

**CO4** evaluate the problems in Moments, Skewness, Kurtosis, correlation, Regression, theory of attributes, random variables and some special distribution functions.

**CO5** find the solutions in statistical problems using Moments, Skewness, Kurtosis, the properties of Correlation and Regression, theory of attributes, random variables and some special distribution functions.

**CO - PO and PSO Mapping (Course Articulation Matrix)**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	3	2	2	2	2	2	2	2	2	3
<b>CO2</b>	3	2	2	2	2	2	2	2	2	2
<b>CO3</b>	3	3	3	2	3	3	3	3	2	1
<b>CO4</b>	3	1	3	1	1	1	3	1	1	2
<b>CO5</b>	3	3	3	2	3	2	3	2	2	1
<b>Total Contribution of Cos to POs</b>	<b>15</b>	<b>11</b>	<b>13</b>	<b>9</b>	<b>11</b>	<b>10</b>	<b>13</b>	<b>10</b>	<b>9</b>	<b>9</b>
<b>Weighted Percentage of Cos contribution to POs</b>	<b>100</b>	<b>73.33</b>	<b>86.67</b>	<b>60</b>	<b>73.33</b>	<b>66.67</b>	<b>86.67</b>	<b>66.67</b>	<b>60</b>	<b>60</b>

**0-No Correlation**

**1-Weak**

**2-Moderate**

**3-Strong**

## Course Content

### Unit I Moments (L-11 hrs; T-1 hr)

Moments, Skewness and Kurtosis - Curve fitting : Principle of least squares - Fitting a straight line.

Chapters: 4 & 5

### Unit II Correlation and Regression (L-11 hrs; T-1 hr)

Correlation and Regression – Karl Pearson’s coefficient of correlation – Properties – Lines of Regression – Coefficient of Regression and properties – Rank Correlation.

Chapter: 6

### Unit III Theory of Attributes (L-11 hrs; T-1 hr)

Association of Attributes – Consistency of data – criteria for independence – Yule’s coefficient of Association.

Chapter: 8

### Unit IV Random variables (L-11 hrs; T-1 hr)

Random variable – Distribution function – properties of Distribution function – Mathematical Expectation – Addition theorem of Expectation – Multiplication theorem of Expectation – Moment generating function – cumulants – characteristic function -Properties of characteristic function.

Chapter: 12

### Unit V Some special distributions (L-11 hrs; T-1 hr)

Binomial and Poisson Distribution and their moments, Generating function, characteristic function, properties and simple applications. Normal Distribution – Standard normal distribution and their properties – simple problems.

Chapter 13: 13.1- 13.3

### Recommended Text

1. Arumugam S and Thangapandi Isaac. A., *Statistics*, New Gamma Publishing House, Palayamkkottai, 2011.

### Reference Books

1. Gupta. S.C. and Kapoor. V.K., *Fundamentals of Mathematical Statistics*, Eleventh edition, Sultan Chand & sons, New Delhi, 2002.
2. Vittal P.R., *Mathematical Statistics*, Margham Publications, Chennai, 2013.
3. Sanchati D.C & Kapoor, *Statistics*, Seventh Edition, Sultan Chand & Co,1997.

### Website and E-learning Sources

1. <https://milnepublishing.geneseo.edu/natural-resources-biometrics/chapter/chapter-7-correlation-and-simple-linear-regression/>
2. <https://www.britannica.com/science/statistics/Random-variables-and-probability-distributions>

### Part-III B.Sc. Mathematics / Semester – III /

#### Elective Generic Lab - 3 (Allied Lab): STATISTICS WITH R PROGRAMMING (U23MA3AP)

<b>Lecture Hours</b>	<b>: -</b>	<b>Tutorial Hours: -</b>
<b>Practical Hours</b>	<b>: 30</b>	<b>No. of Credits : 1</b>
<b>Contact Hours per Semester</b>	<b>: 30</b>	
<b>Contact hours per Week</b>	<b>: 2</b>	
<b>Internal Marks</b>	<b>: 40</b>	
<b>External Marks</b>	<b>: 60</b>	
<b>Total Marks</b>	<b>: 100</b>	

#### Objectives of the Course

This Course provides

- knowledge about the analysis of data using R Programming.

#### Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the Course, the students will be able to

**CO1** understand the fundamental syntax of R.

**CO2** demonstrate the measures of central tendency dispersion..

**CO3** calculate the correlation and regression coefficients.

**CO4** analyze the distribution and fitting of distribution (Binomial, Poisson and Normal).

**CO5** compute basic tendencies of statistics and produce data visualizations.

#### CO - PO and PSO Mapping (Course Articulation Matrix)

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	3	2	2	2	3	2	3	2	3	2
<b>CO2</b>	2	3	3	2	3	3	2	3	3	2
<b>CO3</b>	3	2	3	2	2	2	3	2	2	2
<b>CO4</b>	2	3	3	3	3	3	3	3	3	3
<b>CO5</b>	3	2	3	2	2	3	2	2	2	2
<b>Total Contribution of Cos to POs</b>	<b>13</b>	<b>12</b>	<b>14</b>	<b>11</b>	<b>13</b>	<b>13</b>	<b>13</b>	<b>12</b>	<b>13</b>	<b>11</b>
<b>Weighted Percentage of Cos contribution to POs</b>	<b>86.67</b>	<b>80</b>	<b>93.33</b>	<b>73.33</b>	<b>86.67</b>	<b>86.67</b>	<b>86.67</b>	<b>80</b>	<b>86.67</b>	<b>73.33</b>

**0-No Correlation**

**1-Weak**

**2-Moderate**

**3-Strong**

## List of Practicals

1. Construct the diagrammatic representations of data.
2. Construction of frequency distribution of discrete series and continuous series.
3. Computation of measures of central tendency dispersion.
4. Calculation of correlation coefficients (Karl Pearson's coefficient of correlation and Spearman rank correlation coefficient).
5. Calculation of regression coefficients (simple linear regression).
6. Identify the distribution and fitting of distribution (Binomial, Poisson and Normal).
7. Estimation of population mean and variance (simple random sampling, stratified random sampling and systematic random sampling).

(All the practicals are compulsory)

## Recommended Text

1. Arumugam S and Thangapandi Isaac. A., *Statistics*, New Gamma Publishing House, Palayamkottai, 2011.
2. Murali Mohan, *Statistics with R Programming – A Beginners Guide*, S. Chand Publications, New Delhi, 2018.

## Reference Books

1. Srinivasa K G, Siddesh G M, Chetan Shetty, Sowmya B J, *Statistical Programming in R*, Oxford University Press, New Delhi, 2017.
2. Gupta. S.C. and Kapoor. V.K., *Fundamentals of Mathematical Statistics*, Eleventh edition, Sultan Chand & sons, New Delhi, 2002.
3. Sandip Rakshit, *Statistics with R Programming*, McGraw Hill India, First Edition, 2018.

## Website and E-learning Sources

1. <https://www.stats.ox.ac.uk/~evans/Rprog/LectureNotes.pdf>
2. <https://www.dcehvpvm.org/E-Content/Stat/FUNDAMENTAL%20OF%20MATHEMATICAL%20STATISTICS-S%20C%20GUPTA%20&%20V%20K%20KAPOOR.pdf>

## Part-IV B.Sc. Mathematics / Semester – III /

### Skill Enhancement Course SEC4 (DSC): MATLAB (U23MA3SP1)

<b>Lecture Hours</b>	: -	<b>Tutorial Hours</b>	: -
<b>Practical Hours</b>	: 30	<b>No. of Credits</b>	: 2
<b>Contact Hours per Semester</b>	: 30		
<b>Contact hours per Week</b>	: 2		
<b>Internal Marks</b>	: 50		
<b>External Marks</b>	: -		
<b>Total Marks</b>	: 50		

### Objectives of the Course

This Course provides

- knowledge about the use of MATLAB.
- in modern computing environments the tool to solve mathematical problems.

### Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the Course, the students will be able to

**CO1** understand the basic commands of MATLAB to find the addition of two matrices and transpose of a matrix.

**CO2** apply the concepts in linear algebra to find determinant of matrix and multiplication of matrix.

**CO3** analyze the specific features to plot a function, polarplot, straight line fit, exponential curve fitting.

**CO4** determine eigen values and eigen vectors.

**CO5** compose matrix factorization.

### CO - PO and PSO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	3	2	3	3	3	2	3	2
<b>CO2</b>	3	2	3	2	3	3	3	2	3	2
<b>CO3</b>	1	2	1	2	1	1	2	1	1	1
<b>CO4</b>	3	2	2	2	3	2	-	3	2	3
<b>CO5</b>	3	2	3	2	3	3	2	2	3	2
<b>Total Contribution of Cos to POs</b>	<b>13</b>	<b>10</b>	<b>12</b>	<b>10</b>	<b>13</b>	<b>12</b>	<b>10</b>	<b>10</b>	<b>12</b>	<b>10</b>
<b>Weighted Percentage of Cos contribution to POs</b>	<b>86.67</b>	<b>66.67</b>	<b>80</b>	<b>66.67</b>	<b>86.67</b>	<b>80</b>	<b>66.67</b>	<b>66.67</b>	<b>80</b>	<b>66.67</b>

