

CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)

Nationally Accredited with 'A' Grade by NAAC

ISO 9001:2015 Certified

PG AND RESEARCH DEPARTMENT OF MATHEMATICS



B.Sc., MATHEMATICS AUTONOMOUS SYLLABUS (2022-2023 and ONWARDS)

CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)
PG AND RESEARCH DEPARTMENT OF MATHEMATICS

VISION

To strive for excellence in the mathematical sciences in addition to encourage people to undertake opportunities in transdisciplinary domains.

MISSION

- To enhance analytical and logical problem-solving capabilities.
- To provide excellent mathematical science knowledge for a suitable career and to groom students for national prominence.
- To teach students how to use data analytics.
- To prepare students for transdisciplinary research and applications.
- Value-based education and service-oriented training programmes are used to acquire life skills.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Statements
PEO1	LEARNING ENVIRONMENT To facilitate value-based holistic and comprehensive learning by integrating innovative learning practices to match the highest quality standards and train the students to be effective leaders in their chosen fields.
PEO2	ACADEMIC EXCELLENCE To provide a conducive environment to unleash their hidden talents and to nurture the spirit of critical thinking and encourage them to achieve their goal.
PEO3	EMPLOYABILITY To equip students with the required skills in order to adapt to the changing global scenario and gain access to versatile career opportunities in multidisciplinary domains.
PEO4	PROFESSIONAL ETHICS AND SOCIAL RESPONSIBILITY To develop a sense of social responsibility by formulating ethics and equity to transform students into committed professionals with a strong attitude towards the development of the nation.
PEO5	GREEN SUSTAINABILITY To understand the impact of professional solutions in societal and environmental contexts and demonstrate the knowledge for an overall sustainable development.

PROGRAMME OUTCOMES FOR B.Sc Mathematics, B.Sc Physics,
B.Sc Chemistry PROGRAMME

After completing a B.Sc., programme, a learner will be able to

PO NO.	On completion of B.Sc Mathematics / B.Sc Physics / B.Sc Chemistry Programme, the students will be able to
PO1	DOMAIN KNOWLEDGE Analyse, design and develop solutions by applying from fundamental concepts of basic sciences and expertise in discipline.
PO2	PROBLEM SOLVING Ability to think abstractly, to evaluate and concentrates effectively on problem-solving, as well as knowledge of global challenges.
PO3	CREATIVE THINKING AND TEAM WORK Develop prudent decision-making skills and mobility to work in teams to solve multifaceted problems.
PO4	EMPLOYABILITY Self-study acclimatize them to observe effective interactive practices for practical learning enabling them to be a successful science graduate.
PO5	LIFE LONG LEARNING Assure consistent improvement in the performance and arouse interest to pursue higher studies in premium institutions.

PROGRAMME SPECIFIC OUTCOMES FOR B.Sc MATHEMATICS

PSO NO.	The Students of B.Sc Mathematics will be able to	POs Addressed
PSO1	Procure a precise understanding of the mathematical concepts.	PO1, PO3
PSO2	Excel by enhancing interpersonal skills, overcoming procedural challenges and intending career paths.	PO3, PO4
PSO3	Recognize, strengthen and analyse mathematical problems in order to acquire better conclusion.	PO4, PO5
PSO4	Manipulate numerical abilities across a variety of domains.	PO2, PO5
PSO5	Develop and desire to learn more about advanced mathematics and its applications.	PO5



CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)

PG AND RESEARCH DEPARTMENT OF MATHEMATICS

B.Sc MATHEMATICS PROGRAMME STRUCTURE

LEARNING OUTCOME BASED CURRICULUM FRAMEWORK (CBCS-LOCF)

(For the candidates admitted from the Academic year 2022-2023 Onwards)

Semester	Part	Course	Course Title	Course Code	Inst. Hrs. / week	Credits	Exam			Total	
							Hrs.	Marks			
								Int	Ext		
I	I	Language Course-I (LC)	இக்கால இலக்கியம்	22ULT1	6	3	3	25	75	100	
			Hindi Literature & Grammar – I	22ULH1							
			History of Popular Tales, Literature and Sanskrit Story	22ULS1							
			Basic French – I	22ULF1							
	II	English Language Course – I (ELC)	Functional English for Effective Communication – I	22UE1	6	3	3	25	75	100	
	III	Core Course – I (CC)	Differential Calculus and Trigonometry	22UMA1CC1	5	4	3	25	75	100	
		Core Course – II (CC)	Integral Calculus	22UMA1CC2	4	4	3	25	75	100	
		First Allied Course – I (AC)	Mathematical Statistics I	22UMA1AC1	5	4	3	25	75	100	
		First Allied Course – II (AP)	Mathematical Statistics (P)	22UMA1AC2P	2	2	3	40	60	100	
	IV	Ability Enhancement Compulsory Course-I (AECC)	UGC Jeevan Kaushal-Universal Human Values	22UGVE	2	2	-	100	-	100	
	Total				30	22				700	
II	I	Language Course-II (LC)	இடைக்கால இலக்கியமும், புதினமும்	22ULT2	5	3	3	25	75	100	
			Hindi Literature & Grammar – II	22ULH2							
			Poetry, Textual Grammar and Alankara	22ULS2							
			Basic French – II	22ULF2							
	II	English Language Course – II (ELC)	Functional English for Effective Communication – II	22UE2	6	3	3	25	75	100	
	III	Core Course – III (CC)	Differential Equations and Laplace Transforms	22UMA2CC3	5	5	3	25	75	100	
		Core Course – IV (CC)	Vector Calculus and Fourier Series	22UMA2CC4	4	4	3	25	75	100	
		Core Practical –I (CP)	MATLAB Programming (P)	22UMA2CC1P	2	2	3	40	60	100	
		First Allied Course – III (AC)	Mathematical Statistics II	22UMA2AC3	4	3	3	25	75	100	
	IV	Ability Enhancement Compulsory Course-II (AECC)	Environmental Studies	22UGEVS	2	2	-	100	-	100	
		Ability Enhancement Compulsory Course-III (AECC)	Innovation and Entrepreneurship	22UGIE	2	1	-	100	-	100	
	Extra Credit Course			SWAYAM	As per UGC Recommendation						
	Total					30	23				800

III	I	Language Course-III (LC)	காப்பியமும், நாடகமும்	22ULT3	5	3	3	25	75	100
			Hindi Literature & Grammar – III	22ULH3						
			Prose, Textual Grammar and Vakyarachana	22ULS3						
			Intermediate French – I	22ULF3						
	II	English Language Course – II (ELC)	Learning Grammar Through Literature – I	22UE3	6	3	3	25	75	100
	III	Core Course – V (CC)	Analytical Geometry (3D)	22UMA3CC5	4	4	3	25	75	100
		Core Course – VI (CC)	Classical Algebra and Theory of Numbers	22UMA3CC6	5	5	3	25	75	100
		Second Allied Course – I (AC)	Python Programming	22UMA3AC4	5	4	3	25	75	100
		Second Allied Course–II (AP)	Python Programming (P)	22UMA3AC5P	3	2	3	40	60	100
	IV	Generic Elective Course- I (GEC)	Mathematics for Competitive Examinations – I	22UMA3GEC1	2	2	3	25	75	100
			Basic Tamil-I	22ULC3BT1						
			Special Tamil-I	22ULC3ST1						
Extra Credit Course			SWAYAM	As per UGC Recommendation						
Total					30	23				700

15 Days INTERNSHIP during Semester Holidays

IV	I	Language Course-IV (LC)	பண்டைய இலக்கியமும், உரைநடையும்	22ULT4	6	3	3	25	75	100
			Hindi Literature & Functional Hindi	22ULH4						
			Drama, History of Drama Literature	22ULS4						
			Intermediate French - II	22ULF4						
	II	English Language Course – IV (ELC)	Learning Grammar Through Literature - II	22UE4	6	3	3	25	75	100
	III	Core Course – VII (CC)	Sequences and Series	22UMA4CC7	5	5	3	25	75	100
		Core Course – VIII (CC)	Methods in Numerical Analysis	22UMA4CC8	5	5	3	25	75	100
		Second Allied Course– III (AC)	Internet of Things	22UMA4AC6	4	3	3	25	75	100
		Internship	Internship	22UMA4INT	-	2	-	-	100	100
	IV	Generic Elective Course- II (GEC)	Mathematics for Competitive Examinations – II	22UMA4GEC2	2	2	3	25	75	100
			Basic Tamil-II	22ULC4BT2						
			Special Tamil-II	22ULC4ST2						
		Skill Enhancement Course – I (SEC)	Statistical Tools and Techniques - R Programming (P)	22UMA4SEC1P	2	2	3	40	60	100
Extra Credit Course			SWAYAM	As per UGC Recommendation						
Total					30	25				800

V	III	Core Course – IX (CC)	Abstract Algebra	22UMA5CC9	6	6	3	25	75	100
		Core Course – X (CC)	Real Analysis	22UMA5CC10	5	5	3	25	75	100
		Core Course – XI (CC)	Statics	22UMA5CC11	5	5	3	25	75	100
		Core Course XII (CC)	Discrete Mathematics	22UMA5CC12	5	5	3	25	75	100
		Discipline Specific Elective – I (DSE)	A. Operations Research	22UMA5DSE1A	5	4	3	25	75	100
			B. Astronomy	22UMA5DSE1B						
	C. Artificial Intelligence		22UMA5DSE1C							
	IV	Ability Enhancement Compulsory Course -IV (AECC)	UGC Jeevan Kaushal - Professional Skills	22UGPS	2	2	-	100	-	100
		Skill Enhancement Course – II (SEC)	LaTeX (P)	22UMA5SEC2P	2	2	3	40	60	100
	Extra Credit Course		SWAYAM	As per UGC Recommendation						
Total					30	29				700

VI	III	Core Course – XIII (CC)	Linear Algebra	22UMA6CC13	5	5	3	25	75	100
		Core Course – XIV(CC)	Complex Analysis	22UMA6CC14	5	5	3	25	75	100
		Core Course –XV (CC)	Dynamics	22UMA6CC15	4	4	3	25	75	100
		Core Course –XVI (CC)	Cyber Security	22UGCS	5	4	3	25	75	100
		Discipline Specific Elective – II(DSE)	A. Graph Theory	22UMA6DSE2A	5	4	3	25	75	100
			B. Number Theory	22UMA6DSE2B						
			C. Fundamentals of Big Data Analytics	22UMA6DSE2C						
		Project	Project Work	22UMA6PW	5	4	-	-	100	100
	V	Ability Enhancement Compulsory Course -V (AECC)	Gender Studies	22UGGS	1	1	-	100	-	100
		Extension activity		22UGEA	0	1	-	-	-	-
Total					30	28				700

	Grand Total				180	150				4400
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Note:

Part – I-Language – Tamil/Hindi/French/Sanskrit

Part – II- English

List of Allied Courses:

Allied Course I- Mathematical Statistics

Allied Course II- Computer Science

Part	Course	No. of Courses	Credits	Total Credits
I	Tamil/ Other Language	4	12	12
II	English	4	12	12
III	Core (Theory& Practical)	16+1	77	109
	Project Work	1	4	
	Internship	1	2	
	First Allied	3	9	
	Second Allied	3	9	
	DSE	2	8	
IV	GEC	2	4	15
	SEC	2	4	
	AECC-I -Universal Human Values	1	2	
	AECC-II-Environmental Studies	1	2	
	AECC-III-Innovation and Entrepreneurship	1	1	
	AECC-IV- Professional Skills	1	2	
V	Gender Studies	1	1	02
	Extension Activities	–	1	
		44		150

The Internal and External marks for Theory and practical papers are as follows:

Subject	Internal Marks	External Marks
Theory	25	75
Practical	40	60

FOR THEORY:

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks].

