DEPARTMENT OF MATHEMATICS

COURSE STRUCTURE & SYLLABI
(For the students admitted from year 2023-2024 onwards)

Programme : B.Sc. Mathematics

JAMAL MOHAMED COLLEGE (AUTONOMOUS)
Accredited with A++ Grade by NAAC (4th Cycle) with CGPA 3.69 out of 4.0
(Affiliated to Bharathidasan University)
TIRUCHIRAPPALLI – 620 020

B.Sc. MATHEMATICS

Sem	Course Code	Part	Course Category	Course Title	Ins. Hrs/ Week	Credit	Marks		Total
							CIA	ESE	
I	23U1LT1/LA1/LF1 /LH1/LU1	I	Language - I		6	3	25	75	100
	23UCN1LE1	II	English - I	English for Communication - I	6	3	25	75	100
	23UMA1CC1	III	Core - I	Calculus with SageMath	5	5	25	75	100
	23UMA1CC2		Core - II	Analytical Geometry with Geogebra	3	3	25	75	100
	23UPH1AC1		Allied - I	Fundamentals of Physics	5	4	25	75	100
	23UPH1AC2P		Allied - II	Properties of Matter - Practical	3	2	20	80	100
	23UCN1AE1	IV	AECC - I	Value Education	2	2	-	100	100
				Total	**30**	**22**			**700**
II	23U2LT2/LA2/LF2 /LH2/LU2	I	Language - II		6	3	25	75	100
	23UCN2LE2	II	English - II	English for Communication - II	6	3	25	75	100
	23UMA2CC3P	III	Core - III	Python Programming - Practical	5	5	20	80	100
	23UMA2CC4		Core - IV	Classical algebra with MATLAB	4	4	25	75	100
	23UPH2AC3		Allied - III	Essentials of Physics	4	4	25	75	100
	23UPH2AC4P		Allied - IV	Optical, Thermal and Electricity - Practical	3	2	20	80	100
	23UCN2SS	IV	Soft Skills Development	Soft Skills Development	2	2	-	100	100
	23UCN2CO	V	Community Outreach	JAMCROP	-	@	-	-	@
	23U2BT1 / 23U2AT1		Basic Tamil - I / Advanced Tamil - I	எழுத்தும் இலக்கியமும் அறிமுகம் - I / தமிழ் இலக்கியமும் வரலாறும் - I	-	-	-	100 #	-
	@Only grades will be given			**Total**	**30**	**23**			**700**
III	23U3LT3/LA3/LF3 /LH3/LU3	I	Language - III		6	3	25	75	100
	23UCN3LE3	II	English - III	English for Communication - III	6	3	25	75	100
	23UMA3CC5	III	Core - V	ODE and Laplace Transform with Scilab	4	4	25	75	100
	23UMA3CC6		Core – VI	Vector Calculus and Trigonometry with Scilab	3	3	25	75	100
	23UMA3AC5:1		Allied - V	Mathematical Statistics - I with R	4	4	25	75	100
	23UMA3AC6:1		Allied - VI	Mathematical Statistics - II with R	3	2	25	75	100
	23UMA3GE1	IV	Generic Elective - I		2	2	-	100	100
	23UCN3AE2		AECC - II	Environmental Studies	2	2	-	100	100
				Total	**30**	**23**			**800**
IV	23U4LT4/LA4/LF4 /LH4/LU4	I	Language - IV		6	3	25	75	100
	23UCN4LE4	II	English - IV	English for Communication - IV	6	3	25	75	100
	23UMA4CC7	III	Core - VII	Advanced Calculus	5	5	25	75	100
	23UMA4CC8		Core - VIII	PDE and Fourier series with Maple	3	3	25	75	100
	23UMA4AC7:1		Allied - VII	Statistics for Data Science with R	4	4	25	75	100
	23UMA4AC8P:1		Allied - VIII	Statistical lab using SPSS - Practical	4	2	20	80	100
	23UMA4GE2	IV	Generic Elective - II		2	2	-	100	100
	23UCN4EL		Experiential Learning	Field Visit / Case Study / Survey	-	2	-	100	100
	23UCN4EA	V	Extension Activities	NCC, NSS, etc.	-	1	-	-	-
	23U4BT2 / 23U4AT2		Basic Tamil - II / Advanced Tamil - II	எழுத்தும் இலக்கியமும் அறிமுகம் - II / தமிழ் இலக்கியமும் வரலாறும் - II	-	-	-	100 #	-
				Total	**30**	**25**			**800**
V	23UMA5CC9	III	Core - IX	Mechanics	6	6	25	75	100
	23UMA5CC10		Core - X	Modern Algebra	5	5	25	75	100
	23UMA5CC11		Core - XI	Real Analysis	5	5	25	75	100
	23UMA5CC12		Core - XII	Numerical Methods with Mathematica	5	5	25	75	100
	23UMA5DE1A/B		Discipline Specific Elective - I		5	4	25	75	100
	23UMA5SE1P	IV	Skill Enhancement Course - I	Latex - Practical	2	1	-	100	100
	23UMA5SE2P		Skill Enhancement Course - II	App Development - Practical	2	1	-	100	100
	23UMA5EC1	V	Extra Credit Course - I*	Online Course	-	*	-	-	-
				Total	**30**	**27**			**700**
VI	23UMA6CC13	III	Core - XIII	Linear Algebra	6	6	25	75	100
	23UMA6CC14		Core - XIV	Complex Analysis	6	6	25	75	100
	23UMA6CC15		Core - XV	Number Theory	5	5	25	75	100
	23UMA6PW		Project Work	Group Project	3	2	-	100	100
	23UMA6DE2A/B		Discipline Specific Elective - II		5	4	25	75	100
	23UMA6DE3A/B		Discipline Specific Elective - III		4	4	25	75	100
	23UCN6AE3	IV	AECC - III	Gender Studies	1	1	-	100	100
	23UMA6EC2	V	Extra Credit Course - II*	Online Course	-	*	-	-	-
	23UMAECA		Extra Credit Course for all**	Online Course	-	**	-	-	-
	*** Programme Specific Online Course for Advanced Learners** **** Any Online Course for Enhancing Additional Skills**			**Total**	**30**	**28**			**700**
				Grand Total		**148**			**4400**

GENERIC ELECTIVE COURSES

Semester	Course Code	Course Title
III	23UMA3GE1	Mathematics for Competitive Examination - I
IV	23UMA4GE2	Mathematics for Competitive Examination - II

Self-Study Course – Basic and Advanced Tamil

(Applicable to the candidates admitted from the academic year 2023 -2024 onwards)

Semester	Course Code	Course Title
II	23U2BT1	Basic Tamil – I (எழுத்தும் இலக்கியமும் அறிமுகம் - I)
	23U2AT1	Advanced Tamil – I (தமிழ் இலக்கியமும் வரலாறும் - I)
IV	23U4BT2	Basic Tamil – II (எழுத்தும் இலக்கியமும் அறிமுகம் - II)
	23U4AT2	Advanced Tamil – II (தமிழ் இலக்கியமும் வரலாறும் - II)

Mandatory

Basic Tamil Course - I and II are offered for the students who have not studied Tamil Language in their schools and college.

Advanced Tamil Course - I and II are offered for those who have studied Tamil Language in their schools but have opted for other languages under Part - I.

DISCIPLINE SPECIFIC ELECTIVES

Semester	Course Code	Course Title
V	23UMA5DE1A	Graph Theory
	23UMA5DE1B	Control Theory
VI	23UMA6DE2A	Operations Research
	23UMA6DE2B	Discrete Mathematics
	23UMA6DE3A	Astronomy
	23UMA6DE3B	Fuzzy Set Theory

ALLIED MATHEMATICS FOR B.Sc. COMPUTER SCIENCE

Sem	Course Code	Part	Course	Course Title	Ins. Hrs/ Week	Credit	Marks		Total
							CIA	ESE	
I	23UMA1AC1	III	Allied - I	Linear Algebra and Differential Equations	4	3	25	75	100
	23UMA1AC2		Allied - II	Numerical Methods with Octave	4	3	25	75	100
	Total				**8**	**6**			**200**
II	23UMA2AC3	III	Allied - III	Operations Research	4	3	25	75	100
	23UMA2AC4		Allied - IV	Statistics	3	3	25	75	100
	Total				**7**	**6**			**200**
Grand Total						**12**			**400**

ALLIED MATHEMATICS FOR B.Sc. PHYSICS

Sem	Course Code	Part	Course	Course Title	Ins. Hrs/ Week	Credit	Marks		Total
							CIA	ESE	
III	23UMA3AC5:2	III	Allied - V	Calculus	4	3	25	75	100
	23UMA3AC6:2		Allied - VI	Algebra and Trigonometry	3	3	25	75	100
	Total				**7**	**6**			**200**
IV	23UMA4AC7:2	III	Allied - VII	Differential Equations	4	3	25	75	100
	23UMA4AC8:2		Allied - VIII	Vector Calculus and Fourier series	4	3	25	75	100
	Total				**8**	**6**			**200**
Grand Total						**12**			**400**

ALLIED MATHEMATICS FOR B.Sc. CHEMISTRY

Sem	Course Code	Part	Course	Course Title	Ins. Hrs/ Week	Credit	Marks		Total
							CIA	ESE	
III	23UMA3AC5:3	III	Allied - V	Calculus	4	3	25	75	100
	23UMA3AC6:3		Allied - VI	Algebra and Trigonometry	3	3	25	75	100
	Total				**7**	**6**			**200**
IV	23UMA4AC7:3	III	Allied - VII	Differential Equations	4	3	25	75	100
	23UMA4AC8:3		Allied - VIII	Statistics and Vector Calculus	4	3	25	75	100
	Total				**8**	**6**			**200**
Grand Total						**12**			**400**

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UMA1CC1	CORE - I	5	5	25	75	100
Course Title	Calculus with SageMath						

SYLLABUS		
Unit	**Contents**	**Hours**
I	Successive Differentiation: The nth derivatives of Standard result - Trigonometrical transformation of functions - * Formation of equations involving derivatives * - Leibnitz formula for the nth derivative of a product - Related problems.	**15**
II	*Homogeneous functions* - Partial derivatives of a function of two functions - Maxima and Minima of function of two variables - Lagrange's Method of undetermined Multipliers.	**15**
III	Curvature: Circle, Radius and Centre of Curvature - Cartesian Formula for the Radius of Curvature - Coordinates of the Centre of Curvature.	**15**
IV	Evolute and Involute - Radius of Curvature when the curve is given in Polar Co-ordinates. Multiple Integrals – Evaluation - Illustrative Examples.	**15**
V	Double Integrals in Polar coordinates - Change the order of Integration - Triple Integrals – Examples.	**15**
VI	**Current Trends (For CIA only) – Contemporary developments related to calculus during the semester concerned.**	

…… Self Study

Text Books:

1. **T.B-1** T.K.Manicavachagom Pillay and Others, Calculus Volume-I, S. Viswanathan Publishers Pvt. Ltd. (2019).
2. **T.B-2** T.K.Manicavachagom Pillay and Others, Calculus Volume-II, S. Viswanathan Publishers Pvt. Ltd. (2019).

UNIT I	Chapter III	Sections 1, 2	**T.B- 1**
UNIT II	Chapter VIII	Sections 1.6, 1.7, 4, 5	**T.B- 1**
UNIT III	Chapter X	Sections 2.1 – 2.4	**T.B- 1**
UNIT IV	Chapter X	Sections 2.5, 2.6	**T.B- 1**
	Chapter V	Sections 1,2	**T.B- 2**
UNIT V	Chapter V	Sections 3, 4	**T.B-2**

Reference Books:

1. S. Arumugam and A. Thangapandi Isaac, Calculus, New Gamma Publishing House (2008).
2. Devi Prasad, Advanced Calculus, Prentice Hall of India Learning Pvt. Ltd. (2009).

Web Resources:

1. https://www.youtube.com/watch?v=KijGLjxKlsY
2. https://www.analyzemath.com/calculus/multivariable/maxima_minima.html
3. https://www.youtube.com/watch?v=Cb2E0bznd-w
4. https://www.youtube.com/watch?v=Cb2E0bznd-w

- ***Digital Demonstration using SageMath***

1. Find n^{th} derivative using SageMath.
https://ask.sagemath.org/question/30330/derivative-of-order-varm-returns-0/
2. Find maxima and minima using SageMath.
https://doc.sagemath.org/html/en/reference/functions/sage/functions/min_max.html
3. Find radius of curvature using SageMath.
https://doc.sagemath.org/html/en/reference/riemannian_geometry/sage/geometry/riemannian_manifolds/parametrized_surface3d.html
5. Evaluate multiple integral using SageMath.
https://ask.sagemath.org/question/7636/double-integral/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	remember the fundamental concepts of Differentiation, integration, curvature and evolute	**K1**
CO2	understand and translate integrals of physical problems	**K2**
CO3	apply and solve physical problems using evolute and involute	**K3**
CO4	analyse different types curves using radius of curvature	**K4**
CO5	evaluate physical problems using multiple integrals	**K5**

Relationship Matrix :-

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	1	3	1	3	1	2	1	**2.1**
CO2	3	3	3	1	3	1	3	3	2	1	**2.3**
CO3	3	2	3	2	3	1	3	3	2	1	**2.3**
CO4	3	3	3	2	3	1	2	3	2	1	**2.3**
CO5	3	3	3	1	3	1	3	2	2	1	**2.2**
										Mean Overall Score	**2.24**
										Correlation	**Medium**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators: -

Dr. M. Mohammed Jabarulla
Mrs. A. Thagasin Banu

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UMA1CC2	CORE - II	3	3	25	75	100
Course Title	Analytical Geometry with Geogebra						

SYLLABUS		
Unit	**Contents**	**Hours**
I	Direction cosines- Direction ratios- General equation of the plane- Intercept form- *Normal form*- Angle between two planes.	**9**
II	Length of the perpendicular- Equation of the planes bisecting the angle between two planes- Straight line as the intersection of two planes - Symmetrical form.	**9**
III	Equation of a straight line passing through two given points- Condition for a line to be parallel to a plane – Coplanar lines – Shortest distance between two skew lines.	**9**
IV	Equation of a sphere - Finding centre and radius – Length of the tangent plane to a sphere.	**9**
V	Equation of a circle on a sphere – Intersection of two spheres – Tangent plane to a sphere.	**9**

…… Self Study

Text Books:

1.T.K.Manicavachagom Pillay, T. Narayanan, Analytical Geometry, Part II – 3 Dimensions, S. Viswananthan Publishers Pvt Ltd.(Reprint June2021).
2. Geogebra Manual – The Official Manual of Geogebera Research.shu.ac.uk/geogebra/GIF – Guides/official Geogebra manual.pdf(2011).