**0-No Correlation**

**1-Weak**

**2-Moderate**

**3-Strong**

## List of Practicals

1. To find the addition of two matrices
2. Transpose of a matrix
3. Matrix multiplication
4. Finding the determinant of a matrix
5. Plotting a function
6. Polar plot
7. Straight line fit
8. Exponential curve fitting
9. Finding Eigen values and Eigen vectors of a matrix
10. Matrix Factorizations

(All the practicals are compulsory)

### Recommended Text

1. Rudra Pratap, *Getting Started with MATLAB - A Quick Introduction for Scientists and Engineers*, Oxford University Press, 2003.

### Reference Books

1. William John Palm, *Introduction to Matlab 7 for Engineers*, McGraw-Hill Professional.
2. Dolores M. Etter, David C. Kuncicky, *Introduction to MATLAB 7*, Prentice Hall, 2005.
3. Amos Gilat, *MATLAB: An Introduction with Applications*, Wiley Publications, Fourth edition, 2012.

### Website and E-learning Sources

1. <https://m.njit.edu/Undergraduate/Matlab/M111MATLAB2S08/>
2. [https://www.youtube.com/watch?v=2cSFKSLPqBA&ab\\_channel=ScientificRana](https://www.youtube.com/watch?v=2cSFKSLPqBA&ab_channel=ScientificRana)



**Part-III B.Sc. Mathematics / Semester – IV /**

**Core-7: INDUSTRY MODULE – INDUSTRIAL STATISTICS  
(U23MA407)**

<b>Lecture Hours</b>	<b>: 55</b>	<b>Tutorial Hours: 05</b>
<b>Practical Hours</b>	<b>: -</b>	<b>No. of Credits : 4</b>
<b>Contact Hours per Semester</b>	<b>: 60</b>	
<b>Contact hours per Week</b>	<b>: 4</b>	
<b>Internal Marks</b>	<b>: 25</b>	
<b>External Marks</b>	<b>: 75</b>	
<b>Total Marks</b>	<b>: 100</b>	

**Objectives of the Course**

This Course provides

- the knowledge of index numbers, distribution functions, Analysis of variance and Statistical Quality Control.

**Course Learning Outcomes (for Mapping with POs and PSOs)**

On completion of the Course, the students will be able to

**CO1** remember and understand the concepts of Index Numbers, Test of significance for the large sample and small sample, Type I and Type II Errors, analysis of variance and statistical quality control.

**CO2** explain Index Numbers, apply the concept of Null hypothesis and Alternate hypothesis to find the test of significance for the large and small samples, apply one way, two way classification method, Latin square principle. Mean chart, Range chart P-chart.

**CO3** analyze Unit test, Commodity Reversal test, Time Reversal test, circular test, test of significance for large and small samples.

**CO4** evaluate Index Numbers, analyse the variance using Mean chart, Range chart, P-chart, Goodness of fit.

**CO5** find the solution for statistical problems using analysis of variance and SQC.

**CO - PO and PSO Mapping (Course Articulation Matrix)**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PSO 1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	3	2	3	3	3	3	2	3	3	3
<b>CO2</b>	2	3	3	3	3	3	3	2	2	2
<b>CO3</b>	2	3	2	2	3	3	1	2	3	1
<b>CO4</b>	3	3	2	2	3	2	2	3	1	1
<b>CO5</b>	2	3	3	3	2	2	2	3	3	3
<b>Total Contribution of Cos to POs</b>	<b>12</b>	<b>14</b>	<b>13</b>	<b>13</b>	<b>14</b>	<b>13</b>	<b>9</b>	<b>13</b>	<b>12</b>	<b>10</b>
<b>Weighted Percentage of Cos contribution to POs</b>	<b>80</b>	<b>93.33</b>	<b>86.67</b>	<b>86.67</b>	<b>93.33</b>	<b>86.67</b>	<b>60</b>	<b>86.67</b>	<b>80</b>	<b>66.67</b>

**0-No Correlation**

**1-Weak**

**2-Moderate**

**3-Strong**

## Course Content

### **Unit I Index Numbers (L-11 hrs; T-1 hr)**

Characteristics of index numbers – Laspeyer's and Paasche's – Fisher's and Bowley's Marshall and Edgeworth's index numbers – Tests: Unit test, Commodity Reversal test, Time Reversal test, circular test.