The passing minimum for University Examinations shall be 40% out of 75 marks [i.e. 30 marks].

FOR PRACTICAL:

The passing minimum for CIA shall be 40% out of 40 marks [i.e. 16 marks].

The passing minimum for University Examinations shall be 40% out of 60 marks [i.e. 24 marks].

I SEMESTER

CORE COURSE – I (CC)
DIFFERENTIAL CALCULUS AND TRIGONOMETRY
(2022-2023 Onwards)

Semester I	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UMA1CC1	DIFFERENTIAL CALCULUS AND TRIGONOMETRY	CORE	5	4

Course Objective

- **Compute** mathematical quantities using differential calculus and **interpret** their meaning.
- **Explore** fundamental concepts of single variable calculus
- **Apply** calculus concepts to solve real-world problems such as optimization and related rates problems.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Explain the basic concepts of differentiation, extreme functions of two variables.	K2
CO2	Apply the concept of differentiation for explaining curvature/.	K3
CO3	Explore the solution of problems from a mathematical perspective.	K3
CO4	Associate various types of hyperbolic and inverse hyperbolic functions and Solve problems in summation of trigonometric series.	K4
CO5	Examine the conceptual understanding and fluency with trigonometric functions, techniques and manipulations necessary for success in calculus.	K4

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	2	2	1
CO2	3	2	3	3	3	3	3	3	2	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	2	3	3	2	3	3	2	2	3
CO5	3	2	3	3	2	3	3	3	3	2

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Successive Differentiation: The n^{th} derivative – Standard results – Method of splitting the fractional expressions into partial fractions – Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz formula for the n^{th} derivative of a product – A complete formal proof by induction .	15	CO1, CO2, CO3, CO4, CO5	K2, K3, K4
II	Curvature: Curvature – Circle, radius and centre of curvature – Cartesian formula for the radius of curvature – The coordinates of the centre of curvature – Evolute and Involute – Radius of curvature when the curve is given in polar coordinates.	15	CO1, CO2, CO3, CO4, CO5	K2, K3, K4
III	Expansions: Expansions of $\cos n\theta$ and $\sin n\theta$ -Expansion of $\tan n\theta$ in powers of $\tan \theta$ –Expansion of $\tan(A + B + C + \dots)$ (omitting examples on formation of equations) – Powers of sines and cosines of θ in terms of functions of multiples of θ – Expansions of $\cos^n \theta$ when n is a positive integer – Expansions of $\sin^n \theta$ when n is a positive integer – Expansions of $\sin \theta$ and $\cos \theta$ in a series of ascending powers of θ .	15	CO1, CO2, CO3, CO4, CO5	K2, K3, K4
IV	Hyperbolic functions: Hyperbolic functions – Relation between hyperbolic functions – Relations between hyperbolic functions and circular functions – Inverse hyperbolic functions.	15	CO1, CO2, CO3, CO4, CO5	K2, K3, K4
V	Derivatives for Graphing and Applications: Maxima and Minima: Maxima and Minima of functions of two variables – Working Rule – Lagrange's method of undetermined multiplier Tracing of Curves – Tracing of curves whose equation is in Cartesian coordinates.	15	CO1, CO2, CO3, CO4, CO5	K2, K3, K4
VI	Self-Study for Enrichment: (Not included for End Semester Examinations) Meaning of the Derivative: Geometrical interpretation – Meaning of the sign of the differential coefficient - p - r equation: Pedal equation of a curve – The expansions of $\sin \theta$ and $\cos \theta$ to find the limits of certain expressions – Logarithms of complex quantities: Logarithms of complex quantities – To find the logarithm of $x+iy$ – General value of logarithm of $x+iy$ – Tracing of Curves : Polar Equation.	-	CO1, CO2, CO3, CO4, CO5	K2, K3, K4

Text Books

1. Narayanan. S, .Manicavachagom Pillay. T. K. (2015). *Calculus Volume I*. S. Viswanathan (Printer & publishers) Pvt Ltd.
2. Narayanan. S, .Manicavachagom Pillay. T. K. (2013). *Trigonometry*. S. Viswanathan (Printer & publishers) Pvt Ltd.

Chapters and Sections

UNIT-I	Chapter III: Sections 1.1 – 1.6, 2.1, 2.2 [1]
UNIT-II	Chapter X: Sections 2.1 – 2.6 [1]
UNIT-III	Chapter III: Sections 1 - 4, 4.1, 5 [2]
UNIT- IV	Chapter IV: Sections 1,2,2.1,2.2,2.3 [2]
UNIT- V	Chapter VIII: Sections 4, 4.1,5 [1] Chapter XIII: Sections 1.1 & 1.2 [1]

Reference Books

1. Arumugam. S and Issac. (2014). *Calculus*. New Gamma Publishing House.
2. Singaravelu. A. (2003). *Differential Calculus and Trigonometry*. A.Singaravelu and R.Ramaa 1st edition, Nagapattinam, R Publication.
3. Bali. N.P. (2010). *Differential Calculus*. Laxmi Publications (P) Ltd. New Delhi.

Web References

1. <https://www.youtube.com/watch?v=s8hVridQ5IA>
2. <https://www.youtube.com/watch?v=KijGLjxKlsY>
3. <https://www.youtube.com/watch?v=IQJ0UiM91Z4>
4. <https://www.youtube.com/watch?v=43cMRs2pat4>
5. https://www.youtube.com/watch?v=mAC88G_cc_M
6. <https://www.youtube.com/watch?v=CioY8ElsjO4>
7. https://youtu.be/zExo4_TpOAw

Pedagogy

Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

Course Designer

Dr. P. Sudha

CORE COURSE – II (CC)
INTEGRAL CALCULUS
(2022-2023 Onwards)

Semester I	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UMA1CC2	INTEGRAL CALCULUS	CORE	4	4

Course Objective

- **Analyze** the properties of definite integral and Reduction formulae.
- **Explore** the order of Integration, Triple Integrals, Beta and Gamma functions.
- **Apply** Geometrical Applications of Integration of area under plane curve.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Apply the concepts of double, triple integrals.	K3
CO2	Distinguish the concepts of Beta and Gamma functions.	K3
CO3	Apply the concept of definite integral to solve various problems.	K3
CO4	Interpret the definite integral geometrically as the area under a plane curve.	K3
CO5	Evaluate the types of integration.	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	2	2	3	2
CO2	3	2	3	3	2	2	2	3	3	3
CO3	3	3	3	3	3	2	3	2	2	2
CO4	3	2	3	3	2	3	3	3	2	2
CO5	3	3	3	3	3	2	2	2	3	3

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Integration: Integration of rational algebraic functions: $\int \frac{dx}{ax^2 + bx + c} - \int \frac{lx + m}{ax^2 + bx + c} dx -$ Integration of Irrational functions $\int \frac{px + q}{\sqrt{ax^2 + bx + c}} dx$ – Any expression of the form $\int \frac{dx}{(x - k)\sqrt{ax^2 + bx + c}} - \int \frac{dx}{a + b \cos x}$ (Integration of these types only).	12	CO1, CO2, CO3, CO4, CO5	K3, K5
II	Properties of Definite Integrals – Integration by parts – Reduction formulae.	12	CO1, CO2, CO3, CO4, CO5	K3, K5
III	Multiple Integrals: Definition of the double integrals – Evaluation of the double Integrals – Triple Integrals.	12	CO1, CO2, CO3, CO4, CO5	K3, K5
IV	Improper Integrals: Beta and Gamma functions: Definition – convergence of $\Gamma(n)$ – Recurrence formula for gamma functions – Properties of Beta functions – Relation between Beta and Gamma functions – Definite integrals using Gamma functions.	12	CO1, CO2, CO3, CO4, CO5	K3, K5
V	Geometrical Applications of Integration – Areas under plane curves: Cartesian Co-ordinates – Area of a closed curve – Examples – Area in polar co-ordinates.	12	CO1, CO2, CO3, CO4, CO5	K3, K5
VI	Self-Study for Enrichment: (Not included for End Semester Examinations) $\int \frac{dx}{a \cos x + b \sin x} -$ Bernoulli's formula – Applications of Multiple Integrals – Applications of Gamma functions to multiple integrals – Approximate Integration.	-	CO1, CO2, CO3, CO4, CO5	K3, K5

Text Books

1. Narayanan, S. & Manicavachagom Pillay, T.K.(2015), Calculus, Volume II, S. Viswanathan (Printers & publishers) Pvt Ltd.

Chapters and Sections

- UNIT – I Chapter 1: Sections 7.3 (Type I & II) 8 - Case II and case V, 9
- UNIT – II Chapter 1: Sections 11, 12, 13 (13.1 – 13.9)
- UNIT –III Chapter 5: Sections 2.1, 2.2 & 4
- UNIT – IV Chapter 7: Sections: 2.1 – 2.3, 3 – 5
- UNIT –V Chapter 2: Sections 1.1 – 1.4

Reference Books

1. Shanti Narayan, Integral Calculus (2002), S. Chand & Company Ltd
2. Shanti Narayan & Mittal, P. K (2008) Integral Calculus, S. Chand & Company Ltd
3. Singh, U. P. Srivastava, R. J & Siddiqui, N. H. (2011) Integral Calculus, Wistom Press.