UNIT I Chapter I Sections 7, 8 Chapter II Sections 1, 2, 3, 7 T.B- 1
UNIT II Chapter II Sections 10, 11 Chapter III Sections 1, 2, 3 T.B- 1
UNIT III Chapter III Sections 4, 5, 7 & 8 T.B- 1
UNIT IV Chapter IV Sections 2-5 T.B- 1
UNIT V Chapter IV Sections 6-8 T.B- 1

Reference Books:

1. 1. Shanti Narayanan, Analytical Solid Geometry, S.Chand& Company Ltd, New Delhi(2007).
2. M.L. Khanna, Solid Geometry, Jai Prakash Nath& co, Educational Publishers, 25th Edition (2005).
3.P.R.VITAL ,Analytical Geometry 2D and 3D ,Pearson Publication (2013)

Digital Demonstration using Geogebra

1) Relation between Cartesian Coordinates and Polar Coordinates :
https://www.youtube.com/watch?v=Oh2DefOhcA&ab
2) Equation of a plane in Normal form:
https://www.youtube.com/watch?v=2sZKZHyaQJ8&ab
https://www.youtube.com/watch?v=AEZq5uLhbIU&ab
3) Equation of a Straight Line in Symmetrical Form:
https://www.youtube.com/watch?v=AlAReyCFskU&ab
4) The Equation of a Sphere with centre at (a, b, c) and radius r:
https://www.youtube.com/watch?v=WhYX0T_UqBQ&ab
5) Equation of a Cone with a given Vertex and a given guiding curve:
https://www.youtube.com/watch?v=XQi6ul9-nJo&a
6) https://youtu.be/OwNru3Znsfk
7) https://youtu.be/_MgBCc0z8N8
8) https://youtu.be/zYtAgCiUA7c
9. https://youtu.be/ysagRAwySFg

Web Resource:
1. Tangent, Normal : https://nptel.ac.in/courses/111/104/111104095/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	recall and classify geometric shapes using correct mathematical language. Draw and label figures based on verbal descriptions.	**K1**
CO2	understand various equations of Planes, Straight Line, Sphere, Cone, and Cylinder.	**K2**
CO3	apply theorems involving vertical angles, complementary angles, supplementary angles, transversals, internal angle measure in triangles, circles and tangent lines to circles and applying geometric concepts to solve problems.	**K3**
CO4	classify and discuss about a circle on a sphere with examples.	**K4**
CO5	determine the intersection of two sphere and tangent plane to a sphere with problems.	**K5**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of Cos**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	**2**	**2**	**2**	**1**	**3**	**3**	**3**	**2**	**2**	**2.3**
CO2	**2**	**3**	**3**	**2**	**1**	**3**	**3**	**2**	**2**	**2**	**2.3**
CO3	**2**	**2**	**2**	**1**	**1**	**2**	**2**	**3**	**2**	**2**	**1.9**
CO4	**3**	**2**	**2**	**2**	**1**	**2**	**2**	**3**	**2**	**2**	**2.1**
CO5	**2**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1.7**
Mean Overall Score											**2.06**
Correlation											**Medium**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

Dr. U. Abuthahir
Mrs. J. Sarthaj Banu

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UPH1AC1	Allied – I	5	4	25	75	100

Course Title	FUNDAMENTALS OF PHYSICS

SYLLABUS		
Unit	**Contents**	**Hours**
I	**Elasticity:** Hooke's law – Young's modulus, Rigidity modulus & Bulk modulus – Expression for bending moment - determination of Young's modulus by non-uniform bending (Pin and Microscope) - surface tension:- definition –determination of surface tension by drop weight method –Viscosity: co-efficient of viscosity –determination of co-efficient of viscosity by burette method (variable pressure head) – *comparison of viscosities*	**15**
II	**Mechanics:** Newton's law of gravitation –Kepler's laws of planetary motion–gravitation contstant-determination of 'G' by Boy's method- friction- laws of friction – centre of gravity - centre of gravity of solid cone and solid hemisphere – meta center – meta centric height – *determination of the metacentric height of a ship*	**15**
III	**Sound:** Simple harmonic motion (SHM) –equation of simple harmonic motion – composition of two SHM's in a straight line – composition of two SHM's at right angles to each other – Lissajou's figures (Basic concept only) –ultrasonic – properties – production by piezo-electric method- *applications of ultrasonics*– reverberation and reverberation time-conditions for a good auditorium	**15**
IV	**Heat:** Newton's law of cooling -determination of specific heat capacity of a liquid by cooling – thermal conductivity – co-efficient of thermal conductivity – determination of thermal conductivity of a bad conductor by Lee's disc method – solar constant – * determination of solar constant by Angstrom's Pyrheliometer*-temperature of the sun	**15**
V	**Diffusion and Osmosis:** **Diffusion**: Diffusion of liquids – Graham's laws of diffusion in liquids –*Ficks' law of diffusion* – analogy between liquid diffusion and heat conduction – experimental determination of coefficient of diffusion. **Osmosis:** osmosis and osmotic pressure – laws of osmotic pressure -experimental determination of osmotic pressure (Berkeley and Hartley method)	**15**

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Text Book(s):

1. R. Murugesan, Properties of matter, S.Chand& Co, reprint (2022)
Unit – I: Sec: 1.1,1.2,1.15.1.21, 3.1, 3.17, 2.1, 2.5, 2.7
Unit – III: 11.1 , 11.2, 12.1,12.2, 12.4, 11.9, 11.10,11.16, 11.17, 11.21
Unit – II: Sec: 6.1-6.3, 22.1-22.3, 20.1- 20.3
2. R. Murugesan, Properties of matter, S.Chand& Co, 4th Edition, 2005
Unit – V: Sec: 2.21, 8.1- 8.28
3. Brijlal&Subramaniam, Heat & thermodynamics, S.Chand Publications, 7th Edition, 2008.
Unit – IV: Sec: 4.1- 5.5

Reference Book(s):
1. BrijLal&Subramaniam,Properties of Matter, S.Chand Publications, 4th edition, 2008. 2. MathurD.S, Elements of Properties of Matter ,Eleventh edition, Shyamlal Charitable Trust, New Delhi, 1993.
Web Resource(s):
1. https://www.askiitians.com/physics/mechanics/surface-tension.aspx 2. https://www.esaral.com/oscillations-class-11-simple-harmonic-motion-notes 3. https://www.adda247.com/teaching-jobs-exam/heat-and-temperature/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	understand the basic principles of certain physical properties of the materials around us	**K2**
CO2	Applications of different constants associated with different materials	**K3**
CO3	analyze viscosity, surface tension, diffusion, osmosis, properties of liquid	**K4**
CO4	analyze the centre of gravity of various objects	**K4**
CO5	interpret the physical properties of new materials	**K5**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**2**	3	**3**	**2**	**2**	**3**	**3**	**3**	**2**	**2**	**2.5**
CO2	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**1**	**1**	**2**	**2.2**
CO3	**3**	**1**	**3**	**1**	**3**	**2**	**2**	**2**	**2**	**3**	**2.2**
CO4	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**1**	**3**	**2.6**
CO5	**1**	**3**	**2**	**2**	**2**	**2**	**3**	**3**	**2**	**2**	**2.2**
										Mean Overall Score	**2.34**
										Correlation	**MEDIUM**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. C. Hariharan

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UPH1AC2P	ALLIED –II	3	2	20	80	100

Course Title	PROPERTIES OF MATTER – PRACTICAL

List of Experiments:

1. Young's Modulus – Non Uniform bending (Scale &Telescope)
2. Surface tension and interfacial surface tension by drop weight method.
3. Potentiometer – Low range voltmeter calibration
4. Air wedge – Thickness of a thin wire.
5. Comparison of viscosities by capillary flow method.
6. AND, OR and NOT logic gates using discrete components.

Books for reference:
1. M.N. Srinivasan,S. Balasubramaniyan, R. Ranganathan, A text book of Practical Physics, S.Chand&Sons , reprint 2010.
2. C.C. Ouseph, U.J. Rao& V. Vijayendran, Practical physics and electronics, S. Viswanathan, Pvt,Ltd, First edition,2007.

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Recall the basic principles of properties of matter and understand the concepts of bending behaviour beams	**K2**
CO2	Make practical skills essential for experimentation.	**K3**
CO3	Apply experimental approaches to correlate with physics theory to develop practical understanding.	**K3**
CO4	Analyze themselves the concept of heat, optics and acoustics	**K4**
CO5	evaluate the ideas required for their higher studies	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	2	2	2	1	2	2	2	2.2
CO2	2	3	2	3	2	2	2	2	3	2	2.3
CO3	2	2	2	3	3	2	3	3	2	2	2.4
CO4	2	1	2	2	2	2	2	3	2	2	2.0
CO5	2	3	3	2	3	3	2	1	2	2	2.3
Mean Overall Score											**2.22**
Correlation											**Medium**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. Abbas Manthiri

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UCN1AE1	AECC - I	2	2	-	100	100

Course Title	Value Education for Men

SYLLABUS		
Unit	**Contents**	**Hours**
I	**VALUES IN LIFE:** Purpose and philosophy of life – Need for values –five fold moral culture. Values: truth, loyalty, integrity, humility, trustworthy, considerate, not being greedy, clean habits, punctuality, kindness, gratitude, patience, respect and character building.	6
II	**PERSONAL WELLBEING**: Social responsibility - taming a healthy mind and body – personal hygiene - Balanced diet – meditation – yoga - positive thinking – introspection - a passion for Nature- Win-win strategy.	6
III	**ROLE OF MEN IN FAMILY**: As a responsible student – committed employee - loyal husband - dedicated father – fatherhood- sacrificing human – considerate true friend.	6
IV	**MAN A SOCIAL BEING**: A friendly neighbour - living a life with definite motives – emotions and moral desire- uncompromising will power- puberty- secondary sexual characters- marriage: Purpose – marital life- Harmony with spouse- fidelity towards spouse.	6
V	**PROFESSIONAL VALUES**: More of a giver than a taker - being compassionate – patriotism - respecting culture - dependence on God – avoiding worry- professional ethics.	6

Hours of Teaching: 5 Hours and Hours of Activity: 25 Hours

Textbook(s):

1. Value Education for health, Happiness and harmony, the world community service centre, Vethathri Publications
2. N. Venkataiah, Value Education, APH Publishing Corporation, New Delhi, 1998
3. K.R. Lakshminarayanan and M. Umamageshwari, Value Education, Nalnilam Publication, Chennai.

Web References:

1. https://www.slideshare.net/humandakakayilongranger/values-education-35866000
2. https://www.ananda.org/blog/5-secrets-to-a-harmonious-marriage/
3. https://www.un.org/esa/socdev/family/docs/men-in-families

Activity:

- Assignment on Values (not less than 20 Pages)
- Multiple Choice Questions and Quiz
- Elocution - (Manners and good Habits for 3 to 5 minutes)
- Field Visit
- Debating - Current issues
- Essay writing: Proper use of e-gadgets, Ethics, Cyber ethics, Social media, etc.,
- Case Study / Album Making / Poster Presentation / Documentary- Celebrating National Days, Drug abuse & illicit trafficking, Independence Day, Secularism, Teachers Day, National Youth Awakening Day, Father's Day / Mother's Day and etc.,

EVALUATION COMPONENT: TOTAL: 100 MARKS

Component I:

Documentary (or) Poster Presentation (or) Elocution - 25 marks

Component II:

Quiz (or) Multiple choice questions Test - 25 marks

Component III:

Album Making (or) Case Study on a topic (or) Field visit - 25 marks

Component IV:

Assignment (or) Essay Writing (or) Debating - 25 marks

Course Coordinator: Dr. M. Purushothaman

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UCN1AE1	AECC - I	2	2	-	100	100

Course Title	Value Education for Women

SYLLABUS		
Unit	**Contents**	**Hours**
I	**VALUES IN LIFE:** Purpose and philosophy of life – Need for values –five fold moral culture - Imbibing values: truth, loyalty, integrity, humility, trustworthy, considerate, not being greedy, clean habits, punctuality, kindness, gratitude, patience, respect and character building.	6
II	**FAMILY**: Nuclear – cluster – significance - social functions - changing trend - role of women in family - obedient daughter - purposeful youth- dedicated wife - caring mother.	6
III	**PUBERTY**: Need of knowledge of menstruation- menstrual symptoms – handling – menstrual disorder - maintaining good personal hygiene - motherhood- Stages of pregnancy- post pregnancy care.	6
IV	**MARRIAGE**: Types of marriage - purpose of marriage- love and infatuation – need for marital preparation - pre and post marital counselling - conflicts in marital life - divorce single parenthood.	6
V	**HARMONY WITH SPOUSE**: Husband and wife relationship - fidelity towards spouse-relationship among the family members. Tenets of bride for healthy family – kindness, respect, patience, care, love.	6

Hours of Teaching: 5 hours and Hours of Activity: 25 hours

Textbook(s):

1. Value Education for health, Happiness and harmony, the world community service centre, Vethathri Publications
2. N. Venkataiah, Value Education, APH Publishing Corporation, New Delhi, 1998
3. Betty, Carten and Meg Goldric, The Changing family life style - A Framework for Family Therapy, 2nd Edition, 2000.
4. Marie, Madearentas, Family Life Education, CREST-Centre for research education service training for family promotion, Bangalore, 1999.

Web References:

1. https://www.slideshare.net/humandakakayilongranger/values-education-35866000
2. https://www.ananda.org/blog/5-secrets-to-a-harmonious-marriage/
3. https://www.nap.edu/read/2225/chapter/14

Activity:

- Assignment on Values (not less than 20 Pages)
- Multiple Choice Questions and Quiz
- Elocution - (Manners and good Habits for 3 to 5 minutes)
- Field Visit
- Debating - Current issues
- Essay writing: Proper use of e-gadgets, Ethics, Cyber ethics, Social media, etc.,
- Case Study / Album Making / Poster Presentation / Documentary- Celebrating National Days, Drug abuse & illicit trafficking, Independence Day, Secularism, Teachers Day, National Youth Awakening Day, Father's Day / Mother's Day and etc.,

EVALUATION COMPONENT: TOTAL: 100 MARKS

Component I:

Documentary (or) Poster Presentation (or) Elocution - 25 marks

Component II:

Quiz (or) Multiple choice questions Test - 25 marks

Component III:

Album Making (or) Case Study on a topic (or) Field visit - 25 marks

Component IV:

Assignment (or) Essay Writing (or) Debating - 25 marks

Course Coordinator: Dr. M. Purushothaman

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UMA2CC3P	CORE - III	5	5	20	80	100

Course Title	Python Programming - Practical

SYLLABUS		
Unit	**Contents**	**Hours**
I	Getting started with Python – Variables – Printing – *Input and Output*.	**15**
II	For loops - If statements – Conditional Operators - elif	**15**
III	*Numbers* – Math Operators – Random Numbers – Math functions - Modules and functions.	**15**
IV	Strings – Concatenation and repetition – the in operator- indexing – slices – looping – String methods	**15**
V	Lists – List methods - Tuples	**15**

…… Self Study

List of Programs
1. To evaluate simple expressions 2. To Find the square root 3. To calculate the Area of the triangle 4. To Solve quadratic equation 5. To Swap 2 variables
6. To Check if a number is odd or even 7. To find the largest among three numbers 8. To find the factorial of a given number 9. To print the Fibonacci sequence 10. To find the sum of natural numbers
11. To make a simple calculator 12. To find factors of a given number 13. To find HCF and GCD 14. To convert decimal into other number systems 15. To display calendar
16. To sort words in alphabetical order 17. To demonstrate slice operation 18. To check whether a string is palindrome or not 19. To reverse a string 20. Program that uses different string methods like upper, lower, split, join, count, replace and find on string object.
21. To create python list 22. To multiply two matrices 23. Program using list methods. 24. To understand different types of tuples 25. Program using tuple methods.