**Chapter: 9**

### **Unit II Test of significance (large samples) (L-11 hrs; T-1 hr)**

Testing of Hypothesis – Null hypothesis and Alternate hypothesis – Type I and Type II errors - Critical Region, Level of significance – Test of significance for large samples – Testing a single proportion – Difference of proportions. Testing a single mean and Difference of means.

**Chapter: 14**

### **Unit III Test of significance (small samples) (L-11 hrs; T-1 hr)**

Tests based on t-distribution – single mean and Difference of means – Tests based on F-distribution – Variance Ratio test – Tests based on Chi-square Distribution – Independence – Goodness of fit.

**Chapter: 15**

### **Unit IV Analysis of variance (L-11 hrs; T-1 hr)**

**Analysis of variance:** one Criteria of classification, Two criteria of classification - Latin square – simple problems.

**Chapter: 17**

### **Unit V Statistical Quality control (L-11 hrs; T-1 hr)**

**Statistical Quality control:** Definition – uses of SQC, Process control – Control chart: Mean chart, Range chart, P-chart, Product Control – Acceptance sampling plans.

**Chapter 21 - Sections: 21.1-21.8, 21.11 and 21.14 (Book 2)**

## **Recommended Text**

1. Arumugam. S and Thangapandi Isaac. A., *Statistics*, New Gamma Publishing House, Palayamkottai, 2011.
2. Gupta S.C. and Kapoor V.K., *Fundamentals of Mathematical Statistics*, Eleventh edition, Sultan Chand & sons, New Delhi, 2007.

## **Reference Books**

1. Vittal. P.R., 2013, *Mathematical Statistics*, Margham Publications, Chennai, 2013.
2. Sanchati D. C & Kapoor, 1997, *Statistics*, 7th edition Sultan Chand & Co.
3. David freedman, Robert Pisani, Roger Purves, *Statistics*, Fourth Edition.

## **Website and E-learning Sources**

1. <https://static1.squarespace.com/static/55624f9fe4b0077f89b6ed3d/t/5574e56ee4b0af3076142f69/1433724270410/7-Stat-large-sample-hypothesis.pdf>
2. [http://www.swlearning.com/quant/asw/embs\\_2e/statistics\\_chapter.pdf](http://www.swlearning.com/quant/asw/embs_2e/statistics_chapter.pdf)

## Part-III B.Sc. Mathematics / Semester – IV /

### Core-8: ELEMENTS OF MATHEMATICAL ANALYSIS (U23MA408)

<b>Lecture Hours</b>	<b>: 55</b>	<b>Tutorial Hours: 5</b>
<b>Practical Hours</b>	<b>: -</b>	<b>No. of Credits : 4</b>
<b>Contact Hours per Semester</b>	<b>: 60</b>	
<b>Contact hours per Week</b>	<b>: 4</b>	
<b>Internal Marks</b>	<b>: 25</b>	
<b>External Marks</b>	<b>: 75</b>	
<b>Total Marks</b>	<b>: 100</b>	

#### Objectives of the Course

The Course deals with

- types and properties of sequences and series of real numbers.

#### Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the Course, the students will be able to

**CO1** define sequences and series and understand these concepts.

**CO2** demonstrate the behavior of sequence and series.

**CO3** illustrate the concept of convergence and divergence and analyze some test of convergence and divergence.

**CO4** evaluate the problems on sequences and series.

**CO5** create the new sequences using the number series concept.

#### CO - PO and PSO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO2	PSO3
<b>CO1</b>	2	2	2	2	1	2	1	2	2	2
<b>CO2</b>	1	2	2	3	2	3	2	3	2	3
<b>CO3</b>	2	2	2	2	1	1	1	2	2	2
<b>CO4</b>	2	3	1	3	3	1	2	3	3	3
<b>CO5</b>	3	3	3	1	2	2	3	3	3	1
<b>Total Contribution of Cos to POs</b>	<b>10</b>	<b>12</b>	<b>10</b>	<b>11</b>	<b>9</b>	<b>9</b>	<b>9</b>	<b>13</b>	<b>12</b>	<b>11</b>
<b>Weighted Percentage of Cos contribution to POs</b>	<b>66.67</b>	<b>80</b>	<b>66.67</b>	<b>73.33</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>86.67</b>	<b>80</b>	<b>73.33</b>

0-No Correlation

1-Weak

2-Moderate

3-Strong

## Course Content

### Unit I Sequences (L - 11 hrs; T- 1 hr)

Sequences - Bounded Sequences – Monotonic Sequences – Convergent Sequences – Divergent and Oscillating Sequences.