Web References

1. <https://youtu.be/w-T90XSM90s>
2. <https://youtu.be/VXSn6EY9klg>
3. <https://youtu.be/2l-SV8cwsW>
4. <https://youtu.be/bLhxQldbWW8>
5. <https://youtu.be/4KDenLHggDM>
6. https://youtu.be/db7d_a0wiUg
7. <https://youtu.be/zFy-OpajEtA>
8. <https://youtu.be/j6A44yQrGfU>
9. <https://youtu.be/scKJXbQpePM>
10. <https://youtu.be/FsC3do74Ulo>

Pedagogy

Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

Course Designer

Dr. P. Shalini

FIRST ALLIED COURSE –I (AC)
MATHEMATICAL STATISTICS I
(2022-2023 Onwards)

Semester I	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UMA1AC1	MATHEMATICAL STATISTICS I	ALLIED	5	4

Course Objective

- **Enable** the students to acquire the knowledge of statistics.
- **Analyze** the properties of various statistical functions.
- **Explore** the concepts of some statistical distributions.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	On the successful completion of the course, students will be able to Apply Student's t, Fisher's t and F statistics to derive their probability Distribution.	K3
CO2	Analyze how correlation is used to identify the relationships between variables and how regression analysis is used to predict outcomes.	K3
CO3	Solving mean, median, mode, moments and moment generating functions of discrete and continuous distributions.	K3
CO4	Distinguish between a discrete and a continuous random variable.	K4
CO5	Examine the various properties of expectation, variance and the concept of covariance.	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	2	2	1
CO2	3	2	3	3	3	3	3	3	2	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	2	3	3	2	3	3	2	2	3
CO5	3	2	3	3	2	3	3	3	3	2

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Random Variables and Distribution Functions: Random Variable – Distribution Functions – Properties of Distribution Function – Discrete Random Variable – Probability Mass Function – Discrete Distribution Function – Continuous Random Variable – Probability Density Function – Various Measures of Central Tendency, Dispersion, Skewness and Kurtosis for Continuous Probability Distribution – Continuous Distribution Function – Joint Probability Mass Function and Marginal and Conditional Probability Function – Joint Probability Distribution Function – Joint Density Function, Marginal Density Function - The Conditional Distribution Function and Conditional Probability Density Function.	15	CO1, CO2, CO3, CO4, CO5	K3, K4
II	Mathematical Expectation: Mathematical Expectation – Addition Theorem of Expectation – Multiplication Theorem of Expectation – Co-variance – Expectation of a Linear Combination of Random Variables – Variance of a Linear Combination of Random Variables – Expectation of a Continuous random variable – Conditional Expectation & Conditional Variance.	12	CO1, CO2, CO3, CO4, CO5	K3, K5
III	Generating Functions: Moment Generating Function – Theorems on moment Generating Functions– Cumulants– Additive Property of Cumulants – Effect of Change of Origin and Scale on Cumulants – Characteristic Function – Properties of Characteristic Function.	12	CO1, CO2, CO3, CO4, CO5	K3, K5
IV	Correlation and Linear Regression: Introduction – Meaning of Correlation – Scatter Diagram – Karl Pearson's Co-efficient of Correlation: Limits for Correlation Co-efficient –	12	CO1, CO2, CO3, CO4, CO5	K3, K5

	Assumptions Underlying Karl Pearson's Correlation Co-efficient – Rank Correlation : Spearman's Rank Correlation Co- efficient – Tied or Repeated Ranks – Repeated Ranks (continued) - Introduction – Linear Regression : Regression Co-efficient - Properties of Regression Co-efficient – Angle between two lines of Regression.			
V	Exact Sampling Distributions: Chi-Square Distribution: Introduction – Derivation of the Chi-Square Distribution(χ^2) – M.G.F. of Chi-Square Distribution : Cumulant Generating Function of χ^2 -Distribution – Limiting Form of χ^2 -Distribution for–Characteristic Function of χ^2 -Distribution – Mode and Skewness of χ^2 -Distribution – Additive Property of χ^2 Variates – Chi- Square Probability Curve – Students 't' Distribution : Derivation of the Students 't' Distribution – Fisher's 't' – Distribution of Fisher's 't' – Constants of t-distribution – Limiting Form of t-distribution – F- Distribution : Derivation of Snedecor's F- Distribution – Constants of F-Distribution – Mode and Points of Inflexion of F-Distribution.	12	CO1, CO2, CO3, CO4, CO5	K3, K5
VI	Self-Study for Enrichment: (Not included for End Semester Examinations) Independent Random Variables – Uniqueness Theorem of Characteristic Function – Limits for the Rank Correlation Coefficient – Graph of t-distribution – Critical Values of t .	-	CO1, CO2, CO3, CO4, CO5	K3, K5

Text Books

1. Gupta, S.C. & Kapoor, V.K. (2004). *Elements Of Mathematical Statistics*. Sultan Chand & Sons, New Delhi.
2. Gupta, S.C. & Kapoor, V.K. (2015). *Fundamentals Of Mathematical Statistics*. Sultan Chand & Sons, New Delhi.

Chapters and Sections

UNIT-I	Chapter 5: Sections 5.1 to 5.5.3, 5.5.5 [1]
UNIT-II	Chapter 6: Sections 6.1 to 6.8 [1]
UNIT-III	Chapter 6: Sections 6.9 to 6.11.1 [1]
UNIT- IV	Chapter 10: Sections 10.1 to 10.4.2 & 10.7, 10.7.1 to 10.7.3 [2] Chapter 11: Sections 11.1 to 11.2.3 [2]
UNIT- V	Chapter 15: Sections 15.1 to 15.3.6 [2] Chapter 16: Sections 16.2 to 16.2.5, 16.5, 16.5.1 to 16.5.3 [2]

Reference Books

1. Pillai, R.S.N. Pillai & Bhagavathi. (2008). *Statistics, Theory and Practice*. S.Chand & Sons.
2. Bhishma Rao, G.S.S. (2011). *Probability and Statistics*. Scitech Publications (India) Pvt Ltd.
3. Veerarajan, T. (2010). *Probability, Statistics and Random Processes*. Tata McGraw Hill Education Private Limited.

Web References

1. <https://www.youtube.com/watch?v=YXLVjCKVP7U>
2. <https://www.youtube.com/watch?v=xTpHD5WLuoA>
3. <https://www.youtube.com/watch?v=wjwLTNYOuI4>
4. <https://www.youtube.com/watch?v=zmyh7nCjmsg>
5. <https://www.youtube.com/watch?v=ux8zQvWWLk>

Pedagogy

Power point Presentations, Group Discussions, Seminar, Quiz, Assignment and Smart Classroom.

Course Designer

Ms. V. ManiMozhi

FIRST ALLIED COURSE – II (AC)
MATHEMATICAL STATISTICS (P)
(2022-2023 Onwards)

Semester I	Internal Marks: 40		External Marks:60	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UMA1AC2P	MATHEMATICAL STATISTICS (P)	ALLIED	2	2

Course Objective

- **Understands** the basic concepts in quantitative data analysis.
- **Apply** the technical knowledge to **interpret** and **solve** the problems.
- **Explore** the ideas of Excel in Statistics.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Explore various statistical concepts in Excel.	K3
CO2	Solve the Measures of Central Tendency and Measures of Dispersion using Excel.	K3
CO3	Compute Correlation and Regression co-efficient between two data sets and their applications.	K3
CO4	Analyze the concepts of testing the hypothesis and apply the test to the real-life problems.	K4
CO5	Make use of formulas, including the use of built-in functions.	K3

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	1	2	3	2	2	2	3	2	2	2
CO2	1	2	3	2	2	2	3	2	2	2
CO3	1	2	3	2	2	2	3	2	2	2
CO4	1	2	3	2	2	2	3	2	2	2
CO5	1	2	3	2	2	2	3	2	2	2

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –
“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

LIST OF PROGRAMS

- 1) Arithmetic Mean, Geometric Mean and Harmonic Mean.
- 2) Median and Mode.
- 3) Quartile Deviation and Mean Deviation.
- 4) Standard Deviation and Co-efficient of Variation.
- 5) Karl Pearson's Co-efficient of Skewness.
- 6) Bowley's Co-efficient of Skewness.
- 7) Moments and Kurtosis.
- 8) Karl Pearson's Co-efficient of correlation.
- 9) Rank Correlation.
- 10) Fit the regression line.
- 11) Test the hypothesis for the difference between two sample means.
- 12) Test the hypothesis for single proportion.
- 13) Test the significance of hypothesis using 't' test.
- 14) Test the significance of hypothesis using 'F' test.
- 15) Test the significance of hypothesis using chi-square test.

Text Books

1. Asha Chawla. & Seema Malik. (2017). *Statistical Analysis with MS Excel*. Avichal Publishing Company.

Reference Books

1. Web Tech Sol. (2010). *Mastering Microsoft Excel Functions and Formulas*. Khanna Book Publishing Company.
2. Neil J. Salkind. (2015). *Excel Statistics a Quick Guide*. SAGE Publications, Inc.
3. Charles Zaiontz. (2015). *Statistics using Excel Succinctly*. E-Book.

Web links

1. <https://www.youtube.com/watch?v=2rEhWFhSqnI>
2. <https://www.youtube.com/watch?v=L9TiYC6tQmU>
3. <https://www.youtube.com/watch?v=v5kYz3ADPBI>
4. <https://www.youtube.com/watch?v=9cXluqvGe8c>
5. <https://www.youtube.com/watch?v=egAvfCZTpz8>
6. <https://www.youtube.com/watch?v=7Y1g340tcbU>
7. https://www.youtube.com/watch?v=_QnsH74zXhA
8. https://www.youtube.com/watch?v=BIS11D2VL_U
9. https://www.youtube.com/watch?v=_WNUfgZipww

10. <https://www.youtube.com/watch?v=j966OJol0iA>
11. <https://www.youtube.com/watch?v=mUycvaTRrCw>
12. <https://www.youtube.com/watch?v=ckcUt3EyD-Q>

Pedagogy

Power point presentations, Live Demo, Hands on training.