Text Book:

Brian Heinold, A Practical Introduction to Python Programming, Creative Commons Attribution, 2012.

UNIT I Chapter I Sections 1.1 – 1.8
UNIT II Chapter II Sections 2.1- 2.5,
Chapter IV Sections 4.1-4.5
UNIT III Chapter III Sections 3.1- 3.5,
Chapter XIII Sections 13.1- 13.5
UNIT IV Chapter VI Sections 6.1 – 6.8
UNIT V Chapter VII Sections 7.1 – 7.7,
Chapter VIII Sections 8.1 – 8.7

Reference Books:

1. Chun, J. Wesley, CORE Python Programming, 2nd Edition, Pearson, 2007 Reprint 2010.
2. Varadha Rajkumar K, Marlapalli Krishna and Jaya Prakash S., Basic Python Programming for Beginners, BlueRose Publishers, 2021.

Web Resources:

1. Jeffrey Elkner, Chris Meyers Allen Downey, Learning with Python, Dreamtech Press, 2015. http://www.foo.be/docs-free/thinkCSpy.pdf
2. ReemaThareja, Python programming using problem solving approach, Oxford University Press, 2017. https://india.oup.com/productPage/5591038/7421214/9780199489497

Course Outcomes

Upon successful completion of this course, the student will be able to:-

CO No.	CO Statement	Cognitive Level (K-Level)
CO1	remember the fundamental concepts of variables and operators	**K1**
CO2	understand decision making and looping	**K2**
CO3	apply functions in the programming	**K3**
CO4	analyse different types of string operations	**K4**
CO5	evaluate list and tuples in the programming	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	1	3	2	3	1	2	3	**2.4**
CO2	3	3	3	1	3	3	3	3	2	3	**2.7**
CO3	3	2	3	2	3	3	3	3	2	3	**2.7**
CO4	3	3	3	2	3	3	2	3	2	3	**2.7**
CO5	3	3	3	1	3	2	3	2	2	3	**2.5**
Mean Overall Score											**2.6**
Correlation											**High**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators: -

Dr. M. Mohammed Jabarulla

Dr. S. Shajitha Begum

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UMA2CC4	CORE - IV	4	4	25	75	100

Course Title	Classical Algebra with MATLAB

SYLLABUS

Unit	Contents	Hours
I	Inequalities - Triangle inequalities - Arithmetic, Geometric and Harmonic means.	12
II	Cauchy - Schwarz inequality - Some more inequalities and related problems.	12
III	Relation between the roots and coefficients of equations - Symmetric function of the roots - Sum of the powers of the roots of an equation.	12
IV	Transformation of equation - *Roots with sign changed*, Roots Multiplied by a given number, *Reciprocal roots* - Reciprocal equation - Diminishing, Increasing the roots of a given equation by a given quantity.	12
V	Descarte's rule of signs – Newton's method of divisors – Horner's method.	12

…… Self Study

Text Books:

1. S. Arumugam and A. Thangapandi Isaac, Sequences and series, New Gamma Publishing House (2012).

2. T.K. Manicavachagom Pillai, T. Natarajan, and K.S. Ganapathy, Algebra, Volume-I,S.Viswanathan Publishers, Pvt. Ltd. (2012).

UNIT I	Chapter II	Sections 2.1-2.3	**T.B- 1**
UNIT II	Chapter II	Sections 2.4-2.6	**T.B- 1**
UNIT III	Chapter VI	Sections 11-13	**T.B- 2**
UNIT IV	Chapter VI	Sections 15, 16, 17	**T.B- 2**
UNIT V	Chapter VI	Sections 24, 29.4, 30	**T.B- 2**

Reference Books:

1. S. Arumugam, A. Thangapandi Isaac, Algebra (Theory of Equations, Inequalities and Theory of numbers), New Gamma Publishing House (2006)
2. T.K. Manicavachagom Pillai, T. Natarajan, and K.S. Ganapathy, Algebra, Volume- II, S.Viswanathan Publishers, Pvt. Ltd. (2008).
3. S. Arumugam, A. Thangapandi Isaac, Theory of Equations and Trigonometry, New Gamma Publishing House (2006)

Web Resources:

1. https://www.mathworks.com/matlabcentral/answers/116618-solving-inequalitis-in-matlab
2.https://www.mathworks.com/help/matlab/math/roots-of-polynomials.html
3.https://www.math-only-math.com/relation-between-roots-and-coefficients-of-a-quadratic-equation.html

Practical(s)

- To find Arithmetic, Geometric and Harmonic Means using MATLAB
- To check validation of some important inequalities using MATLAB
- To find the roots of algebraic equations using MATLAB

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	remember the properties of inequality and types of algebraic equations.	**K1**
CO2	understand some important inequalities and relate the roots and co-efficients of equation.	**K2**
CO3	apply the concepts of inequality and algebraic equation to solve real world problems.	**K3**
CO4	analyse the various types of inequalities and the structure of algebraic equations.	**K4**
CO5	determine the roots of equation using MATLAB	**K5**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	1	3	2	1	3	3	2	3	2	2.2
CO2	3	2	3	3	2	2	3	3	2	2	2.5
CO3	3	3	3	3	2	3	3	3	3	2	2.8
CO4	3	2	3	3	2	3	3	3	3	3	2.8
CO5	2	3	2	2	1	2	3	3	3	3	2.4
Mean Overall Score											2.54
Correlation											High

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

Dr. S. Mohamed Yusuff Ansari.

Mrs. A. Thagasin Banu

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UPH2AC3	ALLIED – III	4	4	25	75	100

Course Title	ESSENTIALS OF PHYSICS

SYLLABUS

Unit	Contents	Hours
I	**OPTICS** Spherical Aberration in a lens – Methods of minimizing Spherical Aberration – Interference– Air-wedge – Thickness of a thin wire (Theory and Experiment) – Newton's rings – Radius of curvature of the lens-Diffraction-Determination of wavelength of light using grating- *Polarization* –Specific Rotatory Power- Laurent's Half Shade Polarimeter	12
II	**ELECTRICITY** Coulomb's law – Gauss law - Principle of capacitor –Energy stored in a charged capacitor – Loss of energy due to sharing of charges – *Kirchhoff's laws* – Application of Kirchhoff's laws to Wheatstone bridge – Carey Foster bridge – Determination of specific resistance – Potentiometer - Calibration of low range voltmeter and ammeter	12
III	**ATOMIC AND NUCLEAR PHYSICS** Vector atom model – Quantum numbers – Coupling schemes – The Pauli's Exclusion Principle – Zeeman Effect – Experimental arrangement for normal Zeeman effect – Liquid drop model –Construction and working of an Ionization chamber and Geiger Muller Counter – *Nuclear fission* – Energy released in fission –Nuclear fusion	12
IV	**ELECTRONICS** Formation of P-N Junction Diode – Forward and Reverse biasing of a Junction diode – V-I Characteristics of a Junction Diode – *Junction diode as bridge rectifier* – Zener diode – V-I Characteristics of a Zener Diode – Construction and Working of a transistor **–** Characteristics of a transistor in Common Emitter (CE) and Common Base (CB) configurations	12
V	**NUMBER SYSTEMS AND LOGIC CIRCUITS** Conversion between Decimal, Binary, Octal and Hexadecimal number systems – *The basic logic gates (AND, OR, NOT) using discrete components – NAND and NOR as universal gates – The Exclusive OR gate* – Laws of Boolean algebra – De-Morgan's theorems – Half Adder– Full Adder	12

……. Self Study

Text Books:

1. R. Murugeshan, KiruthigaSivaprasath,Optics and Spectroscopy, S. Chand & Company PVT. Ltd, New Delhi, Reprint, 2016.
   Unit–I:Section1.16 – 1.7, 2.1,2.7-2.9, 3.17,4.19,4.20
   Unit – VI: Section 5.3 – 5.6
2. R. Murugeshan, Electricity and Magnetism,S. Chand & Company PVT. Ltd, New Delhi, Tenth Edition, 2017.

Unit–II: Section 1.2, 2.2, 4.1, 4.9, 4.11, 6.6 – 6.8R. Murugeshan, KiruthigaSivaprasath, Modern Physics,S. Chand & Company PVT. Ltd, New Delhi, Eighteenth Edition, 2016.

Unit –III: Section 4.12 – 4.23, 17.10, 18.3, 18.6, 22.1, 22.6 – 22.6.1

Unit –IV: Section 33.1 – 33.2.1, 33.5.3, 34.1, 35.1 – 35.3

Unit – V: Section 41.1 – 41.15

3. N. Subrahmanyam, Brijlal and M.N. Avadhanulu, A Textbook of Optics, S. Chand & Company PVT. Ltd, New Delhi, Twenty Fourth Edition, 2015.
   Unit – VI: Section 22.8, 22.14 – 22.19

Reference Books :

1. Arthur Beiser, Concepts of Modern Physics, McGraw Hill, Fifth edition, 2002.
2. V.K.Mehta,RohitMehta,PrinciplesofElectronics, S.ChandPublications, Reprint2016

Web Resources:

1. https://www.classcentral.com/course/edx-electricity-and-magnetism-part-1-3032
2. https://www.electronics-tutorials.ws/
3. https://www.nuclear-power.net/nuclear-power/reactor-physics/atomic-nuclear-physics/

Course Outcomes

Upon successful completion of this course, the student will be able to:

CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Recall the basic principles and contemporary concepts on various fields on physics like optics, electrostatics, atomic and nuclear physics	K1
CO2	Understand the basic ideas of geometric optics	K2
CO3	Construct digital circuits for simple real world problems	K3
CO4	List the applications of electronics in modern gadgets	K4
CO5	Explain the fundamental concepts of electricity	K5

Relationship Matrix

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	2	1	3	2	2	3	1	2	3	2.1
CO2	2	3	1	2	3	2	3	2	3	2	2.3
CO3	2	3	2	3	1	1	3	2	1	3	2.1
CO4	3	2	3	1	1	3	2	2	2	3	2.2
CO5	3	2	3	3	2	3	2	2	3	1	2.4
										Mean Overall Score	2.22
										Correlation	MEDIUM

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

Dr. S. Shek Dhavud
Dr.P. Revathi

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UPH2AC4P	ALLIED–IV	3	2	20	80	100

Course Title	OPTICAL, THERMAL AND ELECTRICITY - PRACTICAL

List of Experiments:

1. Young's modulus – Cantilever depression method
2. Potentiometer – Ammeter calibration.
3. Compound Pendulum: Determination of the radius of Gyration
4. Comparison of radii: Capillary flow method.
5. Sonometer – Verification of transverse laws of vibration (I & II Law)
6. Meter bridge resistance.
7. Verification of De Morgan's theorems using ICs.
8. Determination of the resistance of a material using post office box.

Books for Reference:

1. M.N. Srinivasan,S. Balasubramaniyan, R. Ranganathan, A text book of Practical Physics, S.Chand&Sons , reprint 2010.

2. C.C. Ouseph, U.J. Rao& V. Vijayendran, Practical physics and electronics, S. Viswanathan, Pvt,Ltd, First edition,2007.

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Recall the basic principles of properties of matter and underlying the concepts of bending behaviour beams	**K2**
CO2	Make practical skills essential for experimentation.	**K3**
CO3	Apply experimental approaches to correlate with physics theory to develop practical understanding.	**K3**
CO4	Analyze the concepts of heat and acoustics and understood the measurements of some physical quantities through heat and electricity experiments	**K4**
CO5	evaluate the circuit construction in the electronics	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	2	2	2	1	2	2	2	2.2
CO2	2	3	2	3	2	2	2	2	3	2	2.3
CO3	2	2	2	3	3	2	3	3	2	2	2.4
CO4	2	1	2	2	2	2	2	3	2	2	2.0
CO5	2	3	3	2	3	3	2	1	2	2	2.3
Mean Overall Score											2.22
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Mr. S. Mohamed Ibrahim Sulaiman Sait

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UCN2SS	Soft Skills Development	2	2	-	100	100
Course Title	Soft Skills Development						

SYLLABUS		
Unit	**Contents**	**Hours**
I	**Communication Skills:** Verbal and Non - Verbal communication - The active vocabulary - Conversational Etiquette - KOPPACT syndrome	6
II	**Emotional Skills:** Emotional Intelligence - The five steps to Emotional Quotient - Self Awareness and Regulation - Empathy - Social Intelligence - stress management - coping with failures	6
III	**Functional Skills:** Using the tools of communicatory and emotional skills - Resume writing - Preparation of Curriculum Vitae - interview skills - Acing the interview - Group dynamics - Mock interviews and Group discussions	6
IV	**Interpersonal Skills:** Synergising relationships - SWOT analysis - SOAR analysis - The social skills - Time Management - Decision making - problem solving - prioritising and Implementation	6
V	**Personality Skills:** Leadership skills - Attributes and Attitudes - Social leader Vs The Boss - critical and creative thinking	6

Hours of Teaching : 5 hours and Hours of Activity: 25 hours

Textbook(s):

1. Social intelligence: The new science of human relationships - Daniel Goleman; 2006.
2. Body Language in the workplace - Allan and Barbara Pease; 2011.
3. Student's Hand Book: Skill Genie - Higher education department, Government of Andhra Pradesh.

Web References:

1. https://nptel.ac.in/courses/109105110

EVALUATION CRITERIA

Work Book (Each unit carries 10 marks) - 50 Marks
Examination - 50 Marks

1. Teacher who handles the subject will award 50 marks for work book based on the performance of the student.
2. On the day of examination the examiners (Internal & External) will jointly award the marks for the following categories:

- Self-Introduction - 20 Marks
- Resume - 10 Marks
- Mock Interview - 20 Marks

To assess the self-introduction, Examiners are advised to watch the video presentation submitted by the students. If they failed to submit the video presentation, the Examiners may direct the student to introduce himself orally and a maximum 10 marks only will be awarded.