Sections: 3.1 – 3.5

### Unit II Monotonic Sequences (L - 11 hrs; T- 1 hr)

The Algebra of Limits- Theorems and Problems - Behaviour of Monotonic Sequences – The Geometric Sequence – Problems.

Sections: 3.6 & 3.7

### Unit III Cauchy's First Limit and Second Limit Theorem (L - 11 hrs; T- 1 hr)

Cauchy's first limit theorem – Cauchy's second limit theorem – Cesaro's theorem – subsequences - Cauchy sequence – Cauchy's general principle of convergence.

Sections: 3.8, 3.9 & 3.11

### Unit IV Series of Positive Terms (L - 11 hrs; T - 1 hr)

Infinite series –  $n^{\text{th}}$  term test – Comparison test – Kummer's test – D'Alembert's ratio test – Raabe's test - Gauss test – Root test.

Sections: 4.1 – 4.3

### Unit V Series of Arbitrary Terms (L- 11 hrs; T- 1 hr)

Alternating series – Leibnitz's test - Tests for convergence of series of arbitrary terms – Multiplication of series – Abel's Theorem - Mertens theorem.

Sections: 5.1, 5.3 & 5.5

### Recommended Text

1. Arumugam S and Thangapandi Issac, *Sequences and Series*, New Gamma Publishing House, Palayamkottai, 2002.

### Reference Books

1. Goldberg R, *Methods of Real Analysis*, Oxford and IBH Publishing Co., New Delhi, 1970.
2. Shanti Narayanan, M.D. Rai Singhanian, *Elements of Real Analysis*, Eighth Revised Edition, S.Chand and Company Ltd., New Delhi, 2007.
3. Walter Rudin, *Principles of Mathematical Analysis*, third edition, 1976.

### Website and E-learning Sources

1. <https://www.youtube.com/watch?v=zNn93sWGSWk>
2. <https://www.youtube.com/watch?v=dGpGqrVGeJA>

**Part-III B.Sc. Mathematics / Semester – IV /**

**Elective Generic-4 (Allied): PROGRAMMING LANGUAGE**

**WITH C (U23MA4A4)**

<b>Lecture Hours</b>	<b>: 55</b>	<b>Tutorial Hours: 5</b>
<b>Practical Hours</b>	<b>: -</b>	<b>No. of Credits : 3</b>
<b>Contact Hours per Semester</b>	<b>: 60</b>	
<b>Contact hours per Week</b>	<b>: 4</b>	
<b>Internal Marks</b>	<b>: 25</b>	
<b>External Marks</b>	<b>: 75</b>	
<b>Total Marks</b>	<b>: 100</b>	

**Objectives of the Course**

This Course

- trains the students to run simple C programmes.
- helps the students to solve large and complex problem in reasonable time.
- enable the students to learn a language that is well suited for both systems software and business packages.

**Course Learning Outcomes (for Mapping with POs and PSOs)**

On completion of the Course, the students will be able to

**CO1** remember and understand commands and operators of C language.

**CO2** develop knowledge about textual information, Characters and Strings.

**CO3** apply C declarations, Operators and Expressions, Managing inputs and output operations, arrays and user defined functions to solve the problems in mathematical sciences.

**CO4** analyze mathematical problems using C operators and arrays.

**CO5** evaluate the mathematical problems using the concepts of C programming.

**CO - PO and PSO Mapping (Course Articulation Matrix)**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PSO 1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	3	2	3	3	3	3	3	3	2	3
<b>CO2</b>	2	3	3	3	3	3	3	2	3	3
<b>CO3</b>	3	3	3	3	2	3	2	3	3	3
<b>CO4</b>	3	3	2	2	3	2	3	2	3	3
<b>CO5</b>	2	2	3	3	3	3	3	3	3	2
<b>Total Contribution of Cos to POs</b>	<b>13</b>	<b>13</b>	<b>14</b>	<b>14</b>	<b>14</b>	<b>14</b>	<b>14</b>	<b>13</b>	<b>14</b>	<b>14</b>
<b>Weighted Percentage of Cos contribution to POs</b>	<b>86.67</b>	<b>86.67</b>	<b>93.33</b>	<b>93.33</b>	<b>93.33</b>	<b>93.33</b>	<b>93.33</b>	<b>86.67</b>	<b>93.33</b>	<b>93.33</b>

**0-No Correlation**

**1-Weak**

**2-Moderate**

**3-Strong**

## Course Content

### Unit I Introduction to C Language

(L-11 hrs; T-1 hr)

Introduction – Character Set – C tokens – Keywords and Identifiers – Identifiers – Constants – Variables – Data types – Declaration of Variables – Declaration of Storage Class – Assigning Values to Variables – Defining Symbolic Constants – Declaring Variable Constant.