Course Designers

1. Dr. P. Saranya
2. Dr. C. Saranya

II SEMESTER

CORE COURSE – III (CC)
DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS
(2022-2023 Onwards)

Semester II	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UMA2CC3	DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS	CORE	5	5

Course Objective

- **Explain** the basics of Ordinary Differential Equations.
- **Emphasize** in the field of Partial Differential Equations.
- **Explore** the mathematical methods formatted for major concepts.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	On the successful completion of the course, students will be able to Explain various notions in ODE, PDE, Laplace transforms.	K1, K2
CO2	Classify the problem models in the respective area.	K3
CO3	Identify the properties of solutions in the field of mathematics.	K3
CO4	Solve various types of problems involving differential equations.	K3
CO5	Analyze the applications of the Differential equations in practical life.	K4

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	2	2	3
CO2	3	2	3	3	3	3	3	3	2	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	2	3	3	2	3	3	2	2	3
CO5	3	2	3	3	2	3	3	3	3	2

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	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 – Extended form of Clairaut's form – Exact differential equations – Conditions of integrability of $M dx + N dy = 0$ – Practical rule for solving an exact differential equation – Rules for finding integrating factors - simple problems.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	Linear equations with constant coefficients: Definition – The operator D – Complementary function of a linear equation with constant coefficients – Particular integral – General method of finding P.I. – Special methods for finding P.I. of the forms e^{ax} , $\cos ax$ or $\sin ax$, $e^{ax}V$, x^m – Linear equations with variable coefficients – Methods of finding particular integrals – Method of Variation of Parameters (Omit third & higher order equations).	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	Partial differential equations of the first order: Classification of Integrals – Derivation of partial differential equations – By elimination of constants – By elimination of an arbitrary function – Lagrange's method of solving the linear equation – Special methods for some standard forms $F(p, q) = 0$, $F(x, p, q) = 0$, $F(y, p, q) = 0$, $F(z, p, q) = 0$, $f_1(x, p) = f_2(y, q)$ Clairant's form – Equations reducible to the standard forms – Charpit's method .	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	Partial differential equations of higher order: Introduction – Homogeneous differential equation – Methods of finding C.F. – Methods of finding P.I. of the forms	15	CO1, CO2, CO3, CO4,	K1, K2, K3, K4

	e^{ax+by} , $x^r y^s$, $\sin(ax+by)$ or $\cos(ax+by)$, $e^{ax+by} \varphi(x,y)$.		CO5	
V	Laplace transforms & inverse laplace transforms: Definition – Piecewise continuity – Sufficient conditions for the existence of the Laplace Transforms – Basic results – Laplace Transform of periodic functions – Some general theorems & simple applications – Evaluation of certain integrals using Laplace Transform – The Inverse Laplace Transforms –Modification of results in Laplace Transform to get the inverse Laplace Transform - Use of Laplace Transforms in solving ODE with constant coefficients.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	Self Study for Enrichment: (Not included for End Semester Examination) Equations that do not contain x explicitly- Equations that do not contain y explicitly- Equations homogeneous in x and y - Special method of evaluating the P.I. when X is of the form x^m –Solving of few standard forms from Charpit's method - Methods of finding P.I. of the forms $\sin ax \sin by$ or $\cos ax \cos by$ - Use of Laplace Transforms in solving system of differential equations.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Books

1. Narayanan, S and Manicavachagom Pillay, T.K (2016). *Differential Equations And Its Applications*. S.Viswanathan Publishers Pvt. Ltd.
2. Arumugam, S and Thangapandi Isaac, A (2014). *Differential Equations And Applications*. New Gamma publishing House.

Chapters and Sections

UNIT-I	Chapter IV: Sections 1 - 3 [1] Chapter II: Section 6 [1].
UNIT-II	Chapter V: Sections 1-5 [1] (Omit 5.5) Chapter VIII: Section 4 [1] (Omit 6.1)
UNIT-III	Chapter XII: Sections 1-6 [1]
UNIT- IV	Chapter V: Sections 1-2 [2]
UNIT- V	Chapter IX: Sections 1-8 [1]

Reference Books

1. Raisinghania M.D. (2008). *Ordinary and Partial Differential Equations*. S.Chand & Company.

Web References

1. <https://youtu.be/aYrsPeE7NLO>
2. https://youtu.be/913LV_0QDO0
3. <https://youtu.be/JEyzQtRPnjK>
4. <https://youtu.be/6rTtLQr8uq0>
5. <https://youtu.be/ZDHmF5PBk-8>

Pedagogy

Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

Course Designer

Dr. R.Divya

CORE COURSE – IV (CC)
VECTOR CALCULUS AND FOURIER SERIES
(2022-2023 Onwards)

Semester II	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UMA2CC4	VECTOR CALCULUS AND FOURIER SERIES	CORE	4	4

Course Objective

- **Explain** the basics principles of vector calculus.
- **Explore** the mathematical methods with vector integration.
- **Understand** the concepts and properties of Fourier Series.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Remember and recall the concepts of Vector Calculus and Fourier Series.	K1
CO2	Solve various types of problems in the Core area.	K3
CO3	Explain the concepts of odd and even functions.	K3
CO4	Describe the development of series.	K3
CO5	Examine the concepts of integration for finding solution.	K4

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	2	3	3	2	3	3	2	2	3
CO3	3	2	3	3	2	3	3	3	3	2
CO4	3	2	3	3	2	3	3	2	2	3
CO5	3	2	3	3	2	3	3	3	3	2

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Vector Differentiation: Vector valued function of a single scalar variable. Differential Operators: Definition – The Vector differential operator – The operator $a \cdot \nabla$, where a is a unit vector – The Gradient of a scalar point function – Equation of tangent plane and normal – Divergence and Curl of a vector .	12	CO1, CO2, CO3, CO4, CO5	K1, K3, K4
II	Vector Integration: Vector Integration – Line integrals-Normal Surface Integral $\int_S \vec{F} \cdot \hat{n} dS$ - Flux across a Surface-Volume Integral $\int_V F dV$ (Simple Problems only).	12	CO1, CO2, CO3, CO4, CO5	K1, K3, K4
III	Vector Integration: Gauss's Divergence Theorem $\int_S \vec{F} \cdot \hat{n} dS = \int_V \text{div } \vec{F} dV$ - Stoke's theorem $\int_C \vec{F} \cdot d\vec{r} = \int_S \text{curl } \vec{F} \cdot \hat{n} dS$ - Green's theorem - Stoke's theorem in space.	12	CO1, CO2, CO3, CO4, CO5	K1, K3, K4
IV	Fourier series: Fourier series – definition - Fourier Series expansion of periodic functions with Period 2π and period $2a$ – Odd & even functions in Fourier Series.	12	CO1, CO2, CO3, CO4, CO5	K1, K3, K4
V	Fourier series: Half- range Fourier Series – definition - Development in Cosine series - Development in Sine series - Change of interval.	12	CO1, CO2, CO3, CO4, CO5	K1, K3, K4
VI	Self Study for Enrichment: (Not included for End Semester Examination) Theorems on differentiation- Properties of grad ϕ - Stoke's theorem in Cartesian form - Properties of odd and even functions- Combination of Series.	-	CO1, CO2, CO3, CO4, CO5	K1, K3, K4

Text Books

1. Khanna. M.L., *Vector Calculus*, Jai Prakash Nath and Co., 8th Edition, (1986).
2. Narayanan.S, Manicavachagam Pillai. T.K., *Calculus*, Vol.III, S.Viswanathan (Printers and Publishers) Pvt Limited, (2014).

Chapters and Sections

UNIT-I	Chapter I: Section 1 [1] Chapter II: Sections 2-4, 6,7[1]
UNIT-II	Chapter III: Sections 1 – 4 [1]
UNIT-III	Chapter III: Sections 5 - 7 [1]
UNIT- IV	Chapter IV: Sections 1-3 [2]
UNIT- V	Chapter IV: Sections 4-6 [2]

Reference Books

1. Duraipandiyan. P & Lakshmi Duraipandian, *Vector Analysis*, Emerald Publishers (1998).
2. Vittal. P.R. & V.Malini, *Vector Analysis*, Margham Publications (2014).
3. Sankarappan. S & Arulmozhi. G. (2006). *Vector Calculus, Fourier Series and Fourier Transforms*, Vijay Nicole imprints Private Limited, Chennai.

Web References:

1. <https://www.youtube.com/watch?v=FfJtVvQtqTM&list=PLU6SqDYcYsfJz9FAzbgocIjlkW4NXAar->
2. <https://www.youtube.com/watch?v=9LqzrAHrSS0&list=PLeIE3weEKo4YnuLABAWpfuN9ufYJjg1SR>
3. https://www.youtube.com/watch?v=KCS-VTm398I&list=PLhSp9OSVmeyLke5_cby8i8ZhK8FHpw3qs
4. https://www.rtu.ac.in/expert/app/documents/kjangid@rtu.ac.in_51629122020100932am.pdf

Pedagogy

Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

Course Designer

Dr. R. Radha

CORE PRACTICAL – I (CP)
MATLAB PROGRAMMING (P)
(2022-2023 Onwards)

SEMESTER II	INTERNAL MARKS: 40		EXTERNAL MARKS:60	
COURSE CODE	COURSE TITLE	CATEGORY	HRS /WEEK	CREDITS
22UMA2CC1P	MATLAB PROGRAMMING (P)	CORE PRACTICAL	2	2

Course Objective

- **Apply** MATLAB as a simulation tool.
- **Compute** mathematical solutions using MATLAB and develop inter-disciplinary skills.
- **Determine** syntax, semantics, data-types and library functions of numerical computing.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Explain fundamental concepts of MATLAB.	K2
CO2	Illustrate a great numbers of MATLAB commands and how to use them in programming and in many applications in Mathematics.	K2
CO3	Compute simple program for a given problem in MATLAB coding.	K3
CO4	Determine the result and the outcome of any command or script.	K4
CO5	Deduce Mathematical solutions using MATLAB tools.	K5

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	2	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	2	3

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

Listings:

1. Finding the leap year.
2. Operations using Matrices (Addition, Subtraction, Multiplication, Transpose and Inverse)
3. Basic plotting of variables (Simple and multiple data set).
4. Sorting of given data.
5. Finding the sum of n numbers, sum of square of n numbers, sum of 'n' odd numbers.
6. Finding the roots of a polynomial equation.
7. Solving system of equations using matrices.
8. Finding the Eigen vectors and Eigen values.
9. Generating Fibonacci series.
10. Vector operations.
11. Evaluation of integrals.
12. Finding the derivatives of given order.
13. Operations on sets.

Web Links

1. https://www.youtube.com/watch?v=_Rd61S1yS24
2. <https://www.youtube.com/watch?v=EF4wmV5xBM0>
3. <https://www.youtube.com/watch?v=XsrhAO3r3VY>
4. <https://www.youtube.com/watch?v=aEjeu5jflU>
5. <https://www.youtube.com/watch?v=ZBafH5fss1E>
6. <https://www.youtube.com/watch?v=XtiAC4adozQ>
7. <https://www.youtube.com/watch?v=kt8QSk-M6c>
8. <https://www.youtube.com/watch?v=y4Sy9xo-pFU>
9. <https://www.youtube.com/watch?v=pi6Dkvs6rP4>
10. <https://www.youtube.com/watch?v=YzEp0jiVyYs>
11. <https://www.youtube.com/watch?v=LFoutvnfP6A>
12. <https://www.youtube.com/watch?v=7BJUX3oIlz0>

Pedagogy

Power point presentations, Live Demo, Hands on Training.