Mock Interview Marks Distribution (**20-Marks**)

Attitude (self interest, confidence etc.) (4 Marks)	Physical appearance including dress code (4 Marks)	Communication Skills (6 Marks)	Answering questions asked from the resume and work book (6 Marks)

Course Coordinator:
Dr. M. Syed Ali Padusha

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UMA3CC5	CORE – V	4	4	25	75	100

Course Title	ODE AND LAPLACE TRANSFORMS WITH SCILAB

SYLLABUS

Unit	Contents	Hours
I	Linear equation – Bernoulli's equation – Exact differential equations: Sufficient condition for exact differential equations – Practical rule for solving an exact differential equations – Rules for finding integrating factor.	12
II	Equations of the first order but of higher degree: Equations solvable for dy/dx - Equations solvable for y - *Equations solvable for x* – Clairaut's form – Equations that do not contain x explicitly - Equations that do not contain y explicitly - Homogeneous equations in x and y.	12
III	Linear Equations with constant coefficients - The operator D - Complementary function of a linear equation with constant coefficients – Particular integrals - General method of finding PI - Special methods for finding PI - Linear equations with variable coefficients.	12
IV	Laplace transforms – Sufficient condition for the existence of the Laplace transforms –Properties of Laplace transforms – Laplace transforms of periodic function – Some general theorems – *Evaluation of integrals*.	12
V	The inverse Laplace transforms -Inverse transforms of functions – Related problems. Application of Laplace transforms - Solution of ODE with constant coefficients – Solution of Systems of Differential equations - Solution of differential equations with variable coefficients.	12

…… Self Study

Text Book(s):

S. Narayanan and T. K. Manicavachagom Pillay, Differential Equation and its Application, Viswanathan Publishers Pvt. Ltd., Ninth edition (2006)

UNIT I	Chapter II	Sections 4, 5, 6.1 – 6.5
UNIT II	Chapter IV	Sections 1 – 4
UNIT III	Chapter V	Sections 1 – 5
UNIT IV	Chapter IX	Sections 1 - 5
UNIT V	Chapter IX	Sections 6 - 11

Reference Book(s):

1. M.D. Raisinghania, Ordinary and Partial Differential Equations, S. Chand & Co. (2010).
2. M.L. Khanna, Differential Equations, Jai Prakash Nath and Co. (2004).
3. Murray R. Spiegel, Schaum's Outline of Theory and Problems of Laplace Transforms, McGraw Hill, (1965).

Web Resource(s):

1. https://www.youtube.com/watch?v=IFpT-Ptmkyg
2. https://youtu.be/tpVoFcIEKHI
3. https://youtu.be/tg_QM9b1bdA
4. https://youtu.be/ogC78S3FY8Q
5. https://youtu.be/YiZiB7mG0_Q

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Retrieve the elementary ordinary differential equations.	**K1**
CO2	Interpret the concept of solving differential equations.	**K2**
CO3	Apply Laplace transforms to solve ordinary differential equations	**K3**
CO4	Discuss various formulae for Laplace and inverse Laplace transforms.	**K4**
CO5	Evaluate the linear differential equation with constant & variable coefficients	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**2**	**3**	**2.8**
CO2	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**1**	**3**	**2.7**
CO3	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**1**	**2**	**2**	**2.4**
CO4	**3**	**3**	**3**	**2**	**1**	**3**	**3**	**3**	**2**	**2**	**2.5**
CO5	**2**	**3**	**3**	**3**	**3**	**2**	**3**	**1**	**3**	**3**	**2.6**
Mean Overall Score											**2.6**
Correlation											**High**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

1. Dr. U. Abuthahir
2. Dr. K.S. Kanzul Fathima

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UMA3CC6	Core – VI	3	3	25	75	100

Course Title	VECTOR CALCULUS AND TRIGONOMETRY WITH SCILAB

SYLLABUS

Unit	Contents	Hours
I	Introduction – Gradient – Divergent – *Curl* – Formulae involving ∇– operators involving ∇ twice.	9
II	Line, Surface and Volume integrals – Theorem of Gauss (Statement only) – simple problems.	9
III	Green's Theorem (in space) (Statement only) - Stokes Theorem (Statement only) - Green's Theorem (in plane) (Statement only) – simple problems.	9
IV	Expansion of sin nθ, cos nθ, and tan nθ - Powers of sines and cosines of θ in terms of functions of multiples of θ.	9
V	Hyperbolic functions: Relations between Hyperbolic functions – Inverse hyperbolic functions	9

…… Self Study

Text Book(s):

1. S. Narayanan and T.K. Manicavachagom Pillay, Vector Algebra and Analysis, S. Viswanathan Publishers, Pvt. Ltd., (1995)
2. S. Narayanan and T.K. Manicavachagom Pillay, Trigonometry, S. Viswanathan Publishers, Pvt. Ltd., 2006.

UNIT I	Chapter IV	Sections 7 - 12	T.B- 1
UNIT II	Chapter VI	Sections 1 - 6	T.B- 1
UNIT III	Chapter VI	Sections 7 - 10	T.B- 1
UNIT IV	Chapter III	Sections 1-2, 4	T.B- 2
UNIT V	Chapter IV	Sections 1,2	T.B- 2

Reference Book(s):

1. Vector Analysis, Schaum's outline series, Murray R. Spiegel., Seymour Lipschutz, Dennis Spellman, Second Edition, McGraw Hill Book Company, 2009.
2. P.K.Mittal, Trigonometry, Vrinda Publications(P) Ltd., 2007

Web Resource(s):

1. https://users.scilab.narkive.com/CBGtibfE/scilab-queries-about-vector-and-complex-numbers
2. https://help.scilab.org/sinh
3. https://help.scilab.org/acosh
4. https://help.scilab.org/docs/2023.1.0/en_US/log.html
5. https://help.scilab.org/docs/2023.1.0/en_US/section_99038107015b1d789de50bf92f154a85.html
6. https://help.scilab.org/docs/2023.1.0/en_US/cosh.html

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Relate and study of hyperbolic functions with examples	**K1**
CO2	Acquire more knowledge on line, surface and volume integrals	**K2**
CO3	Demonstrate and discuss the expansion of trigonometric multiple functions	**K3**
CO4	Apply domain knowledge for vector integration	**K4**
CO5	Remember the double integral and application to area with examples	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**2**	**2.7**
CO2	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2.7**
CO3	**3**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**2.6**
CO4	**3**	**2**	**2**	**3**	**2**	**3**	**3**	**3**	**2**	**2**	**2.5**
CO5	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**2**	**2**	**2.6**
										Mean Overall Score	**2.62**
										Correlation	**High**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

1. Dr. H. Sheik Mujibur Rahman
2. Mrs. M. Affrose Begum

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UMA3AC5:1	Allied - V	4	4	25	75	100

Course Title	MATHEMATICAL STATISTICS - I WITH R

SYLLABUS

Unit	Contents	Hours
I	Arithmetic Mean; *Weighted mean*; Median; Mode; Geometric Mean; Harmonic Mean- Simple Problems	12
II	Measures of Dispersion; Range; Quartile Deviation; Mean Deviation; Standard Deviation and Root mean square Deviation- Simple problems	12
III	Coefficient of Dispersion; Coefficient of variation; Moments; Pearson's β and γ Co-efficients- Simple problems	12
IV	Theory of probability- Introduction; Classical probability; empirical probability; Axiomatic approach to probability; Laws of Addition of Probabilities; Laws of Multiplication of Compound Probability; Independent Events; Pairwise Independent Events; Baye's theorem- simple problems.	12
V	Random variable; Distribution function; Properties of Distribution function; Discrete random variable; Probability mass function; Discrete distribution function; Continuous random variable; Probability density function; Joint probability mass function and marginal and conditional probability function; Joint probability distribution function; Joint density function, Marginal density function; Independent random variables; The conditional distribution function and conditional probability density function – Simple problems.	12

…… Self Study

Text Book(s):

S.C.Gupta & V.K.Kapoor, Elements of Mathematical Statistics, Sultan Chand publication, Third Edition, Reprint 2019.

UNIT I	Chapter 2	Sections 2.5, 2.5.3, 2.6, 2.7, 2.8, 2.9
UNIT II	Chapter 3	Sections 3.3, 3.4, 3.5, 3.6, 3.7
UNIT III	Chapter 3	Sections 3.8, 3.8.1, 3.9, 3.10
UNIT IV	Chapter 4	Sections 4.1, 4.3.1, 4.3.2, 4.5, 4.6.2, 4.7, 4.7.2, 4.7.3, 4.8
UNIT V	Chapter 5	Sections 5.1-5.4.1, 5.5.1-5.5.5

Reference Book(s):

1. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons Publication, Twelfth Edition (2023).
2. P.R.Vittal, Mathematical Statistics, Margham Publishers, Chennai, Reprint 2009.

Web Resource(s):

1. https://onlinecourses.swayam2.ac.in/cec23_mg14/preview
2. https://onlinecourses.swayam2.ac.in/cec23_ma08/preview
3. https://onlinecourses.nptel.ac.in/noc23_ma77/preview
4. https://onlinecourses.nptel.ac.in/noc23_ma83/preview

Digital Demonstration using R

Topic	Web Link
Arithmetic Mean	https://www.r-tutor.com/elementary-statistics/numerical-measures/mean
Median	https://www.r-tutor.com/elementary-statistics/numerical-measures/median
Range	https://www.r-tutor.com/elementary-statistics/numerical-measures/range
Quartiles	https://www.r-tutor.com/elementary-statistics/numerical-measures/quartile
Standard Deviation	https://www.r-tutor.com/elementary-statistics/numerical-measures/standard-deviation

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Recall the basic concept of measures of central tendencies with examples.	**K1**
CO2	Calculate the measures of dispersion and coefficient of variation.	**K2**
CO3	Determine the Coefficient of Dispersion and Coefficient of variation.	**K3**
CO4	Explain classical probability and examine Baye's theorem.	**K4**
CO5	Evaluate the distribution function and probability density function.	**K5**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2.8**
CO2	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2.8**
CO3	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2.8**
CO4	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2.8**
CO5	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2.8**
										Mean Overall Score	**2.8**
										Correlation	**High**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

1. Dr. A. Prasanna
2. Dr. M.A. Rifayathali
3. Mrs. S. Sharmila Banu

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UMA3AC6:1	Allied - VI	3	2	25	75	100

Course Title	MATHEMATICAL STATISTICS - II WITH R

SYLLABUS

Unit	Contents	Hours
I	Mathematical Expectation; Addition theorem of Expectation; Multiplication theorem of Expectation; Co-variance; Moment Generating Function; Cumulants– Simple problems.	9
II	Theoretical discrete distribution – Binomial distribution; Moments of Binomial distribution; Recurrence relation for the Moments of Binomial distribution; Moment generating Function of Binomial distribution- Simple Problems.	9
III	Poisson distribution; Moments of the Poisson distribution; Recurrence relation for the Moments of the Poisson distribution; Moment generating function of Poisson distribution- Simple Problems.	9
IV	Theoretical continuous distribution - Rectangular (or) Uniform distribution; Normal distribution; M.G.F. of Normal distribution; Cumulant generating Function of Normal distribution; Moments of Normal distributions - Simple Problems.	9
V	Curve fitting; Fitting of a Straight Line; Fitting of second Degree Parabola; * Fitting of Polynomial of Kth Degree* –Change of Origin - Simple problems.	9

…… Self Study

Text Book(s):

S.C.Gupta & V.K.Kapoor, Elements of Mathematical Statistics, Sultan Chand publication, Third Edition, Reprint 2019.

UNIT I	Chapter 6	Sections 6.1–6.4, 6.9, 6.10
UNIT II	Chapter 7	Sections 7.2, 7.2.1, 7.2.2, 7.2.6
UNIT III	Chapter 7	Sections 7.3.1, 7.3.2, 7.3.4, 7.3.5
UNIT IV	Chapter 8	Sections 8.1, 8.2, 8.2.5, 8.2.6, 8.2.7
UNIT V	Chapter 9	Sections 9.1 – 9.1.4

Reference Book(s):

1. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons Publication, Twelfth Edition (2023).
2. P.R.Vittal, Mathematical Statistics, Margham Publishers, Chennai, Reprint 2009.

Web Resource(s):

1. https://onlinecourses.nptel.ac.in/noc23_ma77/preview
2. https://onlinecourses.swayam2.ac.in/cec23_mg14/preview
3. https://onlinecourses.swayam2.ac.in/cec23_ma08/preview

Digital Demonstration using R

Topic	Web Link
Binomial Distribution	https://www.r-tutor.com/elementary-statistics/probability-distributions/binomial-distribution
Poisson Distribution	https://www.r-tutor.com/elementary-statistics/probability-distributions/poisson-distribution
Uniform Distribution	https://www.r-tutor.com/elementary-statistics/probability-distributions/continuous-uniform-distribution
Normal Distribution	https://www.r-tutor.com/elementary-statistics/probability-distributions/normal-distribution

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Define mathematical expectation and moment generating function with examples.	**K1**
CO2	Explain Binomial distribution.	**K2**
CO3	Explain Poisson distribution.	**K3**
CO4	Explain the concepts of continuous distribution.	**K4**
CO5	Compare Fitting of a Straight Line and Fitting of second Degree Parabola.	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2.8**
CO2	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2.8**
CO3	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2.8**
CO4	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2.8**
CO5	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2.8**
Mean Overall Score											**2.8**
Correlation											**High**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

1. Dr. A. Prasanna
2. Dr. M.A. Rifayathali
3. Mrs. S. Sharmila Banu

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UMA3GE1	Generic Elective – I	2	2	-	100	100

Course Title	MATHEMATICS FOR COMPETITIVE EXAMINATION - I

SYLLABUS

Unit	Contents	Hours
I	Numbers – H.C.F and L.C.M of Numbers	6
II	Decimal Fractions - Simplification	6
III	Square roots and Cube roots – *Average* – Surds and Indices	6
IV	*Percentage* – Profit and Loss - Ratio and Proportion	6
V	Partnership – Chain Rule – *Alligation or Mixture*	6

…… Self Study

Text Book(s):

Dr. R.S. Aggarwal, Quantitative Aptitude, S. Chand and Company Ltd, (2022).

UNIT I	Chapters 1 & 2
UNIT II	Chapters 3 & 4
UNIT III	Chapters 5, 6 & 9
UNIT IV	Chapters 11, 12 & 13
UNIT V	Chapters 14, 15 & 21

Reference Book(s):

1. R. V. Praveen, Quantitative Aptitude and Reasoning, PHI Private Limited, (2012).
2. Edgar Thorpe, Course in Mental Ability and Quantitative Aptitude, 3rd Edition, Mc Graw Hill Education, (2012).