**Chapter 2 - Sections: 2.1 – 2.12.**

### Unit II Operators and Expressions

(L-11 hrs; T-1 hr)

Introduction – Arithmetic Operators – Relational Operators – Logical Operators – Assignment Operators – Increment and Decrement Operators – Conditional Operator – Bitwise Operators – Special Operators – Arithmetic Expressions – Evaluation of Expressions – Precedence of Arithmetic Expressions.

**Chapter 3 – Sections: 3.1 – 3.12.**

### Unit III Managing Input and Output Operations

(L-11 hrs; T-1 hr)

getchar() – putchar() – scanf() – printf().

**Decision Making and Branching:-** Introduction – Decision Making with IF

Statement – Simple IF statement – The IF...Else Statement – Nesting of IF...

Else Statements – The ELSE IF ladder – The Switch Statement – The ?: Operator – The GOTO statement. **Decision Making and Looping:-** Introduction – The WHILE Statement – The DO Statement – The FOR statement – Jumps in Loops.

**Chapter – 4, 5, 6 (Sections: 5.1 – 5.9 & 6.1 – 6.4)**

### Unit IV Arrays

(L-11 hrs; T-1 hr)

Introduction – One-dimensional arrays – Declaration of One dimensional arrays – Initialization of One- dimensional arrays - Two-dimensional arrays – Initialization of Two-dimensional arrays – Multi-dimensional arrays. Character Arrays and Strings:- Introduction – Declaring and Initializing String Variables – Reading Strings from Terminal – Writing Strings to Screen – String Handling Functions.

**Chapter - 7, 8 Sections- 7.1 – 7.7 & 8.1 – 8.4, 8.8.**

### Unit V User-Defined functions

(L-11 hrs; T-1 hr)

Introduction – Need for User-defined functions – Definition of functions – Return Values and their Types – Function

Calls – Function Declaration – Category of functions – No Arguments and No return values –

Arguments but No return Values – Arguments with return values – No arguments but a return a value – Recursion – The Scope, Visibility and lifetime of a variables.

**Chapter 9: Sections: 9.1, 9.2 & 9.5 - 9.13, 9.16, 9.19.**

### Recommended Text

1. Balagurusamy E, *Programming in ANSI C* – 6th Edition- Tata McGraw Hill Publishing Company Limited.

### Reference Books

1. Byron S Gottfried, *Programming with C*, Third Edition, Tata McGraw Hill Education Private Limited.
2. Reema Thareja, *Programming in C*, Oxford University press.
3. Vinoth Yadav, *Modern C programming language Advance*.

### Website and E – learning Sources

1. [https://www.vssut.ac.in/lecture\\_notes/lecture1424354156.pdf](https://www.vssut.ac.in/lecture_notes/lecture1424354156.pdf)
2. [http://www.tekkom.dk/w/images/4/42/6272\\_cnote.pdf](http://www.tekkom.dk/w/images/4/42/6272_cnote.pdf)
3. <https://phy.ntnu.edu.tw/~cchen/pdf/ctutor.pdf>

**Part-III B.Sc. Mathematics / Semester – IV**  
**Elective Generic Lab-4 (Allied Lab): PROGRAMMING**  
**LANGUAGE WITH C LAB (U23MA4AP)**

<b>Lecture Hours</b>	<b>: -</b>	<b>Tutorial Hours: -</b>
<b>Practical Hours</b>	<b>: 30</b>	<b>No. of Credits : 1</b>
<b>Contact Hours per Semester</b>	<b>: 30</b>	
<b>Contact hours per Week</b>	<b>: 2</b>	
<b>Internal Marks</b>	<b>: 40</b>	
<b>External Marks</b>	<b>: 60</b>	
<b>Total Marks</b>	<b>: 100</b>	

### Objectives of the Course

This Course

- provides practical knowledge about C Programming language.
- trains the students to run simple C Programmes, to improve logical thinking.
- helps the students to solve large and complex problem in reasonable time.
- helps to learn a language that is well suited for both systems software and business packages.

### Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the Course, the students will be able to

**CO1** remember and understand commands and operators of C language.

**CO2** apply C declarations, Operators and Expressions, Managing inputs and output operations, arrays and user defined functions to solve the problems in mathematical sciences.