Course Designer

Dr. P. Saranya

FIRST ALLIED COURSE –III (AC)
MATHEMATICAL STATISTICS II
(2022-2023 and Onwards)

Semester II	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UMA2AC3	MATHEMATICAL STATISTICS II	ALLIED	4	3

Course Objectives

- **Enable** in-depth knowledge of probability.
- **Explore** the concepts of some statistical data.
- **Analyse** the properties of discrete and continuous distributions.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Define the basic concepts in probability, some special distributions, and sampling distributions.	K1
CO2	Explain the properties of probability, special distributions and the theory of sampling distributions to find solutions of real-life problems.	K2
CO3	Solve problems in probability, some special distributions and sampling distributions.	K3
CO4	Examine the given data and interpret the results	K4
CO5	Analyze probability, and various distributions in the case of solid conclusions about the values of the population parameter.	K4

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	2	2	1
CO2	3	2	3	3	3	3	3	3	2	3
CO3	3	3	2	3	3	3	3	3	3	3
CO4	3	2	3	3	2	3	3	2	2	3
CO5	3	2	3	3	2	3	3	3	3	2

“1” – Slight (Low) Correlation

“2” – Moderate (Medium) Correlation

“3” – Substantial (High) Correlation

“-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Theory of probability: Introduction – Short History – Definitions of Various Terms – Mathematical or Classical or ‘a Priori’ Probability – Statistical or Empirical Probability – Mathematical Tools: Preliminary Notion of sets – Sets and Elements of Sets – Operations on Sets – Algebra of Sets - Axiomatic approach to Probability – Random Experiment (Sample Space) – Event – Some Illustrations – Algebra of Events – Probability : Mathematical Notion – Probability Function – Laws of Addition of Probabilities – Extension of General Law of Addition of Probabilities – Law of Multiplication or Theorem of Compound Probability - Independent Events – Pairwise Independent Events – Mutually Independent Events – Baye’s theorem.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	Special Discrete Probability Distributions: Introduction – Discrete uniform Distribution- Bernoulli Distribution : Moments of Bernoulli Distribution - Binomial Distribution : Moments of Binomial Distribution – Recurrence Relation for the Moments of Binomial Distribution – Factorial Moments of Binomial Distribution –Mean Deviation about Mean of Binomial Distribution – Mode of Binomial Distribution – Moment Generating Function of Binomial Distribution – Additive Property of Binomial Distribution	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	Special Discrete Probability Distributions: Poisson Distribution: The Poisson Process – Moments of the Poisson Distribution – Mode of the Poisson Distribution – Recurrence Relation for Moments of the Poisson Distribution – Moment Generating Function of the Poisson Distribution – Characteristic Function of the Poisson Distribution –	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

	Cumulants of the Poisson Distribution – Additive or Reproductive Property of Independent Poisson Variates.			
IV	Special Continuous Probability Distributions: Introduction –Normal Distribution: Normal Distribution as a Limiting Form of Binomial Distribution – Chief Characteristics of the Normal Distribution – Mode of Normal Distribution – Median of Normal Distribution – M.G.F. of Normal Distribution – Cumulant Generating Function (c.g.f.) of Normal Distribution – Moments of Normal Distribution – A Linear Combination of Independent Normal Variates - Fitting of Normal Distribution.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	Special Continuous Probability Distributions: Rectangular (or Uniform) Distribution: Moments of Rectangular Distribution – M.G.F. of Rectangular Distribution – Characteristic Function of Rectangular Distribution – Mean Deviation (about Mean) of Rectangular Distribution–Gamma Distribution(only definition)– Beta Distributions of first kind : Constants of Beta Distributions of first kind – Beta Distributions of second kind : Constants of Beta Distributions of Second kind.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	Self-Study for Enrichment: (Not included for End Semester Examinations) Extension of Multiplication Law of Probability – Characteristic Function of Binomial Distribution – Cumulants of the Binomial Distribution – Recurrence Relation for Cumulants of Binomial Distribution – Recurrence formula for the Probabilities of Poisson distribution –Log-normal Distribution – Triangular Distribution– Exponential Distribution.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Books

1. Gupta, S.C. & Kapoor, V.K. (2018). *Elements of Mathematical Statistics*. Sultan Chand & Sons, New Delhi.
2. Gupta, S.C. & Kapoor, V.K. (2014). *Fundamentals of Mathematical Statistics*. Sultan Chand & Sons, New Delhi.

Chapters and Sections

UNIT-I	Chapter 4: Section 4.1 -4.8 (omit 4.7.1)[1]
UNIT-II	Chapter 8: Sections 8.1 to 8.3, 8.4(8.4.1 to 8.4.7) [2]
UNIT-III	Chapter 8: Sections 8.5 (8.5.1 to 8.5.8)[2]
UNIT- IV	Chapter 9: Sections 9.1 and9.2 (9.2.1 to 9.2.8,9.2.14)[2]
UNIT- V	Chapter 9: Sections 9.3, 9.5, 9.6 -9.7[2]

Reference Books

1. Pillai. R.S.N. Pillai & Bhagavathi. (2008). *Statistics, Theory and Practice*. S.Chand & Sons.
2. Bhishma Rao. G.S.S. (2011). *Probability and Statistics*. Scitech Publications (India) Pvt Ltd.
3. Veerarajan. T. (2010). *Probability, Statistics and Random Processes*. Tata McGraw Hill Education Private Limited.

Web References

1. <https://www.youtube.com/watch?v=ZKkiCC6uCaU&list=PLpEFfNathorfHzVYKNRFgtWJp2R1vTZfj>
2. <https://www.youtube.com/watch?v=jmqZG6roVqU>
3. <https://www.youtube.com/watch?v=gHBL5Zau3NE>
4. <https://www.youtube.com/watch?v=3PWKQiLK41M>
5. <https://www.youtube.com/watch?v=dOr0NKyD31Q>
6. <https://www.statisticshowto.com/probability-and-statistics/statistics-definitions/uniform-distribution/>

Pedagogy

Power Point Presentations, Group Discussions, Seminar, Quiz and Assignment.

Course Designer

Ms. V. ManiMozhi

III SEMESTER

CORE COURSE – V (CC)
ANALYTICAL GEOMETRY (3D)
(2022-2023 Onwards)

Semester III	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UMA3CC5	ANALYTICAL GEOMETRY (3D)	CORE	4	4

Course Objective

- **Understand** the geometrical terminology and idea of the Planes, Straight line, Sphere and Cone.
- **Explain** the properties of four basic three-dimensional shapes.
- **Recognize** three-dimensional shapes in the world around them.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Remember the basic concepts of Straight Line, Plane, the Sphere and the Cone.	K1
CO2	Understand the aspects of Modern Mathematics through Straight Line, Plane, the Sphere and the Cone.	K2
CO3	Relate the Various forms of equation of a plane, Straight line, Sphere and Cone.	K3
CO4	Determine the angle between the plane, the line and infer about coplanar lines and Shortest distance between two lines.	K4
CO5	Evaluate the Problems based on Properties of the Coordinate system of equations.	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	2	2	3
CO2	3	2	3	3	3	3	3	3	2	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	2	3	3	2	3	3	2	2	3
CO5	3	2	3	3	2	3	3	3	3	2

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Coordinate System: Introduction - Rectangular Cartesian Coordinates - Distance between two Points - Direction Cosines.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	Planes: Equation of a Plane – Angle Between two Planes – Angle Bisectors of two Planes.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	Straight Lines: Equation of a Straight Line – A Plane and a Line – Equations of Two Skew Lines in a Simple form.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	The Sphere: Introduction – Equation of a Sphere – Tangent Line and Tangent Plane – Section of a Sphere.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	Cones : Definition - Equation of a Cone with a conic as Guiding curve - Enveloping Cone of a Sphere.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	Self Study for Enrichment: (Not included for End Semester Examination) Equations of Two Skew Lines in a Simple Form - The Intersection of Three Planes - Orthogonal Projection on a Plane - Volume of a Tetrahedron - Angle of Intersection of Two Spheres - Quadratic Cones with Vertex at Origin.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Arumugam S and Thangapandi Isaac A (2011). *Analytical Geometry 3D and Vector Calculus*. New Gamma Publishing House, Palayamkottai.
2. Shanti Narayanan and Mittal P.K. (2007). *Analytical Solid Geometry*. S. Chand & Company Ltd. New Delhi.

Chapters and Sections

UNIT-I	Chapter I: Sections 1.0 - 1.3 [1]
UNIT-II	Chapter II: Sections 2.1 - 2.3 [1]
UNIT-III	Chapter III: Sections 3.1 - 3.3 [1]
UNIT- IV	Chapter IV: Sections 4.0 - 4.3 [1]
UNIT- V	Chapter VII: Sections 7.1, 7.1.1, 7.1.2 [2]

Reference Books

1. Duraipandian P, Laxmi Duraipandian and Muhilan D (1984). *Analytical Geometry Three Dimensional*. Emerald Publishers.
2. Pandey H.D, Khan M.Q and Gupta B.N. (2011). *A Text Book of Analytical Geometry and Vector Analysis*. Wisdom Press.
3. Manicavachagom Pillai T.K. and Natarajan T (2009). *A Text book of Analytical Geometry Part II - Three Dimensions*. Viswanathan, S., Printers & Publishers Pvt Ltd.

Web References

1. <https://www.pdfdrive.com/analytical-geometry-of-three-dimensions-e158533348.html>
2. https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SMT1303.pdf
3. <https://school.careers360.com/maths/three-dimensional-geometry-chapter-pge>
4. <https://youtu.be/UXIT-68QvTE>
5. <https://www.youtube.com/watch?v=rbPMX0h2hWQ>

Pedagogy

Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

Course Designer

Dr. P. Sudha

CORE COURSE – VI (CC)
CLASSICAL ALGEBRA AND THEORY OF NUMBERS
(2022-2023 Onwards)

Semester III	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UMA3CC6	CLASSICAL ALGEBRA AND THEORY OF NUMBERS	CORE	5	5

Course Objective

- **Establish** a sound knowledge on theory of equations.
- **Inculcate** the students in applicable algebra.
- **Enable** the students to solve the Problems based on the applications of the theory of numbers.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Remember the relation between roots and co-efficients of Polynomial equations.	K1
CO2	Understand the symmetric functions in solving equations and find sum of r^{th} power of roots.	K2
CO3	Compute transformation of equations and solve Reciprocal equations.	K3
CO4	Determine the inequalities in all manners.	K4
CO5	Evaluate the Problems based on the applications of the theory of numbers	K5

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	2	2	3
CO2	3	2	3	3	3	3	3	3	2	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	2	3	3	2	3	3	2	2	3
CO5	3	2	3	3	2	3	3	3	3	2

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Relation between the roots and coefficients of Equations – Symmetric function of the roots – Sum of the powers of the roots of an equation.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	Newton's theorem on the sum of the power of the roots- Transformations of Equations– Reciprocal equations – To increase or decrease the roots of a given equation by a given quantity.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	Form of the quotient and remainder when a polynomial is divided by a binomial – Removal of terms – To form of an equation whose roots are any power of the roots of a given equation – Transformation in general.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	Inequalities – Elementary principles – Geometric & Arithmetic means – Weirstrass inequalities – Cauchy inequality.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	Theory of Numbers – Prime & Composite numbers – Divisors of a given number N – Euler's function $\phi(N)$ and its value –Integral part of a real number – The highest Power of a prime P contained in n! – Congruences	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	Self Study for Enrichment: (Not included for End Semester Examination) Descarte's rule of signs– Applications to Maxima & Minima–Fermat's, Wilson's & Lagrange's Theorems.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Manicavachagom Pillay.T.K, Natarajan.T, Ganapathy.K.S (2015), *Algebra Volume I* , S.Viswanathan (Printers & Publishers) Private Limited
2. Manicavachagom Pillay.T.K, Natarajan.T, Ganapathy.K.S (2015), *Algebra Volume II*, S.Viswanathan (Printers & Publishers) Private Limited

Chapters and Sections

UNIT-I	Chapter VI: Sections 11 - 13 [1]
UNIT-II	Chapter VI: Sections 14 - 17 [1]
UNIT-III	Chapter VI: Sections 18 - 21 [1]
UNIT- IV	Chapter IV: Sections 1 - 12 [2]
UNIT- V	Chapter V: Sections 1 - 15 [2]

Reference Books

1. Ramakrishna Ghosh, Kantish Chandra Maity (1980). *Higher Algebra (Classical & Modern)*, New Central Book Agency (P0 Ltd.
2. Ivan Niven, Herbert S.Zuckerman, Hugh L. Montgomery (2016). *An Introduction to the Theory of Numbers* , Wiley.
3. Narayanan.S , Hanumantha Rao.R , Manicavachagom Pillay.T.K and P. Kandaswamy (2009). *Ancillary Mathematics*, Viswanathan S. Printers & Publishers Pvt Ltd.