Web Resource(s):

1. https://www.youtube.com/watch?v=xyyejJYeILM
2. https://www.youtube.com/watch?v=eOqurZ2JkrQ
3. https://www.youtube.com/watch?v=OKSJDDAyqP0

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Find LCM and HCF of numbers	**K1**
CO2	Illustrate the problems on square and cubic roots, surds and indices.	**K2**
CO3	Solve the problem based on percentage, chain rule, ratio and proportion	**K3**
CO4	Simplify the fractions and expressions	**K4**
CO5	Determine the profit and loss in business transactions	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**2**	**2.6**
CO2	**2**	**1**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**2**	**2.4**
CO3	**3**	**1**	**2**	**3**	**2**	**3**	**2**	**3**	**2**	**2**	**2.3**
CO4	**2**	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**3**	**3**	**2.5**
CO5	**3**	**3**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**2.7**
Mean Overall Score											**2.5**
Correlation											**High**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

1. Dr. U. Abuthahir
2. Dr. C. Gurubaran

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UCN3AE2	AECC - II	2	2	-	100	100
Course Title	**Environmental Studies**						

Unit	Contents	Hours
I	The multidisciplinary nature of environmental studies Definition, scope, importance, awareness and its consequences on the planet.	6
II	**Ecosystems:** Definition, structure and function of ecosystem; Energy flow in an ecosystem: food chain, food web and ecological succession. Case studies of the following ecosystems: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	6
III	**Natural Resources:** Renewable and Non-renewable Resources: Land Resources and land use change; Land degradation, soil erosion and desertification. Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). Heating of earth and circulation of air; air mass formation and precipitation. Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies. renewable energy resources significance of wind, solar, hydal, tidal, waves, ocean thermal energy and geothermal energy.	6
IV	**Biodiversity and Conservation:** Levels of biological diversity: genetic, species and ecosystem diversity; Biogeography zones of India; Biodiversity patterns biodiversity hot spots. mega-biodiversity nation; Endangered and endemic species of India. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: *In situ* and *Ex situ* conservation of biodiversity. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.	6
V	**Environmental Pollution & Conservation:** Environmental pollution: types, causes, effects and controls; Air, water, soil, chemical and noise pollution Waste to wealth - Energy from waste, value added products from waste, fly ash utilization and disposal of garbage, solid waste management in urban and rural areas, Swachh Bharat Abhiyan, recent advances in solid waste management, modern techniques in rain water harvesting and utilization.	6

Text books:

1. Asthana DK and Meera A, Environmental studies, 2nd Edition, Chand and Company Pvt Ltd, New Delhi, India, 2012.
2. Arumugam N and Kumaresan V, Environmental studies, 4th Edition, Saras Publication, Nagercoil, Tamil Nadu, India, 2014.

Activity – I:

1. Assignments – Titles on Environmental awareness to be identified by teachers from the following (scripts not less than 20 pages)
2. Elocution – (Speech on "Environment beauty is the fundamental duty" of citizen of the country for 3 to 5 minutes)
3. Environment issues – TV, Newspaper, Radio and Medias messages – Discussion ϖ Case Studies/Field Visit/Highlighting Day today environmental issues seen or heard
4. Debating/Report Submission – Regarding environment issues in the study period Activity II
5. Environmental awareness through charts, displays, models and video documentation.

Celebrating Nationally Important Environmental Days National Science Day – 28th February World wild life Day – 3rd March International forest Day – 21st March World Water Day – 22nd March World Meteorological Day – 23rd March World Health Day – 7th April World Heritage Day – 18th April Earth / Planet Day – 22nd April Plants Day – 26th May Environment Day – 5th June Activity III Discipline specific activities
EVALUATION COMPONENT: Component I: (25 Marks) Document (or) Poster presentation or Elocution Component II: (25 Marks) Album making (or) case study on a topic (or) field visit Component III: (25 Marks) Essay writing (or) Assignment submission Component IV: (25 Marks) Quiz (or) multiple choice question test

Course Outcomes		
Course Outcomes: Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-level)**
CO1	To understand the multi-disciplinary nature of environmental studies and its importance	K1
CO2	To obtain knowledge on different types of ecosystem	K2
CO3	To acquire knowledge on Renewable and non-renewable resources, energy conservation	K3
CO4	To understand biodiversity conservation	K4
CO5	To analysis impact of pollution and conversion waste to products	K5

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	02	02	02	02	02	03	03	03	03	03	2.5
CO2	02	03	03	02	03	03	03	03	03	03	2.8
CO3	02	03	03	03	03	03	03	03	03	03	2.9
CO4	02	02	03	03	03	03	03	03	03	03	2.8
CO5	02	03	03	03	03	03	03	02	03	03	2.8
										Mean Overall Score	2.7
										Correlation	High

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. B. Balaguru

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UMA4CC7	Core – VII	5	5	25	75	100

Course Title	ADVANCED CALCULUS

SYLLABUS		
Unit	**Contents**	**Hours**
I	Sets and elements – *Operations on sets* – Functions – Real valued functions – Equivalence – Countability – Real numbers – Least upper bounds	15
II	Definition of a sequence and subsequence – Limit of a sequence – Convergent sequences – Divergent sequences – Bounded sequences – Monotone sequences – Operations on convergent sequences –Operations on divergent sequences.	15
III	Limit superior and limit inferior – Cauchy sequences. Convergent and divergent series of Real Numbers; Series with non-negative numbers; Alternating series; Conditional convergence and absolute convergence.	15
IV	Tests for absolute convergence; Series whose terms form a non-increasing sequence. Limit of a function on a real line; Metric spaces; Limits in metric spaces.	15
V	Improper integrals of the first kind - integral test for series - improper integrals of the second kind -convergence , divergence and absolute convergence of the improper integrals.	15

…… Self Study

Text Book(s):

Richard R. Goldberg, Methods of Real Analysis, (Oxford and IBH Publishing Co.), 1970.

UNIT I	Chapter I	Sections 1.1 - 1.7
UNIT II	Chapter II	Sections 2.1 – 2.8
UNIT III	Chapter II	Sections 2.9, 2.10
	Chapter III	Sections 3.1 – 3.4
UNIT IV	Chapter III	Sections 3.6, 3.7
	Chapter IV	Sections 4.1, 4.2,4.3
UNIT V	Chapter VII	Sections 7.9, 7.10

Reference Book(s):

1. Principles of Real analysis, Third Edition, Walter Rudin, Mc-Graw Hill international edition, 1976.
2. Elements of Real Analysis, Shanti Narayan, M.D. Raisinghania, S. Chand & Company Ltd., Twelfth Revised Edition, 2011.
3. Real analysis, Volume I, K. Chandrasekhara Rao, K.S Narayan, S. Viswanathan Printers & Publishers Pvt. Ltd., 2008.
4. Sequence and Series, S. Arumugam, Issac, New Gamma Publishing House, 1993

Web Resource(s):

1. https://youtu.be/sgsJAtRLGq4?si=VBn3TjqQ9neF8s-
2. https://youtu.be/lfZGtjSWcQs?si=O7wJr94tUxyrFjc5
3. https://youtu.be/VNoHcFoawTg?si=mpz3aTsB0Nz5M90I
4. https://youtu.be/MHDUCp4OAcg?si=uWwwKo6TiTd4SS5d
5. https://youtu.be/ND9cEdfCFr0?si=wYBMIeSYiXHiz-Rq

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Recall and discuss the basic concepts of sets, elements and functions with examples.	**K1**
CO2	Explain the sequences and series of R with the examples	**K2**
CO3	Identify convergent and divergent series of real numbers.	**K3**
CO4	Examine the Limit of a function on a real line with examples	**K4**
CO5	Discuss the convergence and divergence of the improper integrals.	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	**3**	**1**	**3**	**3**	**1**	**3**	**3**	**2**	**3**	**2.5**
CO2	**3**	**3**	**2**	**3**	**3**	**3**	**1**	**3**	**3**	**2**	**2.6**
CO3	**2**	**2**	**3**	**3**	**1**	**3**	**3**	**3**	**1**	**3**	**2.4**
CO4	**3**	**3**	**3**	**3**	**3**	**1**	**2**	**3**	**3**	**2**	**2.6**
CO5	**1**	**3**	**3**	**2**	**3**	**3**	**3**	**1**	**3**	**3**	**2.5**
Mean Overall Score											**2.52**
Correlation											**High**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

1. Mr. S. Masoothu
2. Mrs. A.Reigana Begum

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UMA4CC8	CORE – VIII	3	3	25	75	100

Course Title	PDE AND FOURIER SERIES WITH MAPLE

SYLLABUS

Unit	Contents	Hours
I	Partial Differential Equations: Elimination of arbitrary constants-Elimination of arbitrary functions –Different integrals of PDE – Solution of PDE in some simple cases- Lagrange's method of solving the linear equation.	9
II	Standard types of first order PDE I, II, III and IV (Clairaut's form) –Equations reducible to the standard forms-Charpit's method.	9
III	Partial Differential equations of higher orders: A simple case of the linear PDE with constant coefficients- The general homogeneous linear equation-The homogeneous equations with constant coefficients-Solution of homogeneous equation f (D, D') z = 0 second method- Case of the auxiliary equation having repeated roots, The particular integral.	9
IV	Fourier series: Definition of Fourier series -Finding Fourier expansion of a periodic function with period 2π -*Odd and Even functions*.	9
V	Half range Fourier series –Development in cosine and sine series-Change of interval.	9

…… Self Study

Text Book(s):

1. T.K Manicavachagom Pillay and S. Narayanan, Calculus Volume - III, S. Viswanathan Publishers Pvt., Ltd. (2019).
2. Dr. M.K. Venkataraman, Engineering Mathematics Volume-III B, The National Publishing Company, 13th edition, (1998).

UNIT I	Chapter 4	Sections 1 –4and 6	TB- 1
UNIT II	Chapter 4	Sections 5,7	TB- 1
UNIT III	Chapter II	Sections 13-19	T.B-2
UNIT IV	Chapter 6	Sections 1, 2, 3	T.B-1
UNIT V	Chapter 6	Sections 4,5,6	T.B-1

Reference Book(s):

1. M.D. Raisinghania, Ordinary and Partial Differential Equations, S. Chand & Co. (2010).
2. M.L. Khanna, Differential Equations, Jai Prakash Nath and Co. (2004).

Web Resource(s):

1. https://youtu.be/TDrFoSSQeW0?si=e3V8nupFil9CQPzs
2. https://youtu.be/htnyQcA3Vks?si=3dPR1rN-8FhHM3bo
3. https://youtu.be/cWPkZAaXGmA?si=eX8FVesgc7k44DL_
4. https://youtu.be/wjQtgncIvoo?si=fEq-2THgn2sA9IOL
5. https://youtu.be/praNtRezlkw?si=eC3ENewH8uZ3T8m5
6. https://youtu.be/KPdvul9dl50?si=YmuJeJJCFf_3xfjg
7. https://youtu.be/dtS4gNarS18?si=SfNerKDSHN5GWnOT
8. https://youtu.be/Cb3HpOf2V1g?si=P5XW3AzZxgYPqQFI
9. https://youtu.be/WzX27dVz96c?si=tAWrTER1-hQLEOTo

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Recall the basic concepts in Partial Differential Equation of first order and Classification of integrals	**K1**
CO2	Classify Standard types of first order PDE I, II, III and IV (Clairaut's form)	**K2**
CO3	Develop the half range Fourier series and change of intervals by illustrating some examples.	**K3**
CO4	Analyze the function using the concept of Fourier series and find the Fourier co-efficients for different functions.	**K4**
CO5	Evaluate the Partial Differential equations of higher orders.	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**2**	**1**	**2.5**
CO2	**3**	**2**	**2**	**3**	**3**	**3**	**2**	**3**	**2**	**3**	**2.6**
CO3	**3**	**2**	**2**	**3**	**2**	**3**	**3**	**2**	**2**	**2**	**2.4**
CO4	**3**	**2**	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**2**	**2.6**
CO5	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**2**	**2**	**3**	**2.5**
Mean Overall Score											**2.5**
Correlation											**High**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

1. Dr. S. Mohamed Yusuff Ansari
2. Dr. K.S. Kanzul Fathima

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UMA4AC7:1	Allied – VII	4	4	25	75	100

Course Title	STATISTICS FOR DATA SCIENCE WITH R

SYLLABUS

Unit	Contents	Hours
I	Most Plausible Solution of a system of Linear Equations; Conversion of Data to Linear Form - Simple problems	12
II	Karl Pearson coefficient of correlation; Rank Correlation; Regression; Lines of regression- Simple problems	12
III	Chi-Square variate; Applications of Chi-square distribution; Chi-square test as a test for population variance; Chi-square test of goodness of fit; Independence of attributes- Simple problems.	12
IV	Student's 't' definition; *Application of t-distribution*; Test for single mean; t-Test for difference of means; t-Test for testing significance of an observed sample correlation Coefficient- Simple problems.	12
V	F-Statistic definition; Applications of F-distribution; F-test for equality of population variance- Simple problems.	12

…… Self Study

Text Book(s):

S.C.Gupta & V.K.Kapoor, Elements of Mathematical Statistics, Sultan Chand publication, Third Edition, Reprint 2019.

UNIT I	Chapter 9	Sections 9.2 – 9.3
UNIT II	Chapter 10	Sections 10.3, 10.6, 10.7, 10.7.1
UNIT III	Chapter 13	Sections 13.1, 13.5 - 13.5.3
UNIT IV	Chapter 14	Sections 14.2, 14.2.5- 14.2.8
UNIT V	Chapter 14	Sections 14.3, 14.3.1, 14.3.2

Reference Book(s):

1. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons Publication, Twelfth Edition (2023).
2. P.R.Vittal, Mathematical Statistics, Margham Publishers, Chennai, Reprint 2009.