**CO3** analyze mathematical problems using C operators and arrays.

**CO4** evaluate the mathematical problems using the concepts of C programming.

**CO5** develop knowledge about textual information, Characters and Strings.

### CO - PO and PSO Mapping (Course Articulation Matrix)

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PSO 1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	3	2	3	3	3	3	3	3	2	3
<b>CO2</b>	2	3	3	3	3	3	3	2	3	3
<b>CO3</b>	3	3	3	3	2	3	2	3	3	3
<b>CO4</b>	3	3	2	2	3	2	3	2	3	3
<b>CO5</b>	2	2	3	3	3	3	3	3	3	2
<b>Total Contribution of Cos to POs</b>	<b>13</b>	<b>13</b>	<b>14</b>	<b>14</b>	<b>14</b>	<b>14</b>	<b>14</b>	<b>13</b>	<b>14</b>	<b>14</b>
<b>Weighted Percentage of Cos contribution to POs</b>	<b>86.67</b>	<b>86.67</b>	<b>93.33</b>	<b>93.33</b>	<b>93.33</b>	<b>93.33</b>	<b>93.33</b>	<b>86.67</b>	<b>93.33</b>	<b>93.33</b>

**0-No Correlation**

**1-Weak**

**2-Moderate**

**3-Strong**

## List of Practicals

1. Write a C program to convert the temperature from Fahrenheit to Celsius.
2. Write a C program to test whether the given year is leap year or not.
3. Write a C program to read two integers m and n and print the prime numbers in between them.
4. Write a C program to evaluate the series  $e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$
5. Write a C program to arrange the given set of numbers in ascending order.
6. Write a C program to read two matrices and to find the sum and product of the matrices.
7. Write a C program to check whether a given string is Palindrome or not.
8. Write a C program to read the content of a text file and copy it into another file.
9. Write a C program to find the largest number and its location in the given set of numbers using pointers.
10. Write a C program to find Factorial value, Fibonacci, GCD value – Recursion.

(All the practicals are compulsory)

## Recommended Text

1. E. Balagurusamy, *Programming in ANSI C*, 6th Edition, Tata McGraw Hill Publishing Company Limited.
2. Dr. P. Rizwan Ahmed, *Office Automation 2010*, Margham Publications, 2016.

## Reference Books

1. Byron S Gottfried, *Programming with C*, Third Edition, Tata McGraw Hill Education Private Limited.
2. Reema Thareja, *Programming in C*, Oxford University press.
3. Stephen L. Nelson, *Office 2010*, Computer Reference, Tata McGraw Hill Publishing company Ltd.

## Website and E - learning Sources

- [https://www.vssut.ac.in/lecture\\_notes/lecture1424354156.pdf](https://www.vssut.ac.in/lecture_notes/lecture1424354156.pdf)
- [http://www.tekkom.dk/w/images/4/42/6272\\_cnote.pdf](http://www.tekkom.dk/w/images/4/42/6272_cnote.pdf)



**Part-IV B.Sc. Mathematics / Semester – IV**  
**Skill Enhancement Course SEC5 (DSC): MATHEMATICS**  
**FOR COMPETITIVE EXAM (U23MA4S5)**

<b>Lecture Hours</b>	<b>: 25</b>	<b>Tutorial Hours: 5</b>
<b>Practical Hours</b>	<b>:</b>	<b>No. of Credits : 2</b>
<b>Contact Hours per Semester</b>	<b>: 30</b>	
<b>Contact hours per Week</b>	<b>: 2</b>	
<b>Internal Marks</b>	<b>: -</b>	
<b>External Marks</b>	<b>: 50</b>	
<b>Total Marks</b>	<b>: 50</b>	

### Objectives of the Course

This Course aims

- to develop logical thinking and mathematical reasoning.
- to acquire the knowledge of coding and decoding of communication and networking.

### Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the Course, the students will be able to

**CO1** remember and understand some basic mathematical concepts to study the mathematical reasoning.

**CO2** gain knowledge in coding and decoding.

**CO3** analyze the concept of blood relations, puzzle test and family based puzzles.

**CO4** evaluate the problems using logical deduction.

**CO5** solve the problems in reasoning and derive conclusions from passages.

### CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	3	3	3	3	3	3	2	3
<b>CO2</b>	2	3	3	3	3	3	3	3	3	3
<b>CO3</b>	3	3	2	3	2	3	2	3	3	3
<b>CO4</b>	3	3	2	2	2	2	3	2	2	3
<b>CO5</b>	2	2	3	3	3	3	3	3	3	2
<b>Total Contribution of Cos to POs</b>	<b>13</b>	<b>13</b>	<b>13</b>	<b>14</b>	<b>13</b>	<b>14</b>	<b>14</b>	<b>14</b>	<b>13</b>	<b>14</b>
<b>Weighted Percentage of Cos contribution to POs</b>	<b>86.67</b>	<b>86.67</b>	<b>86.67</b>	<b>93.33</b>	<b>86.67</b>	<b>93.33</b>	<b>93.33</b>	<b>93.33</b>	<b>86.67</b>	<b>93.33</b>

**0-No Correlation**

**1-Weak**

**2-Moderate**

**3-Strong**

## Course Content

### **Unit I Relations (L- 5 hrs ; T- 1 hr)**

Blood relation – Deciphering jumbled up descriptions, Relation puzzle and coded relations.