Web References

1. <https://youtu.be/FAPShLAdkto>
2. <https://blog.myrank.co.in/transformation-of-equation/>
3. <https://youtu.be/XJQStun0WnI>
4. https://youtu.be/MNj_e-t9tIs
5. https://artofproblemsolving.com/wiki/index.php/Cauchy-Schwarz_Inequality

Pedagogy

Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

Course Designer

Dr. R.Radha

SECOND ALLIED COURSE – I (AC)

PYTHON PROGRAMMING

(2022-2023 Onwards)

Semester III	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UMA3AC4	PYTHON PROGRAMMING	ALLIED	5	4

Course Objective

- **Understand** the basic principles of Python.
- **Provide** basic idea on functions and concepts of Python programming.
- **Inculcate** the basic techniques of Python programming.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	On the successful completion of the course, students will be able to Understand Python's core data types while writing new programs.	K2
CO2	Demonstrate programs using simple Python statements and expressions.	K2
CO3	Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements.	K2
CO4	Develop algorithmic solutions to simple computational problems.	K3
CO5	Construct Python programs step-wise and Acquire programming skills in core Python.	K3

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	3	3	3	2	3	3
CO2	3	2	3	3	2	3	3	3	3	2
CO3	3	3	3	2	3	2	3	3	3	3
CO4	3	3	2	3	3	3	3	3	2	3
CO5	2	3	3	3	3	3	3	3	3	3

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Basics of Python Programming : Introduction - Python Character Set –Token - Python Core Data Type - The print() Function - Assigning Value to a Variable - Multiple Assignments- Statement in Python – Multiline Statement in Python - Writing Simple Programs in Python - The input() Function - The eval() Function- Formatting Number and Strings - Python Inbuilt Functions.	15	CO1, CO2, CO3, CO4, CO5	K2, K3
II	Operators and Expressions : Introduction - Operators and Expressions - Arithmetic Operators - Membership Operator - Identity Operator - Operator Precedence and Associativity - Changing Precedence and Associativity of Arithmetic Operators - Translating Mathematical Formulae into Equivalent Python Expressions - Bitwise Operator - The Compound Assignment Operator Decision Statements : Introduction - Boolean Type - Boolean Operators - Using Numbers with Boolean Operators - Using String with Boolean Operators - Boolean Expressions and Relational Operators - Decision Making Statements - Conditional Expressions.	15	CO1, CO2, CO3, CO4, CO5	K2, K3
III	Loop Control Statements : - Introduction - The while Loop - The range() Function - The for Loop - Nested Loops - The break Statement - The continue Statement Functions : Introduction - Syntax and Basics of a Function - Use of a Function - Parameters and Arguments in a Function - Variable Length Non-Keyword and Keyword Arguments - The Local and Global Scope of a Variable - The return Statement- Recursive Functions - The Lambda Function.	15	CO1, CO2, CO3, CO4, CO5	K2, K3
IV	Strings : Introduction - The str class - Basic Inbuilt Python Functions for String - The index[] Operator- Traversing String with for and while Loop - Immutable	15	CO1, CO2, CO3,	K2, K3

	Strings – The String Operators - String Operations. Lists : Introduction - Creating Lists - Accessing the Elements of a List – Negative List Indices - List Slicing [Start : End] - List Slicing with Step Size - Python Inbuilt Functions for Lists - The List Operator – List Comprehensions- List Methods - List and Strings - Splitting a String in List - Passing List to a Function - Returning List from a Function.		CO4, CO5	
V	Tuples, Sets and Dictionaries - Introduction to Tuples – Sets - Dictionaries. Graphics Programming: Drawing with Turtle Graphics : Introduction - Getting Started with the turtle Module - Moving the turtle in any Direction - Moving the turtle to any Location - The Color, Bgcolor, Circle and Speed Method of turtle - Drawing with Colors - Drawing Basic Shapes using Iterations - Changing Color Dynamically Using List - turtles to Create Bar Charts.	15	CO1, CO2, CO3, CO4, CO5	K2, K3
VI	Self Study for Enrichment: (Not included for End Semester Examination) File Handling – Exception Handling.	-	CO1, CO2, CO3, CO4, CO5	K2, K3

Text Book

Ashok Namdev Kamthane, Amit Ashok Kamthane (2020), *Programming and Problem Solving with PYTHON*, Second Edition, McGraw Hill Education

Chapters and Sections

UNIT-I	Chapter II Sections: 2.1 – 2.14
UNIT-II	Chapter III & IV Sections: 3.1 – 3.10 & 4.1 – 4.8
UNIT-III	Chapter V & VI Sections: 5.1 – 5.7 & 6.1 – 6.9
UNIT- IV	Chapter VII & VIII Sections: 7.1 – 7.8 & 8.1 – 8.14
UNIT- V	Chapter XI & XII Sections: 11.1 – 11.3 & 12.1 – 12.9

Reference Books

1. Jeeva Jose and Sojan Lal P. (2021), *Introduction to Computing and Problem Solving with PYTHON*, Khanna Book Publisig Co. (P) Ltd., New Delhi.
2. Satyanarayana Ch., Radhika Mani M., and Jagadesh B.N. (2018), *Python Programming*, Universities Press, Hyderabad.
3. Dr Nageswara Rao R. (2021), *Core Python Programming*, Dreamtech Press, New Delhi.

Web References

1. <https://www.geeksforgeeks.org>
2. <https://www.python.org>
3. <https://www.tutorialspoint.com>
4. <https://www.pythonforbeginners.com>
5. <https://www.w3schools.com>

Pedagogy

Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

Course Designer

Ms. R. Soundaria

SECOND ALLIED COURSE – II (AP)**PYTHON PROGRAMMING (P)****(2022-2023 Onwards)**

Semester III	Internal Marks: 40		External Marks: 60	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UMA3AC5P	PYTHON PROGRAMMING (P)	ALLIED	3	2

Course Objective

- **Explore** python programming language to construct basic programs.
- **Acquire** programming skills in core Python.
- **Analyze** the basics of problem solving.

Course Outcomes**Course Outcome and Cognitive Level Mapping**

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Understand and apply Python's basic concepts.	K2
CO2	Demonstrate different data types and its usage.	K2
CO3	Build and execute simple Python programs.	K3
CO4	Make use of Python lists, tuples, and dictionaries to represent compound data.	K3
CO5	Develop algorithmic solutions to simple computational problems.	K3

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2	3	3	3	3	3
CO2	3	2	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

LIST OF PRACTICALS

1. Get inputs from user and display them.
2. Develop a calculator.
3. Implement Decision making and Loop control statements.
4. Create and call an user defined function.
5. Strings and their built-in functions.
6. List and their built-in functions.
7. Working with Tuples.
8. Working with Dictionaries.
9. Bar chart, Pie Chart and Line graph.
10. Plotting 2D and 3D graphs.
11. Create Fibonacci series.
12. Create Pascal Triangle.
13. Performing Matrix operations.
14. Finding roots of an equations.
15. Calculating HCF, LCM and GCD.

Web References

1. <https://www.geeksforgeeks.org>
2. <https://www.python.org>
3. <https://www.tutorialspoint.com>
4. <https://www.pythonforbeginners.com>
5. <https://www.w3schools.com>

Pedagogy

Power point presentations, Group Discussions, Hands on training, Assignment.

Course Designer

Ms. R. Soundaria

GENERIC ELECTIVE COURSE – I (GEC)
MATHEMATICS FOR COMPETITIVE EXAMINATIONS-I
(2022-2023 Onwards)

Semester III	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UMA3GEC1	MATHEMATICS FOR COMPETITIVE EXAMINATIONS-I	GENERIC ELECTIVE COURSE	2	2

Course Objective

- **Explain** many short tricks to solve the mathematical problems easily.
- **Apply** the knowledge to **interpret** and **solve** the problems.
- **Explore** the ideas and to solve the Mathematical problems.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	On the successful completion of the course, students will be able to Explain the knowledge of the various techniques of Quantitative Aptitude and Reasoning.	K1, K2
CO2	Apply the concepts in solving mathematical problems to succeed in various Competitive examinations.	K3
CO3	Examine various types of Problems using Arithmetic and Reasoning test.	K3
CO4	Apply the different concepts of Arithmetic and Reasoning test to solve the problems.	K3
CO5	Analyze real-life problems and finding solutions.	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2	3	2	3	3	3
CO2	3	2	2	2	2	2	3	3	3	3
CO3	3	2	2	2	2	3	3	2	2	3
CO4	3	2	2	2	2	3	3	2	2	2
CO5	3	2	2	2	2	3	3	3	3	2

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Problems on Numbers – Problems on Ages.	6	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	Time & Distance – Calendar – Clocks.	6	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	Data Interpretation: Bar Graphs – Pie Charts – Line Graphs.	6	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	Reasoning (Including Mathematical): Series – Codes – Relationship – Classification.	6	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	Logical Reasoning.	6	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	Self -Study for Enrichment: (Not included for End Semester Examination) Numbers -HCF and LCM of Numbers -Time and Work- Tabulation – Analogy.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Book

1. Aggarwal. R.S . (2015). *Quantitative Aptitude For Competitive Examinations (Fully Solved)*. S.Chand & Company Pvt.Ltd.
2. Dr.Kautilya.K. (2018). *UGC NET/JRF/SET Teaching & Research Aptitude (General Paper - I)*. UPKAR PRAKASHAN, AGRA – 2, Sixth Edition.