Web Resource(s):

1. **https://onlinecourses.swayam2.ac.in/cec23_ma08/preview**
2. **https://onlinecourses.nptel.ac.in/noc23_ma83/preview**
3. **https://onlinecourses.swayam2.ac.in/cec23_mg14/preview**

Digital Demonstration using R

Topic	Web Link
Correlation Co-efficient	https://www.r-tutor.com/elementary-statistics/numerical-measures/correlation-coefficient
Chi-square distribution	https://www.r-tutor.com/elementary-statistics/probability-distributions/chi-squared-distribution
Chi-square test	https://www.r-tutor.com/elementary-statistics/goodness-fit/chi-squared-test-independence
Student's 't' distribution	https://www.r-tutor.com/elementary-statistics/probability-distributions/student-t-distribution
F distribution	https://www.r-tutor.com/elementary-statistics/probability-distributions/f-distribution

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Find the Most Plausible Solution of a system of Linear Equations.	**K1**
CO2	Explain the concepts of correlation and regression coefficients with examples.	**K2**
CO3	Explain $\chi 2$ – distribution and $\chi 2$ -test for populations.	**K3**
CO4	Explain the concept of Students t-distribution with examples.	**K4**
CO5	Evaluate the application of F-distribution.	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2.8**
CO2	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2.8**
CO3	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2.8**
CO4	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2.8**
CO5	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2.8**
Mean Overall Score											**2.8**
Correlation											**High**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

1. Dr. A. Prasanna
2. Dr. M.A. Rifayathali
3. Mrs. S. Sharmila Banu

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23PMA4AC8P:1	Allied – VIII	4	2	20	80	100

Course Title	STATISTICAL LAB USING SPSS – PRACTICAL

SYLLABUS

Unit	Contents	Hours
I	**Data handling:** open SPSS data file – save – import from other data source – data entry – labeling for dummy numbers - recode into same variable – recode in to different variable – transpose of data – insert variables and cases – merge variables and cases.	12
II	**Data handling:** Split – select cases – compute total scores – table looks – Changing column - font style and sizes	12
III	**Diagrammatic representation:** Simple Bar diagram – Multiple bar diagram – Sub-divided Bar diagram - Percentage diagram - Pie Diagram – Frequency Table – Histogram – Scatter diagram – Box plot.	12
IV	**Descriptive Statistics:** Mean, Median, Mode, SD- Skewness- Kurtosis. Correlation – Karl Pearson's and Spearman's Rank Correlation , Regression analysis: Simple and Multiple Regression Analysis [Enter and stepwise methods]	12
V	**Testing of Hypothesis:** Parametric – One sample – Two sample Independent t – test – Paired t – test. Non – parametric: One sample KS test- Mann-Whitney U test – Wilcoxon Signed Rank test - Kruskal Wallis test – Friedman test- Chi- square test. Analysis of variance: One way and Two way ANOVA.	12

…… Self Study

Text Book(s):

1. SPSS for You - A. Rajathi & P. Chandran – MJP Publications, Chennai, 2019
2. SPSS in Simple Steps, Pandya Kiran, Bulsari Smruti, Sinha Sanjay, Dreamtech press, New Delhi, 2012

Reference Book(s):

1. Data analysis using SPSS for windows, Jeremy J. Foster, Sage publications, London, New edition. Versions 8-10, 2001
2. SPSS for windows Step by Step, George Darren and Mallery Paul, Dorling Kindersley Publishing Pvt Ltd, Noida, UP, 2011

Web Resource(s):

1. **Data handling:** https://youtu.be/uw-UToPCzao?list=PLVI_iGT5ZuRmXlbuwMKi04R6Oe1G3De8G
2. **Data handling:** https://youtu.be/gyzTW08IceU?list=PLVI_iGT5ZuRmXlbuwMKi04R6Oe1G3De8G
3. **Diagrammatic representation:** https://youtu.be/MlAk5nI78qM?list=PLVI_iGT5ZuRmXlbuwMKi04R6Oe1G3De8G
4. **Descriptive Statistics:** https://youtu.be/aOZ56S4YSeY?list=PLVI_iGT5ZuRmXlbuwMKi04R6Oe1G3De8G
5. **Testing of Hypothesis:** https://youtu.be/C2Qa5d9ij0Y?list=PLVI_iGT5ZuRmXlbuwMKi04R6Oe1G3De8G

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Perform a wide range of data management tasks in SPSS application.	**K1**
CO2	Perform data checking and create simple tables and charts.	**K2**
CO3	Perform database management tasks, descriptive statistics and graphics, and basic inferential statistics for comparisons and correlations.	**K3**
CO4	Understand the basic workings of SPSS, and perform basic statistical analyses.	**K4**
CO5	Perform advanced analysis in SPSS	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**2**	**2.7**
CO2	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2.7**
CO3	**3**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**2.6**
CO4	**3**	**2**	**2**	**3**	**2**	**3**	**3**	**3**	**2**	**2**	**2.5**
CO5	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**2**	**2**	**2.6**
Mean Overall Score											**2.62**
Correlation											**High**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

1. Dr. R. Jahir Hussain
2. Mrs. S. Sharmila Banu

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UMA4GE2	Generic Elective – II	2	2	-	100	100

Course Title	MATHEMATICS FOR COMPETITIVE EXAMINATION - II

SYLLABUS

Unit	Contents	Hours
I	Pipes and Cisterns – Time and Work	6
II	Time and Distance – Boats and Streams – *Problems on Trains*	6
III	Simple Interest – Compound Interest	6
IV	Area – Volume and Surface Area	6
V	Calendar – *Clocks* – Permutation and Combination	6

…… Self Study

Text Book(s):

Dr. R.S. Aggarwal, Quantitative Aptitude, S. Chand and Company Ltd, (2022).

UNIT I	Chapters 16 & 17
UNIT II	Chapters 18, 19 & 20
UNIT III	Chapters 22 & 23
UNIT IV	Chapters 24 & 25
UNIT V	Chapters 27, 28 & 30

Reference Book(s):

1. R. V. Praveen, Quantitative Aptitude and Reasoning, PHI Private Limited, (2012).
2. Edgar Thorpe, Course in Mental Ability and Quantitative Aptitude, 3rd Edition, Mc Graw Hill Education, (2012).

Web Resource(s):

1. https://www.youtube.com/watch?v=78b4Jn4rw44
2. https://www.youtube.com/watch?v=edEvlh0tqzk
3. https://www.youtube.com/watch?v=ETiRE7N7pEI
4. https://www.youtube.com/watch?v=2rp_-h6PnFo

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Find area, volume and surface area of solids	**K1**
CO2	Illustrate the problems simple and compound interest	**K2**
CO3	Solve the problem based on Pipes and Cisterns & Time and Work	**K3**
CO4	Examine the date and time in Calendar and clocks respectively	**K4**
CO5	Determine the speed and time taken of boats and trains	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**2.8**
CO2	**2**	**2**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**2**	**2.5**
CO3	**3**	**1**	**2**	**3**	**2**	**3**	**2**	**3**	**2**	**2**	**2.3**
CO4	**2**	**2**	**2**	**2**	**2**	**3**	**2**	**1**	**3**	**3**	**2.2**
CO5	**3**	**3**	**2**	**2**	**2**	**3**	**3**	**2**	**3**	**1**	**2.4**
										Mean Overall Score	**2.44**
										Correlation	**Medium**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

1. Dr. U. Abuthahir
2. Dr. C. Gurubaran

Allied Mathematics for B.Sc. Computer Science

Allied Mathematics for B.Sc. Physics

Allied Mathematics for B.Sc. Chemistry

Allied Mathematics for B.Sc. Computer Science

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UMA1AC1	Allied - I	4	3	25	75	100

Course Title	Linear Algebra and Differential Equations

SYLLABUS

Unit	Contents	Hours
I	Matrices- *Special types of matrices*- Scalar multiplication of a matrix- Equality of matrices, Addition of matrices- Subtraction- Symmetric matrix-Skew symmetric matrix-Hermitian and skew Hermitian matrices- Multiplication of matrices- Inverse matrix- Orthogonal matrices (Problems only).	12
II	Solution of simultaneous equations-Rank of a matrix- Eigen values and Eigen vectors-*Cayley Hamilton theorem*. (Problems only)	12
III	Differential equations of the first order with higher degree – Equations solvable for p- Equations Solvable for y – *Equations Solvable for x* - Clairaut's form. (Problems only)	12
IV	*Linear Differential Equations with constant coefficients * - Particular integral – Special method of finding P.I. – Derivation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Different integrals of First Order P.D.E. (Problems only)	12
V	Standard type of first order partial differential equations I, II, III and IV (Clairaut's form) - *Lagrange's equations*. (Problems only).	12

…… Self Study

Text Books:

1. T.K. Manicavachagom Pillay, T. Natarajan and K.S. Ganapathy, Algebra Volume-II, Ananda Book Depot, Chennai (2019)
2. S. Narayanan, T.K. Manicavachagom Pillay, Calculus Volume-III, S. Viswanathan Publishers Pvt. Ltd. (2012).

UNIT I	Chapter 2	Sections 1-9	T.B-1
UNIT II	Chapter 2	Sections 10-13, 16	T.B-1
UNIT III	Chapter 1	Sections 5.1–5.4, 6.1, 6.2	T.B-2
UNIT IV	Chapter 2	Sections 1–4	T.B-2
	Chapter 3	Sections 1–3	
UNIT V	Chapter 4	Sections 5.1-5.4, 6	T.B- 2

Reference Books:

1. P. Kandasamy and K. Thilagavathy, Allied Mathematics, S. Chand & Company Ltd, New Delhi (2010).
2. A. Abdul Rasheed, Allied Mathematics, Vijay Nicole Imprints private limited, Chennai (2008).
3. S. Arumugam and A. Thangapandi Isaac, Ancillary Mathematics, New Gamma Publishing house (2002).

Web Resources:

1. https://nptel.ac.in/courses/111/107/111107111/
2. https://nptel.ac.in/courses/111/102/111102133/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	recognize and recall the basic concept of matrices and first order differential equations with examples.	**K1**
CO2	compute the operations on matrices and solving differential equations related problems.	**K2**
CO3	apply the concepts of matrices for solving system of equations, Eigen values and Eigen vectors.	**K3**
CO4	analyse the impact of an applications of mathematical concepts in computer science using matrices and differential equations.	**K4**
CO5	evaluate the general solution of ordinary and partial differential equations	**K5**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	2	**3**	**3**	**1**	**3**	**3**	**2**	**3**	**2**	**2.5**
CO2	**3**	**3**	**2**	**2**	**1**	**2**	**3**	**2**	**3**	**2**	**2.3**
CO3	**3**	**3**	**2**	**2**	**1**	**3**	**2**	**3**	**3**	**2**	**2.4**
CO4	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**2**	**2.6**
CO5	**2**	**2**	**2**	**3**	**1**	**2**	**2**	**2**	**3**	**2**	**2.1**
Mean Overall Score											**2.38**
Correlation											Medium

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

Dr. M.A. Rifayathali
Mrs. A. Fathima Begam

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UMA1AC2	Allied – II	4	3	25	75	100

Course Title	Numerical Methods with Octave

SYLLABUS

Unit	Contents	Hours
I	Solution of Algebraic equations by the bisection method – The iteration method – * Newton-Raphson Method *.	**12**
II	Finite Differences: Forward differences – Backward difference. Interpolation: Gregory-Newton forward interpolation formula for equal intervals - *Gregory-Newton backward interpolation formula for equal intervals* – Related Problems.	**12**
III	Exact solutions to a set of linear equations using Gauss Elimination method and Gauss – Jordan Method – Inversion of a matrix using Gauss – *Elimination method*.	**12**
IV	Numerical Integration: Trapezoidal Rule – Simpson's 1/3 rule - *Simpson's 3/8 rule*.	**12**
V	Numerical Solution of Ordinary Differential Equations: Numerical solutions to an Ordinary Differential Equation by Euler's Method – Improved Euler Method – * Modified Euler Method *– Runge-Kutta's second order and fourth order method.	**12**

Note: Theoretical proof not expected.

…… Self Study

Text Book:

P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company Ltd(2010).

UNIT I	Chapter 3	Sections 3.1, 3.2 and 3.4
UNIT II	Chapter 5	Sections 5.1
	Chapter 6	Sections 6.2 and 6.3
UNIT III	Chapter 4	Sections 4.1, 4.2 and 4.3
UNIT IV	Chapter 9	Sections 9.9, 9.13 and 9.14.
UNIT V	Chapter 11	Sections 11.9 – 11.13.

Reference Books:

1. Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India Learning Private Limited, Fourth Edition (2009).
2. F.B. Hildebrand, Introduction to Numerical analysis, Second edition, Tata McgrawHill (1987)
3. A. Singaravelu, Numerical Methods, Meenachi Agency (2000)

Web Resources:

1. https://nptel.ac.in/courses/111107105
2. https://nptel.ac.in/courses/127106019

Digital Demonstration using OCTAVE

https://www.digimat.in/nptel/courses/video/113101072/L29.html

https://www.youtube.com/watch?v=4jD7GPt1x2U - The bisection method

https://www.youtube.com/watch?v=gAmhUrX5Byk - Newton-Raphson Method

https://www.youtube.com/watch?v=XYWEIxY6Qkw - Euler's Method

https://www.youtube.com/watch?v=02nBrrLlheQ - Runge-Kutta's Method

https://www.youtube.com/watch?v=lFPW0cTXhyk - Simpson's Rule

https://www.youtube.com/watch?v=bwqccQRG1R4 - Trapezoidal Rule

https://www.youtube.com/watch?v=EcM3tbLhosU - Gauss – Jordan Method

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Remember the common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.	**K1**
CO2	Demonstrate understanding numerical methods for various mathematical problems	**K2**
CO3	Apply numerical methods to obtain approximate solutions to mathematical problems.	**K3**
CO4	Analyse mathematical problems to determine the suitable numerical techniques.	**K4**
CO5	Evaluate the numerical solution of ordinary differential equations.	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	**3**	**3**	**3**	**2**	**1**	**3**	**3**	**3**	**1**	**3**	**2.5**
CO2	**2**	**2**	**3**	**2**	**1**	**3**	**3**	**3**	**1**	**3**	**2.3**
CO3	**2**	**3**	**3**	**1**	**1**	**3**	**3**	**2**	**1**	**2**	**2.1**
CO4	**3**	**2**	**2**	**1**	**1**	**3**	**3**	**3**	**1**	**2**	**2.1**
CO5	**3**	**2**	**2**	**2**	**1**	**3**	**3**	**2**	**1**	**2**	**2.1**
										Mean Overall Score	**2.22**
										Correlation	**Medium**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators: Dr. V. Krishnan & Mrs. A. Fathima Begam

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UMA2AC3	Allied - III	4	3	25	75	100

Course Title	Operations Research

SYLLABUS

Unit	Contents	Hours
I	Linear Programming Problem- Mathematical Formulation of the Problem – Solving a LPP by Graphical method – General Linear Programming (LPP)- Standard form and Canonical form-* Basic Solution *- Solving LPP by Using Simplex Method (**Problem only**)	12
II	Transportation Problem: Finding IBFS by NWCR, LCM, VAM for given Transportation Problem (Balance and unbalanced). (**Problem only**)	12
III	Assignment Problem (Balanced and unbalanced) – Hungarian Method – Problem of Sequencing Problem - Processing n-jobs through 2-machine – *processing 2-jobs through k-machine*. (**Problem only**)	12
IV	Games and Strategy : Introduction – Two-person zero –sum games – *Some Basic terms – The maxmin –minmax principle* – Games without saddle points – mixed strategies – Graphic solution of 2 X n and m X 2 games. (**Problem only**)	12
V	Network scheduling by CPM – Networks basic components – Logical sequencing – *Rules of Network constructions* – Critical Path Analysis. (**Problem only**)	12

…… Self Study

Text Book:

KantiSwarup, P.K.Gupta and Man Mohan, Operations Research, Sultan Chand &son Pvt. Ltd, 2009

UNIT I: Chapter 2, 3&4 Sections: 2.3,2.4,3.2 - 3.5, 4.1- 4.3.
UNIT II: Chapter 10 Section:,10.9.
UNIT III: Chapter 11&12 Sections: 11.1 – 11.3, 12.4,12.6.
UNIT IV: Chapter 17 Sections: 17.1 – 17.6.
UNIT V: Chapter 25 Sections: 25.1 – 25.4, 25.6.