#### **Section I : 5**

### **Unit II Coding and Decodin (L- 5 hrs; T- 1 hr)**

Coding and Decoding – Letter decoding, Direct letter coding, Number/symbol coding – Matrix Coding- Substitution – Deciphering message word codes – Deciphering number and symbol codes for messages – Jumbled coding.

#### **Section I : 4**

### **Unit III Puzzle Test (L- 5 hrs; T- 1 hr)**

Puzzle test: Classification type – Seating/placing arrangements- Comparison type – Sequential order of things – Selection based on given conditions – Family based puzzles.

#### **Section I : 6**

### **Unit IV Logical Deduction (L- 5 hrs; T- 1 hr)**

Logical deduction – Arguments – Assumptions.

#### **Section II : 1, 2 & 3**

### **Unit V Deriving conclusions from passages (L- 5 hrs; T- 1 hr)**

Deriving conclusions from passages – Theme deduction

#### **Section II : 6 & 7**

### **Recommended Text**

1. Aggarwal R.S, *A Modern approach to Verbal & Nonverbal Reasoning*, S. Chand Company Ltd, 2006.

### **Reference Books**

1. Aggarwal R.S, *A Modern approach to Verbal & Nonverbal Reasoning*, S.Chand Company Ltd, 2010.
2. Aggarwal R.S, *A Modern approach to Verbal & Nonverbal Reasoning*, S.Chand Company Ltd, 2019.
3. Abhilasha Khanna, Arvind Sharma , *Quantitative Aptitude and Arithmetic Competitive Exam Book* - Latest Edition, 2024.

### **Website and E-learning Sources**

1. <https://www.youtube.com/watch?v=4RvII-FIVnY>
2. <https://www.youtube.com/watch?v=LRdLhfDupMU>

**ANALYTICAL GEOMETRY (Two & Three Dimensions) (U23MA203)**  
**For the students those admitted in the academic year 2024-2025 and onwards**  
**Course Content**

**UNIT I Direction Cosines** (L – 11 hrs ; T – 1 hr)

Analytical Geometry of 3D – Coordinate system, Direction cosine, direction ratios.

**UNIT II Polar Co-ordinates** (L – 11 hrs ; T – 1 hr)

General polar equation of straight line – Polar equation of a circle given a diameter, Equation of a Straight line, circle, conic – Equation of a chord, tangent, normal. Equations of the asymptotes of a hyperbola.

**UNIT III System of Planes** (L – 11 hrs ; T – 1 hr)

Length of the perpendicular – Orthogonal projection

**UNIT IV Representation of Line** (L – 11 hrs ; T – 1 hr)

Angle between a line and a plane – co-planar lines – shortest distance between two skew lines – length of the perpendicular – intersection of three planes.

**UNIT V Equation of a Sphere** (L – 11 hrs ; T – 1 hr)

Section of a sphere by a plane – equation of the circle – tangent plane – angle of intersection of two spheres – condition for the orthogonality – radical plane.

**Recommended Text**

1. Loney, S. L., *Co-ordinate Geometry*.
2. Manickavachagam Pillay, T. K. and Natarajan., *A text book of Analytical Geometry*, Part-II Three Dimensions, Viswanathan. S(Printers and Publishers) Pvt Ltd., Chennai, 2012.
3. Durai Pandian, *Analytical Geometry 2 Dimension*, Muhil Publication

**Reference Books**

1. Thomas G. B., and Finny, R. L., *Calculus and Analytical Geometry*, Person Publication, 9<sup>th</sup> Edition, 2010.
2. Robert C. Yates, *Analytic Geometry with calculus*, Prentice Hall, Inc., New York, 1961.
3. [Vittal](https://www.scribd.com/document/400803604/ANALYTIC-GEOMETRY-WITH-CALCULUS-pdf), *Analytical Geometry 2D and 3D*, Pearson Publication, 1<sup>st</sup> Edition, 2013.

**Website and E – learning Sources**

1. <https://nptel.ac.in>
2. <https://www.scribd.com/document/400803604/ANALYTIC-GEOMETRY-WITH-CALCULUS-pdf>