Chapters and Sections

UNIT-I	Chapter 7	Pg.No 161 – 181 [1]
	Chapter 8	Pg.No 182 - 194 [1]
UNIT-II	Chapter 17	Pg.No 384 – 404 [1]
	Chapter 27	Pg.No 593 – 596 [1]
	Chapter 28	Pg.No 597 - 604 [1]
UNIT-III	Chapter 37	Pg.No 676 – 694 [1]
	Chapter 38	Pg.No 695 - 708 [1]
	Chapter 39	Pg.No 709-726 [1]
UNIT- IV	Unit-5	Sections 1-3,5 [2]
UNIT- V	Unit-6	Pg.No 162 – 190 [2]

Reference Books

1. Edgar Thorpe. (2000). *Test of Reasoning for Competitive Examinations*. Tata McGraw-Hill Publishing Company Limited, New Delhi, 2nd Edition.
2. Sinha. T.K. (2002). *80+ Practice Sets of Quantitative Aptitude for Bank PO Exams*. Arihant Publication (India) limited.
3. Abhijit Guha.(2014). *Quantitative Aptitude for Competitive Examinations*. McGraw-Hill Publishing Company Limited, New Delhi, 5 th Edition.

Web References

1. https://www.youtube.com/watch?v=viKaYznFJbw&list=PL5cSYiJ8KoWGqLLS_w6G80U5FUEI0T39 .
2. <https://www.youtube.com/watch?v=ufbDCFun6PY>
3. <https://www.youtube.com/watch?v=hGFGybSODxQ>
4. https://www.youtube.com/watch?v=_up3mXnsVEc&list=PLOoogDtEDyvs3Qznc3-1DnlpbQSRuWP-z
5. https://www.youtube.com/watch?v=MV00SQU_f7E&list=PLOoogDtEDyvvDNHO_Ba58OrE567nCzzl2
6. <https://www.youtube.com/watch?v=31qZR-BbPIs>
7. <https://www.youtube.com/watch?v=ev2SkXJVAbA&list=PLOoogDtEDyvsBG38tzlj1Zkd0PLxgZwXV>

Pedagogy

Chalk and Talk, Power point presentation, Group Discussion, Seminar, Assignment and Quiz.

Course Designer

Dr.L.Mahalakshmi

IV SEMESTER

CORE COURSE VII – (CC)
SEQUENCES AND SERIES
(2022-2023 Onwards)

Semester IV	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UMA4CC7	SEQUENCES AND SERIES	CORE	5	5

Course Objective

- To lay a good foundation for classical analysis.
- To study the behavior of sequences and series.
- To acquire the knowledge of solving problems in Binomial, Logarithm & Exponential Series.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the Successful completion of the course, students will be able to	
CO1	Explain the concepts of convergent sequences, divergent sequences and series.	K2
CO2	Apply the ideas of sequences in Algebra of limits and Compute the behavior of monotonic functions.	K3
CO3	Apply the theory of Cauchy's condensation test and Cauchy's root test on series.	K3
CO4	Solve the problems based on binomial, logarithmic and exponential series.	K3
CO5	Examine infinite series using D' Alembert's ratio test.	K4

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	2	3
CO2	3	3	2	3	2	3	3	3	2	2
CO3	3	3	2	3	2	3	3	3	2	2
CO4	3	3	3	3	3	3	2	3	3	3
CO5	3	3	3	3	2	3	3	3	3	2

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	Cos	COGNITIVE LEVEL
I	Introduction – Sequences – Bounded Sequences – Monotonic Sequences – Convergent Sequences – Divergent Sequences and Oscillating Sequences – The Algebra of Limits.	15	CO1, CO2, CO3, CO4, CO5	K2, K3, K4
II	Behavior of Monotonic sequences – Some theorems on limits –Subsequences -Limit points.	15	CO1, CO2, CO3, CO4, CO5	K2, K3, K4
III	Infinite Series – Definition of Convergence, Divergence & Oscillate – Convergence of Geometric series – Some general theorems concerning infinite series – Series of positive terms – Comparison test- convergence of $\sum \frac{1}{n^k}$ – D'Alembert's Ratio test.	15	CO1, CO2, CO3, CO4, CO5	K2, K3, K4
IV	Cauchy's Condensation test – Cauchy's Root test and their simple problems – Absolute Convergence Series– Conditional Convergence Series – Alternative Series.	15	CO1, CO2, CO3, CO4, CO5	K2, K3, K4
V	Binomial theorem for a rational index – Some important particular case of the Binomial expansion – Sign of terms in binomial expansion – Numerically greatest term – Method of splitting functions into partial fractions – Application of the Binomial theorem to the summation of series – Exponential limit – The exponential theorem – Summation – Logarithmic series – Modification of the logarithmic series – Summation of series – Series which can be summed up by the logarithmic series.	15	CO1, CO2, CO3, CO4, CO5	K2, K3, K4
VI	Self Study for Enrichment: (Not included for End Semester Examination) Cauchy sequence - Raabe's test - Uniform Convergence- Approximate values - Euler's constant - The application of the exponential and logarithmic series to limits and approximations.	-	CO1, CO2, CO3, CO4, CO5	K2, K3, K4

Text Books

1. Dr.S.Arumugam & Mr.A.Thangapandi Isaac(2015), Sequences and Series, New Gamma Publishing House.
2. T.K.Manicavachagam Pillai, T.Natarajan & K.S.Ganapathy (2010), Algebra, Volume I , S.Viswanathan Pvt Limited.

Chapters and Sections

UNIT-I	Chapter III: Sections 3.0-3.6[1]
UNIT-II	Chapter III: Sections 3.7-3.10[1]
UNIT-III	Chapter II: Sections 8-14, 16 [2]
UNIT- IV	Chapter II: Sections 15, 17, 21-24[2]
UNIT- V	Chapter III: Sections 5-10 [2] Chapter IV: Sections 1-3, 5-7, 9[2]

Reference Books

1. M.K. Singal and Asha Rani Singal (2018). A First course in Real Analysis. R.chand & Co.
2. Shanti Narayan, P.K.Mittal (2002). A Course of Mathematical Analysis . S.Chand & Company Ltd.
3. Dr.P.R. Vittal (2014). Allied Mathematics. Margham Publications.

Web References

1. https://youtu.be/XdkoTb8PEG0?si=u_ZtB1anBe7bI0vt
2. <https://youtu.be/BZ-LQpz5EBc?si=9H5Ydbq9amtAxUX4>
3. https://youtu.be/zg9N2gAf6a4?si=_07ubR0LI3GBhMU
4. <https://youtu.be/Fjrb8f-assM?si=Hsn2y6rGxAS4AU-V>
5. <https://youtu.be/jmZIEyabJIU?si=PQB-8QllG1OGxEvv>

Pedagogy

Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

Course Designer

Dr. R.Divya

CORE COURSE VIII– (CC)
METHODS IN NUMERICAL ANALYSIS
(2022-2023 Onwards)

Semester IV	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UMA4CC8	METHODS IN NUMERICAL ANALYSIS	CORE	5	5

Course Objectives:

- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals.
- To understand the knowledge of numerical techniques of differentiation and integration.

Course Outcome

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the Successful completion of the course, students will be able to	
CO1	Apply numerical methods to solve Algebraic, Transcendental equations.	K1, K2
CO2	Classify and solve the numerical techniques of interpolation in various intervals.	K2, K4
CO3	Solve numerical integration and differentiation problems.	K3
CO4	Determine the system of algebraic equations by various methods.	K5
CO5	Compute the numerical solution of ordinary differential equation Using different methods.	K3

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	2	2	3
CO2	3	2	3	3	3	3	3	3	2	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	2	3	3	2	3	3	2	2	3
CO5	3	2	3	3	2	3	3	3	3	2

“1” – Slight (Low) Correlation

“2” – Moderate (Medium) Correlation

“3” – Substantial (High) Correlation “-” indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	ALGEBRAIC AND TRANSCENDENTAL EQUATIONS: Introduction – Iteration Method – Bisection Method – Regula Falsi Method – Newton - Raphson Method – Horner's Method (Problems only).	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	SIMULTANEOUS EQUATIONS: Introduction–Simultaneous Equations – Back Substitution – Gauss Elimination Method – Gauss-Jordan Elimination Method – Calculation of inverse of a Matrix – Crout's Method – Iterative Methods – Gauss Jacobi Iteration Method – Gauss-Seidel Iteration Method (Problems only).	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	INTERPOLATION: Introduction – Newton's interpolation formula– Lagrange's interpolation formula (Problems only)	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	NUMERICAL DIFFERENTIATION AND INTEGRATION: Introduction – Derivatives using Newton's forward difference formula – Derivatives using Newton's backward difference formula - Numerical Integration: Newton-Cotes quadrature formulae - Trapezoidal Rule – Simpson's one third Rule – Simpson's three eight Rule – Weddle's Rule – Romberg's Method (Problems only).	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS: Introduction – Taylor's Series Method – Euler's Method: Modified Euler's Method, Runge - Kutta Methods: Second order and Fourth order R.K Methods – Predictor Corrector Methods – Milne's Method (Problems only)	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	Self Study for Enrichment: (Not included for End Semester Examination) Relaxation Method – Newton Raphson Method for simultaneous equations – Newton's divided differences formula – Gaussian quadrature formula – Adams - Bashforth Method.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Book:

1. S. Arumugam, A. Thangapandi Isaac and A. Somasundaram, (2017), *Numerical Methods*, Second Edition ,Scitech Publications (India) Pvt. Ltd.

Chapters and Sections:

- UNIT I Chapter 3: Sections 3.0, 3.2 – 3.6
- UNIT II Chapter 4: Sections 4.0-4.8
- UNIT III Chapter 7: Sections 7.0, 7.1, 7.3
- UNIT IV Chapter 8: Sections 8.0 - 8.2, 8.5
- UNIT V Chapter 10: Sections 10.0, 10.1,10.3-10.6

Reference Books:

1. M.K. Jain, S.R.K. Iyengar and R.K. Jain (1999), *Numerical Methods for Scientific and Engineering Computations*, New Age International Private Limited.
2. C.E. Froberg (1979), *Introduction to Numerical Analysis*, II Edition , Addison Wesley.
3. Dr. P. Kandasamy, Dr. K. Thilagavathy and Dr. K. Gunavathi, (2013) *Numerical Methods*, S. Chand & Company Pvt Ltd.

Web References:

1. <https://youtu.be/39pu-z3KpAQ?list=PLbzVLFZiGEdQnmR2M2jDmi0nVHUF3WPYg>
2. <https://youtu.be/ukNbG7muKho>
3. <https://youtu.be/Ym1EUjTWMnE>
4. https://youtu.be/o7uwKpZNa_k
5. <https://youtu.be/82IDoaiYU0c>
6. <https://youtu.be/oTN7hGoSPMw>
7. <https://youtu.be/-Lf0VZzKRw0>

Pedagogy:

Power point presentation, Group Discussion, Seminar, Quiz, Assignment.