Reference Books:

1. P.Prem kumar Gupta and D.S. Hira , Operations Research,S.Chand,2000.
2.J.K.Sharma , Operations Research Theory and Applications ,Macmillan India Ltd.(2000)
3.V.Sunderesan,K.S.Ganapathy Subramaniam,K.Ganesan, Operations Research, A.R.Publications,3rd Edition,2005

Web Resources:

MOOC learning:

1. https:/nptel.ac.in/courses/111/107/111107128/
(Lectures by Prof. Kusum Deep, Dept. of Mathematics ,IIT Roorkee)
2. https://nptel.ac.in/courses/112/102/112106134/
(Lectures by Prof.G.Srinivasan, Dept. of . Management Studies IIT Madras)
3.https://www.youtube.com/watch?v=-1jpfY0zA7s (Standard and Canonical Form)
4..https://www.youtube.com/watch?v=fSuqTgnCVRg (Game therory)
5.https://www.youtubr.com/watch?v=KG5b0xZ_Ba8 (Networking theory).

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	define the features of operations research with applications and limitations with practical examples.	**K1**
CO2	illustrate LPP by Graphical and Simplex methods.	**K2**
CO3	construct the Basic feasible solution of Transportation problem by different methods.	**K3**
CO4	analyse the optimum solution for Assignment problems with illustrations.	**K4**
CO5	determine Network scheduling and demonstrate critical path analysis with examples.	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	3	3	3	2	2	3	2.8
CO2	3	3	3	3	3	3	3	3	3	2	2.9
CO3	3	3	3	3	3	3	2	3	2	3	2.8
CO4	3	3	3	3	3	3	2	3	2	2	2.7
CO5	3	3	3	3	3	3	3	2	2	3	2.8
Mean Overall Score											**2.8**
Correlation											**High**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:
Dr. M. Mohamed Althaf
Mrs. Z. Sirajunisha

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UMA2AC4	Allied - IV	3	3	25	75	100

Course Title	Statistics

SYLLABUS

Unit	Contents	Hours
I	Arithmetic Mean-Properties of Arithmetic Mean-Weighted Mean–Median. Merits and Demerits of Mean, *Median*.	9
II	Mode- Geometric Mean- Harmonic Mean. Graphical Location of the Partition values. Merits and Demerits of Mode, Geometric Mean and * Harmonic Mean*.	9
III	Dispersion-Characteristics for Ideal Measure of Dispersion-Measures of Dispersion -Range- Q.D- M.D- S.D, Coefficient of Dispersion -*Coefficient of Variation*-	9
IV	Correlation–Types of Correlation–Scatter Diagram–Karl-Pearson's Coefficient of *Correlation Spearman's Rank Correlation*.	9
V	Regression- Linear -Properties of correlation and regression coefficients. (Numerical Problems only)	9

…… Self Study

Text Book:

S.C. Gupta & V.K. Kapoor, Elements of Mathematical Statistics, Sultan Chand and Sons, Third Edition, Reprint2010.

UNITI	**Chapter 2**	**Sections2.3–2.6**
UNITII	**Chapter 2**	**Sections2.7 –2.9.1& 2.11.1**
UNITIII	**Chapter 3**	**Sections3.1–3.7,3.7.3,3.8**
UNITIV	**Chapter10**	**Section10.1to10.3,10.6**
UNITV	**Chapter10**	**Section10.7**

Reference Books:

1. S.C.Gupta and V.K.Kapoor , Fundamental of Mathematical Statistics , Sultan Chand and Sons Pubilication, 11th Edition,2013.
2.Murray R.Speigal ,John Jschiller ,R.Alu Srinivasan , Probability and statistics , 3rd Edition ,shaum's Outline series ,2010.
3.P.R.Vittal, Business Mathematics and Statistics, Margham Pubilications,2021

Web Resources:

MOOC learning:

1. https://nptel.ac.in/courses/110107114(Introduction – Objectives- Diagrams and Graphs)
(Lectures by Prof.Mukesh Kumar Barua, Dept. of Management Studies ,IIT Roorkee)
2. https://www.syncfusion.com/ebooks/statistics/descriptive-statistics
(Measures of central tendency and dispersion)
3. https://www.youtube.com/watch?v=cOuUsZ9yNyk (Diagramamatic and graphical)
4. https://www.youtube.be/XrGM0OANzaE (Measures of central tendency)
5. https://www.youtu.be/O48XEfedSWs (S.D)
6. https://www.youtu.be/5TJ52gAjzOI (M.D)
7. https://www.youtu.be/C1gjdiCxQ2s (Q.D)
8. https://www.youtu.be/iJcO1ZzX-Qo (correlation)
9. https://www.youtu.be/pT8M17HUh8c (Regression)

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	demonstrate the basic concepts about collection and representation of data with practical examples.	**K1**
CO2	identify the methods for different type of Mean and discuss its merits and demerits.	**K2**
CO3	examine and understanding of the concepts of Median and Mode with examples.	**K3**
CO4	determine the measures of dispersions and their coefficients.	**K4**
CO5	evaluate the direction of linear relationship between two variables, correlation and Regression.	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	2	3	1	3	3	3	3	3	**2.6**
CO2	3	3	3	3	1	3	2	3	3	3	**2.7**
CO3	3	3	3	2	0	3	3	3	3	2	**2.5**
CO4	3	3	3	2	0	3	3	3	3	2	**2.5**
CO5	3	3	3	2	0	3	3	2	2	2	**2.3**
										Mean Overall Score	**2.52**
										Correlation	**High**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators: Dr. T. Shiek Pareeth & Mrs. Z. Sirajunisha

Allied Mathematics for B.Sc. Physics

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UMA3AC5:2	Allied – V	4	3	25	75	100

Course Title	CALCULUS (For Physics)

SYLLABUS		
Unit	**Contents**	**Hours**
I	Higher Derivatives: The nth derivative - Standard results - Trigonometrical transformations - Formation of equations involving derivatives - Leibnitz formula for the nth derivative of a product (Statement only) - Related problems.	12
II	Jacobian – Curvature: Circle, radius and centre of curvature – Cartesian formula for the Radius of Curvature – The Coordinates of the Center of Curvature	12
III	Properties of definite integrals – Integration by parts - Reduction formulae $\int x^n e^{ax}, \int sin^n x, \int cos^n x, and \int sin^m x cos^n x$- Related problems.	12
IV	Multiple Integral: Definition of the double integral – Evaluation of the double integral – *Application of multiple integrals*	12
V	Volume of solids of revolution – volumes of solids as double integrals – Volume as a triple integral - *Areas of curved Surface*	12

…… Self Study

Text Book(s):

1. S. Narayanan, R. Hanumantha Rao and T.K. Manicavachagom Pillay, Ancillary Mathematics Volume - I, S. Viswanathan Publishers Pvt. Ltd Revised Edition (2007).
2. S. Narayanan, R.Hanumantha Rao and T.K.Manicavachagom Pillay, Ancillary Mathematics Volume - II, S.Viswanathan Publishers Pvt. Ltd Revised Edition (2007).

UNIT I	Chapter VI	Sections 6.1	T.B.1
UNIT II	Chapter VI	Sections 6.2, 6.4	T.B.1
UNIT III	Chapter 1	Sections 11, 12, 13.1-13.5	T.B.2
UNIT IV	Chapter 3	Sections 2.1, 2.2 & 4.1	T.B.2
UNIT V	Chapter 3	Sections 3, 5.1 – 5.4	T.B.2

Reference Book(s):

1. T.K.Manicavachagom Pillay and Others, Calculus Volume-I, S. Viswanathan Publishers Pvt. Ltd. (2004).
2. T.K.Manicavachagom Pillay and Others, Calculus Volume-II, S. Viswanathan Publishers Pvt.Ltd. (2004).

Web Resource(s):

1. https://nptel.ac.in/courses/111104092
2. https://nptel.ac.in/courses/111105122

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Recall and illustrate the examples of Multiple Integrals.	**K1**
CO2	Demonstrate and discuss Jacobian – Curvature with examples.	**K2**
CO3	Apply domain knowledge for Integration by parts - Reduction formulae	**K3**
CO4	Examine methods for Higher Derivatives with illustrate the examples.	**K4**
CO5	Study of Application of multiple integrals with suitable examples.	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	**3**	**3**	**1**	**3**	**3**	**1**	**3**	**3**	**3**	**2**	**2.5**
CO2	**3**	**1**	**3**	**1**	**3**	**3**	**2**	**3**	**3**	**1**	**2.3**
CO3	**3**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2.8**
CO4	**1**	**3**	**3**	**1**	**3**	**3**	**3**	**1**	**3**	**2**	**2.3**
CO5	**3**	**3**	**1**	**3**	**1**	**3**	**1**	**3**	**2**	**3**	**2.3**
Mean Overall Score											**2.4**
Correlation											**Medium**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

3. Dr. P. Muruganatham
4. Mr. T. Rabeeh Ahamed

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UMA3AC6:2	Allied – VI	3	3	25	75	100

Course Title	ALGEBRA AND TRIGONOMETRY (For Physics)

SYLLABUS

Unit	Contents	Hours
I	Theory of equations: *Nature of roots* – Relation between the coefficients and the Roots of an algebraic equation – Transformation of equations – Reciprocal equations.	9
II	Matrices- *Special types of matrices*- Scalar multiplication of a matrix- Equality of matrices, Addition of matrices- Subtraction- Symmetric matrix-Skew symmetric matrix-Hermitian and skew Hermitian matrices- Multiplication of matrices (Problems only).	9
III	Matrices: *Various types of Matrices* - Rank of a Matrix - Eigen values and Eigen Vectors- Verification of Cayley-Hamilton theorem.	9
IV	Trigonometry: Expansions of cosnθ and sinnθ – Powers of sines and cosines of θ in Terms of functions of multiple of θ.	9
V	Hyperbolic functions – Simple Problems	9

…… Self Study

Text Book(s):

1. S.Narayanan, R.Hanumantha Rao and T.K. Manicachagom Pillay, P. Kandaswamy, Ancillary Mathematics, Volume I, S. Viswanathan Publishers Pvt. Ltd. Revised Edition (2007).
2.T.K. Manicavachagom Pillay, T. Natarajan and K.S. Ganapathy, Algebra Volume-II, Ananda Book Depot, Chennai (2019).

UNIT I	Chapter 2	Sections 2.1– 2.4	TB-1
UNIT II	Chapter 2	Sections 1-7	TB-2
UNIT III	Chapter 3	Sections 3.1, 3.2, 3.4.	TB-1
UNIT IV	Chapter 5	Sections 5.1, 5.2	TB-1
UNIT V	Chapter 5	Section 5.4.	TB-1

Reference Book(s):

1. A. Abdul Rashid, Allied Mathematics, Vijay Nicole Publishing Company (2008).
2. S. Arumugam and A. Thangapandi Isaac, Ancillary Mathematics, New Gamma Publishing house (2002).

Web Resource(s):

1. https://nptel.ac.in/courses/111107119
2. https://www.digimat.in/nptel/courses/video/111107119/L01.html

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Understand of common algebra and how they are used to obtain solutions of matrices then mathematical problems.	**K1**
CO2	Derive the Trigonometry Expansions of cosnθ and sinnθ – Powers of sines and cosines.	**K2**
CO3	Apply algebra and Trigonometry to obtain solutions to mathematical problems.	**K3**
CO4	Analyse mathematical problems to determine the suitable functions.	**K4**
CO5	Evaluate various Trigonometry functions and roots of algebraic equation, hyperbolic functions.	**K5**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	**3**	**3**	**2**	**1**	**3**	**3**	**3**	**2**	**3**	**2.6**
CO2	**2**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**1**	**3**	**2.5**
CO3	**3**	**1**	**3**	**3**	**1**	**3**	**1**	**3**	**3**	**3**	**2.4**
CO4	**3**	**2**	**3**	**2**	**1**	**1**	**2**	**3**	**3**	**3**	**2.3**
CO5	**2**	**3**	**1**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**2.5**
Mean Overall Score											**2.46**
Correlation											**Medium**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

3. Dr. V. Krishnan
4. Mr. T. Rabeeh Ahamed

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UMA4AC7:2	Allied – VII	4	3	25	75	100

Course Title	DIFFERENTIAL EQUATIONS (For Physics)

SYLLABUS

Unit	Contents	Hours
I	Differential Equations of the first order: Definitions – Solution of Differential Equations – Formation of differential equations – Equations of the first order and the first degree – variable separable – Homogenous equations – *Non-homogenous equations of the first degree in x and y* – linear equation.	12
II	Linear Differential Equations with Constant Coefficients: The operator D and D^{-1} – Particular integral – Special methods of finding P.I – Equations reducible to the linear homogeneous equation.	12
III	Partial Differential Equations: Derivation of partial differential equations – Different integrals of partial differential equations – Solution of partial differential equation in some simple cases – *Some standard types of first order equations* – Lagrange's Equations.	12
IV	Laplace Transforms: Definitions – Laplace transform of periodic functions – Some General Theorems and problems.	12
V	The inverse transforms: Results under inverse transforms of functions – Solving ordinary differential equations with constant coefficients using Laplace transforms.	12

…… Self Study

Text Book(s):

S. Narayanan and T.K. Manicavachagom Pillay, Calculus, Volume – III, S. Viswanathan Publishers Pvt. Ltd., Revised Edition (2019).

UNIT I	Chapter II	Sections 4, 5, 6.1 – 6.5
UNIT II	Chapter IV	Sections 1 – 4
UNIT III	Chapter V	Sections 1 – 5
UNIT IV	Chapter IX	Sections 1 - 5
UNIT V	Chapter IX	Sections 6 - 11

Reference Book(s):

1. S. Arumugam and A. Thangapandi Isaac, Calculus, New Gamma Publishing House (2008).
2. A. Abdul Rashid, Allied Mathematics, Vijay Nicole Publication Company.

Web Resource(s):

1. https://www.classcentral.com/course/swayam-ordinary-and-partial-differential-equations-and-applications-17718
2. https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-ma10/
3. https://nptel.ac.in/courses/111/105/111105093/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Apply domain knowledge for solving first order linear differential equations.	**K1**
CO2	Discuss and solve the linear differential equations with constant coefficients with examples.	**K2**
CO3	Solve the partial differential equations and Lagrange's equations with the examples.	**K3**
CO4	Investigate Laplace transform of periodic functions and some general theorems with examples.	**K4**
CO5	Determine results under inverse transforms of functions with examples and solve differential equations with constant co-efficient	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	**3**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**2**	**2.4**
CO2	**3**	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**3**	**2**	**2.5**
CO3	**3**	**3**	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**2**	**2.5**
CO4	**3**	**3**	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**2**	**2.5**
CO5	**3**	**3**	**3**	**1**	**2**	**3**	**3**	**3**	**2**	**2**	**2.5**
Mean Overall Score											**2.48**
Correlation											**Medium**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

4. Dr. U. Abuthahir
5. Dr. C. Gurubaran

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UMA4AC8:2	Allied – VIII	4	2	25	75	100

Course Title	VECTOR CALCULUS AND FOURIER SERIES (For Physics)

SYLLABUS

Unit	Contents	Hours
I	Fourier Series: Even and Odd Functions – Half Range Fourier Series – Development in Cosine series.	12
II	Development in Sine Series – Change of interval – Combination of series.	12
III	Vector Analysis: Level Surfaces – The vector differential operator – Gradient – Direction and Magnitude of gradient – Divergence and curl.	12
IV	Line integral – Theorem under Line integral – Volume integral – Surface integral.	12
V	Gauss Divergence Theorem (Statement only) – Stokes Theorem (Statement only) - Simple problems.	12

Text Book(s):

S. Narayanan, R. Hanumantha Rao and T.K.Manikavachagompillay, P. Kandasamy, Ancillary Mathematics, Volume – II, S.Viswanathan publishers Pvt. Ltd., Revised Edition (2007).

UNIT I	Chapter - 2	Sections 1 to 4, 5.1
UNIT II	Chapter - 2	Sections 5.2, 6, 7
UNIT III	Chapter - 8	Sections 15 to 20
UNIT IV	Chapter - 8	Sections 1 to 5
UNIT V	Chapter - 8	Sections 6 and 9

Reference Book(s):

1. S. Arumugam and A. Thangapandi Isaac, Calculus, New Gamma Publishing House (2008).
2. A. H. Siddiqi & P.H. Manchanda, A first course in Differential Equations with applications, Macmillan Publishers India Limited, 2006.

Web Resource(s):

1. https://nptel.ac.in/courses/111105122
2. https://nptel.ac.in/courses/111101164

Course Outcomes

Upon successful completion of this course, the student will be able to:

CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Relate and study the Vector differential operator	K1
CO2	Acquire more knowledge on line, volume and surface integral	K2
CO3	Demonstrate and discuss the Half range Fourier series	K3
CO4	Apply domain knowledge for the sine and cosine series in change of interval	K4
CO5	Remember the concept of vector and operators with examples	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	2	3	3	2	3	3	2	2	2.4
CO2	3	2	2	3	3	3	2	3	2	2	2.5
CO3	3	3	2	3	3	3	2	3	3	3	2.5
CO4	3	3	1	2	3	3	3	3	1	3	2.5
CO5	1	3	3	2	3	3	2	2	3	3	2.5
Mean Overall Score											2.58
Correlation											High

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

4. Dr. H. Sheik Mujibur Rahman
5. Mr. T. Rabeeh Ahamed

Allied Mathematics for B.Sc. Chemistry

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UMA3AC5:3	Allied – V	4	3	25	75	100

Course Title	CALCULUS (For Chemistry)

SYLLABUS		
Unit	**Contents**	**Hours**
I	Successive Differentiation – The n^{th} derivatives of Standard result – Trigonometrical transformation of functions - * Formation of equations involving derivatives* - Leibnitz formula for the n^{th} derivative of a product (Statement only) - Related problems.	12
II	Partial Differentiation – Successive partial derivatives – Function of function rule - *Total differential coefficient and special case* – implicit functions - Homogeneous functions - Partial derivatives of a function of two functions.	12
III	Properties of definite integrals – Integration by parts - Reduction formulae $\int x^n e^{ax}, \int sin^n x, \int cos^n x, and \int sin^m x cos^n x$- Related problems.	12
IV	Curvature: Circle, Radius and Center of Curvature - Cartesian Formula for the Radius of Curvature - Coordinates of the Center of Curvature.	12
V	Evolute and Involute – Radius of curvature when the curve is given in polar co-ordinates – p-r equation – pedal equation of a curve.	12

…… Self Study

Text Book(s):

T. K. Manicavachagom Pillay and Others, Calculus Volume-I, S. Viswanathan Publishers Pvt. Ltd. (2004).

UNIT I	Chapter III	Sections 1.1 – 1.6, 2.1, 2.2 (Section 2.1: statement only Section 2.2: problems only)
UNIT II	Chapter V	Sections 1.2, 1.3, 1.5(Section 1.2 and 1.3: Theorems statement only, Section 1.5: Working Rules and problems only)
	Chapter VIII	Sections 4, 5
UNIT III	Chapter VIII	Sections 1.1 – 1.7
UNIT IV	Chapter X	Sections 2.1 – 2.4
UNIT V	Chapter X	Sections 2.5 – 2.8

Reference Book(s):

1. A. Abdul Rasheed, Allied Mathematics, Tata McGraw Hill Education (2006)
2. S. Arumugam and A. Thangapandi Isaac, Calculus, New Gamma Publishing House (2008).

Web Resource(s):

1. https://nptel.ac.in/courses/111104092
2. https://nptel.ac.in/courses/111105122

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Find the nth derivatives of a function and apply the Leibnitz's theorem for finding n^{th} derivative of product of two functions.	**K1**
CO2	Explain the concept of curvature of a curve and to find the radius and center of curvature of a given curve.	**K2**
CO3	Solve maxima and minima for a function of one, two variables.	**K3**
CO4	Understand the concept of evolute, involute and to find radius of curvature using polar co-ordinates and forming pedal equation of a curve.	**K4**
CO5	Discuss the partial derivatives of a function of functions depending on two independent variables and to understand the concepts of homogeneous function, Euler's theorem, total differentiation and implicit functions.	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	3	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2.8**
CO2	**3**	**1**	**3**	**3**	**3**	**3**	**1**	**3**	**1**	**3**	**2.4**
CO3	**3**	**3**	**1**	**3**	**2**	**3**	**3**	**1**	**3**	**3**	**2.5**
CO4	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**2.8**
CO5	**3**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**1**	**3**	**2.4**
Mean Overall Score											**2.58**
Correlation											**High**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

5. Dr. P. Muruganatham
6. Mr. T. Rabeeh Ahamed

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UMA3AC6:3	Allied – VI	3	3	25	75	100

Course Title	ALGEBRA AND TRIGONOMETRY (For Chemistry)

SYLLABUS		
Unit	**Contents**	**Hours**
I	Theory of equations: *Nature of roots* – Relation between the coefficients and the Roots of an algebraic equation – Transformation of equations – Reciprocal equations.	**9**
II	Matrices- *Special types of matrices*- Scalar multiplication of a matrix- Equality of matrices, Addition of matrices- Subtraction- Symmetric matrix-Skew symmetric matrix-Hermitian and skew Hermitian matrices- Multiplication of matrices (Problems only).	**9**
III	Matrices: *Various types of Matrices* - Rank of a Matrix - Eigen values and Eigen Vectors- Verification of Cayley-Hamilton theorem.	**9**
IV	Trigonometry: Expansions of cosnθ and sinnθ – Powers of sines and cosines of θ in Terms of functions of multiple of θ.	**9**
V	Hyperbolic functions – Simple Problems	**9**

…… Self Study

Text Book(s):

1. S.Narayanan, R.Hanumantha Rao and T.K. Manicachagom Pillay, P. Kandaswamy, Ancillary Mathematics, Volume I, S. Viswanathan Publishers Pvt. Ltd. Revised Edition (2007).
2. T.K. Manicavachagom Pillay, T. Natarajan and K.S. Ganapathy, Algebra Volume-II, Ananda Book Depot, Chennai (2019).

UNIT I	Chapter 2	Sections 2.1– 2.4	TB-1
UNIT II	Chapter 2	Sections 1-7	TB-2
UNIT III	Chapter 3	Sections 3.1, 3.2, 3.4.	TB-1
UNIT IV	Chapter 5	Sections 5.1, 5.2	TB-1
UNIT V	Chapter 5	Section 5.4.	TB-1

Reference Book(s):

1. A. Abdul Rashid, Allied Mathematics, Vijay Nicole Publishing Company (2008).
2. S. Arumugam and A. Thangapandi Isaac, Ancillary Mathematics, New Gamma Publishing house (2002).

Web Resource(s):

1. https://nptel.ac.in/courses/111107119
2. https://www.digimat.in/nptel/courses/video/111107119/L01.html

Course Outcomes

Upon successful completion of this course, the student will be able to:

CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Understand of common algebra and how they are used to obtain solutions of matrices then mathematical problems.	**K1**
CO2	Derive the Trigonometry Expansions of cosnθ and sinnθ – Powers of sines and cosines.	**K2**
CO3	Apply algebra and Trigonometry to obtain solutions to mathematical problems.	**K3**
CO4	Analyse mathematical problems to determine the suitable functions.	**K4**
CO5	Evaluate various Trigonometry functions and roots of algebraic equation, hyperbolic functions.	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	2	1	3	3	3	2	3	2.6
CO2	2	3	3	3	1	3	3	3	1	3	2.5
CO3	3	1	3	3	1	3	1	3	3	3	2.4
CO4	3	2	3	2	1	1	2	3	3	3	2.3
CO5	2	3	1	3	1	3	3	3	3	3	2.5
Mean Overall Score											2.46
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

5. Dr. V. Krishnan
6. Mr. T. Rabeeh Ahamed

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UMA4AC7:3	Allied – VII	4	3	25	75	100

Course Title	DIFFERENTIAL EQUATIONS (For Chemistry)

SYLLABUS		
Unit	**Contents**	**Hours**
I	Linear equation – Bernoulli's equation – Exact differential equations.	12
II	Equations of the first order but of higher degree - Equations solvable for dy/dx Equations solvable for y - *Equations solvable for x* – Clairaut's form – Equations that do not contain x explicitly - Equations that do not contain y explicitly - Homogeneous equations in x and y.	12
III	Linear Equations with constant coefficients - The operator D - Complementary function of a linear equation with constant coefficients –Particular integrals.	12
IV	Linear equations with variable coefficients – Equations reducible to the linear equations –Variation of parameters.	12
V	Partial Differential Equations of the first order - Classification of integrals - Derivation of PDE by elimination of constants and functions - Lagrange's method of solving the linear equation -Special methods -Standard forms I, II, *III and IV (Clairant's form) *	12

…… Self Study

Text Book(s):

S. Narayanan and T. K. Manicavachagom Pillay, Differential Equation and its Application, S. Viswanathan Publishers Pvt. Ltd., Ninth edition (2006).

UNIT I	Chapter II	Sections 4, 5, 6.1 –6.4
UNIT II	Chapter IV	Sections 1 – 4
UNIT III	Chapter V	Sections 1 – 4
UNIT IV	Chapter V	Sections 5 and 6
	Chapter VIII	Section 4
UNIT V	Chapter XII	Sections 1 – 5

Reference Book(s):

1. M.D. Raisinghania, Ordinary and Partial Differential Equations, S. Chand & Co. (2010).
2. M.L. Khanna, Differential Equations, Jai Prakash Nath and Co. (2004).

Web Resource(s):

1. https://nptel.ac.in/courses/111/105/111105093/
2. https://nptel.ac.in/courses/111/107/111107111/
3. https://nptel.ac.in/courses/122/107/122107037/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Recall the concept of differential equations.	**K1**
CO2	Classify the different forms of differential equations	**K2**
CO3	Solve the linear differential equations with constant coefficients and particular integrals	**K3**
CO4	Simplify the differential equations with variable coefficients	**K4**
CO5	Evaluate the partial differential equation by Lagrange's method	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	**3**	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**2**	**2.5**
CO2	**3**	**2**	**1**	**1**	**2**	**3**	**3**	**3**	**3**	**2**	**2.3**
CO3	**3**	**3**	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**2**	**2.5**
CO4	**3**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**2**	**2.4**
CO5	**3**	**3**	**2**	**2**	**2**	**3**	**3**	**2**	**2**	**2**	**2.4**
Mean Overall Score											**2.42**
Correlation											**Medium**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

6. Dr. U. Abuthahir
7. Dr. C. Gurubaran

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UMA4AC8:3	Allied – VIII	4	3	25	75	100

Course Title	STATISTICS AND VECTOR CALCULUS (For Chemistry)

SYLLABUS

Unit	Contents	Hours
I	Measures of central tendency- Arithmetic Mean - Properties of Arithmetic Mean - Weighted mean – Median- *Merits and Demerits of Mean, Median*.	12
II	Mode - Geometric mean - Harmonic mean. Graphical Location of the Partition values. *Merits and Demerits of Mode, Geometric Mean and Harmonic Mean*.	12
III	Dispersion-characteristics for ideal measure of dispersion - Measures of Dispersion - Range - Q.D - M.D - S.D, coefficient of dispersion - *Coefficient of variation* - Simple problems.	12
IV	Correlation – Bivariate distribution, correlation – scatter diagram – Karl- Pearson's coefficient of correlation – Rank correlation- Regression - Properties of correlation and regression coefficients. (Numerical Problems only)	12
V	Vector Calculus: The vector differential operator – Gradient - Direction and Magnitude of gradient - Divergence and curl - Related problems.	12

…… Self Study

Text Book(s):

1. S.C.Gupta & V.K.Kapoor, Elements of Mathematical Statistics, Sultan Chand and Sons, Third Edition, Reprint 2010.
2. S.Narayanan, R.Hanumantha Rao , T.K. Manicachagom Pillay and P. Kandasamy, Ancillary Mathematics, Volume II, S. Viswanathan Publishers Pvt. Ltd. Revised Edition (2008).

UNIT I	Chapter 2	Sections 2.3 - 2.6	TB-1
UNIT II	Chapter 2	Sections 2.7-2.9.1, 2.11.1	TB-1
UNIT III	Chapter 3	Sections 3.1-3.7, 3.7.3, 3.8	TB-1
UNIT IV	Chapter 10	Sections 10.1 to 10.3, 10.6, 10.7	TB-1
UNIT V	Chapter 8	Sections 16-20	TB-2

Reference Book(s):

1. Murray R. Speigel, John Jschiller, R. Alu Srinivasan, Probability and Statistics, Third Edition, Shaum's Outline Series (2010).
2. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons Publication, Eleventh Edition (2013).
3. M.L, Khanna, Vector calculus, Jai Prakash Nath and Co., Eighth Edition (1986).

Web Resource(s):

1. https://nptel.ac.in/courses/111/106/111106112/
2. https://nptel.ac.in/courses/111105122

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Relate and study of vector differential operator with examples	**K1**
CO2	Acquire more knowledge on Measures of Central Tendency	**K2**
CO3	Demonstrate and discuss the Measures of Dispersion	**K3**
CO4	Apply domain knowledge for bivariate distributions with examples	**K4**
CO5	Remember the integration and its applications	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**2**	**3**	**2.7**
CO2	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2.7**
CO3	**3**	**1**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**2.4**
CO4	**3**	**2**	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**2**	**2.5**
CO5	**1**	**3**	**3**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**2.5**
									Mean Overall Score		**2.56**
									Correlation		**High**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

6. Dr. H. Sheik Mujibur Rahman
7. Dr. C. Gurubaran