Course Designer:

Dr.R.Radha

SECOND ALLIED COURSE-III (AC)
INTERNET OF THINGS
2022-2023 Onwards

Semester IV	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UMA4AC6	INTERNET OF THINGS	SECOND ALLIED COURSE III (AC)	4	3

Course Objective

- **Able** to understand building blocks of Internet of Things and characteristics.
- **Apply** the concept of Internet of Things in the real-world scenario.
- **Understand** the application areas of Internet of things.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Understand building blocks of Internet of Things and its characteristics.	K1, K2
CO2	Analyze basic protocols in wireless sensor network.	K3
CO3	Categorize different sensor technologies for sensing real world entities and identify the applications.	K4
CO4	Demonstrate the ability to transmit data wirelessly between different devices.	K5
CO5	Design IoT applications in different domains and able to analyze their performance.	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	2	3	3	3
CO2	3	2	3	3	2	3	3	3	3	2
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	2	3	3	2	3	3	3	2	3
CO5	3	3	3	3	3	3	3	3	3	3

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –
“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Introduction to Internet of Things: Introduction – Overview of Internet of Things (IoT) - Characteristics of IoT - IOT Applications - Working and Implementation of IoT - Components of an IoT System - IoT Architecture and Levels - IoT Ecosystem - Value chain and global value chain - Types of Networks – IoT Technologies and Protocols – Technologies used in IoT.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	Introduction to Internet of Things: Communication Protocols – IOT Enabling Technologies – Building blocks of IoT – The logical and Physical design of IoT – Functional blocks of IoT – IoT design Methodology – Communication models.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	Things and Connections: Introduction to control systems – Working of controlled systems – Feedback systems – Connectivity models – OSI model – TCP/IP model – Types of modes – Wired and Wireless Methodology – Transmission media – Guided media – Unguided media.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	Sensors, Actuators and Microcontrollers: Introduction – Sensor – Classification of Sensors – Types of Sensors – Criteria to choose a Sensor – Actuators – Classification of Actuators – Microcontroller – Classification of Microcontrollers – Components of Microcontroller – Types of Microcontrollers – Application of Microcontroller – Embedded System – Real time Embedded system.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	Building IoT Applications: Introduction to Arduino – Types of Arduino Boards – Introduction to Arduino IDE – Parts of Arduino IDE – Development Cycle – Writing/Editing Code in Sketch – Compiling – Debugging – Uploading and Running a File – Role of Serial Monitor – Role of Serial Plotter – LED Programming – Open Your First Sketch.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	Self -Study for Enrichment: (Not included for End Semester Examination) Development tools used in IoT - The process flow of IoT- Embedded 'C' Language Basics – Variables and Identifiers – Keywords – Built –in Data Types – Variable Scope.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Book

1. Prof. Satish Jain & Shashi Singh (2020). *IoT and its Applications*, BPB Publications, India.

Chapters and Sections

UNIT-I	Chapter 1	:	Sections 1.1 – 1.12
UNIT-II	Chapter 1	:	Sections 1.13 – 1.19
UNIT-III	Chapter 2	:	Sections 2.1 – 2.11
UNIT-IV	Chapter 3	:	Sections 3.1 – 3.14
UNIT-V	Chapter 4	:	Sections 4.1 – 4.12

Reference Books

1. Arshdeep Bahga and Vijay Madisetti (2014). *Internet of Things A Hands-on Approach*, Universities Press.
2. Raj Kamal (2017). *Internet of Things Architecture and Design Principles*, Mc Graw Hill Education (India) Private Limited.
3. Preston Gralla (2012). *How the Internet Works*, Pearson Education.

Web References

1. <https://iotbyhvm.ooo/physical-design-of-iot/>
2. <https://www.javatpoint.com/iot-internet-of-things>
3. <https://www.oracle.com/in/internet-of-things/what-is-iot/>
4. <https://www.edureka.co/blog/iot-applications/>
5. <https://www.rfpage.com/applications-of-internet-of-things-iot/>

Pedagogy

Chalk and Talk, Power point presentation, Group Discussion, Seminar, Assignment and Quiz.

Course Designer

Ms. R. Soundaria

GENERIC ELECTIVE COURSE – II (GEC)
(For BCA, B.Sc Computer Science with Cognitive, B.Sc IT)
MATHEMATICS FOR COMPETITIVE EXAMINATIONS - II
(2022-2023 Onwards)

Semester IV	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UMA4GEC2	MATHEMATICS FOR COMPETITIVE EXAMINATIONS-II	GENERIC ELECTIVE	2	2

Course Objective

- **Explain** many short tricks to solve the mathematical problems easily.
- **Apply** the knowledge and to develop their logical reasoning thinking ability.
- **Analyze** the Problems and **Explore** the ideas and to solve the Mathematical problems.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	On the successful completion of the course, students will be able to Explain the knowledge of the various techniques of Quantitative Aptitude and Reasoning.	K1, K2
CO2	Analyze the Problems logically and approach the problems in a different manner.	K3
CO3	Solve a problem and to identify the appropriate computing requirement	K3
CO4	Apply the different concepts of Arithmetic and Reasoning test to solve the problems and Motivate the students to prepare for high level competitive exams.	K3
CO5	Analyze real-life problems and finding solutions.	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2	3	2	3	3	3
CO2	3	2	2	2	2	2	3	3	3	3
CO3	3	2	2	2	2	3	3	2	2	3
CO4	3	2	2	2	2	3	3	2	2	2
CO5	3	2	2	2	2	3	3	3	3	2

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Decimal Fractions – Simplification.	6	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	Square Roots - Cube Roots – Profit & Loss.	6	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	Ratio & Proportion - Problems on Trains - Boats and Streams.	6	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	Simple Interest - Compound Interest.	6	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	Percentage - Permutations & Combinations.	6	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	Self -Study for Enrichment: (Not included for End Semester Examination) Numbers- Approximation- Average - Time and Work - Odd Man Out & Series	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Book

Aggarwal. R.S . (2015). *Quantitative Aptitude For Competitive Examinations (Fully Solved)*. S.Chand & Company Pvt.Ltd.

Chapters and Sections

UNIT-I	Chapter 3 , 4	: Pg.No 46 – 116
UNIT-II	Chapter 5, 11	: Pg.No 117 – 138 , 251-293
UNIT-III	Chapter 12,18,19	: Pg.No 294-310 , 405 - 434

UNIT- IV	Chapter 21,22	: Pg.No 445 – 486
UNIT- V	Chapter 10,30	: Pg.No 208 – 250 , 613 – 620

Reference Books

1. Edgar Thorpe. (2000). *Test of Reasoning for Competitive Examinations*. Tata McGraw-Hill Publishing Company Limited, New Delhi, 2nd Edition.
2. Sinha. T.K. (2002). *80+ Practice Sets of Quantitative Aptitude for Bank PO Exams*. Arihant Publication (India) limited.
3. Abhijit Guha.(2014). *Quantitative Aptitude for Competitive Examinations*. McGraw-Hill Publishing Company Limited, New Delhi, 5 th Edition.

Web References

1. <https://www.youtube.com/watch?v=wR0aaQMfxwI>
2. <https://www.youtube.com/watch?v=Sjpkp8-0t1s>
3. <https://byjus.com/govt-exams/train-problems/>
4. <https://www.sscadda.com/compound-interest-formulas-tricks-and-questions/>
5. <https://www.youtube.com/watch?v=6B-dvOMTeV8>
6. <https://www.youtube.com/watch?v=VSoJwlydCWM>

Pedagogy:

Chalk and Talk, Power point presentation, Group Discussion, Seminar, Assignment and Quiz.

Course Designer:

Dr.L.Mahalakshmi

SKILL ENHANCEMENT COURSE – I (SEC)
STATISTICAL TOOLS AND TECHNIQUES - R PROGRAMMING (P)
(2022 - 2023 Onwards)

Semester IV	Internal Marks: 40		External Marks: 60	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UMA4SEC1P	STATISTICAL TOOLS AND TECHNIQUES - R PROGRAMMING (P)	SKILL ENHANCEMENT COURSE (SEC)	2	2

Course Objectives

- **Understand** how to use the R documentation.
- **Describe** key terminologies, concepts and techniques employed in Statistical Analysis.
- **Apply** various concepts to write programs and statistical analysis through R language.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Calculate simple arithmetic and statistical operations in R.	K1
CO2	Interpret the R programming language and its programming Environment.	K2
CO3	Apply the Statistical Programming Software.	K3
CO4	Manipulate data within R and to create simple graphs and charts.	K3
CO5	Compute R programming from a statistical Perspective.	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	2	2	3	3	2	2	2
CO2	3	3	3	2	2	2	3	2	2	3
CO3	2	2	2	2	2	2	2	2	2	2
CO4	2	3	2	3	2	3	2	3	2	2
CO5	2	2	2	2	2	2	2	2	2	2

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –
“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

LIST OF PROGRAMS

1. Creating and displaying data.
2. Matrix Manipulations.
3. Creating and manipulating a List and an Array.
4. Bar diagrams, Bar plots and subdivided Bar plots.
5. Pie diagram, 3D Pie diagram and Histogram.
6. Reading a CSV file and Calculating the Measures of Central Tendency.
7. String Manipulations.
8. Vector Operations.
9. Control Statements.
10. User defined functions.

Web References

1. <https://www.w3resource.com/r-programming-exercises/>
2. <https://www.r-project.org/about.html>
3. <https://www.tutorialspoint.com/r/index.htm>
4. <https://modernstatisticswithr.com/introduction.html#welcome-to-r>
5. <https://www.w3schools.com/r/default.asp>

Pedagogy

Power point presentations and Illustrations.

Course Designer

Ms. R. Soundaria

V SEMESTER

CORE COURSE - IX(CC)
ABSTRACT ALGEBRA
(2022-2023 and Onwards)

Semester V	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UMA5CC9	ABSTRACT ALGEBRA	CORE	6	6

Course Objectives

- **Understand** the concepts and properties of algebra and their application.
- **Provide** the principles and practices of algebra.
- **Construct** a legitimate proof involves different skills and expertise problem solving.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Understand the basic concept of Group and Ring Theory with examples.	K2
CO2	Illustrate the variety of problem-solving methods used in the relevant field.	K2
CO3	Apply various algebraic terminology.	K3
CO4	Explain the main results of Group and Ring Theory	K3
CO5	Analyse clear and accurate points using the concept of Groups and Rings.	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	3	2	3	2	2	3
CO2	3	2	3	3	3	3	3	3	2	3
CO3	3	3	2	3	3	3	2	3	3	3
CO4	3	2	3	3	2	2	3	2	2	3
CO5	3	2	3	3	2	3	3	3	3	2

“1” – Slight (Low) Correlation

“2” – Moderate (Medium) Correlation

“3” – Substantial (High) Correlation

“-” indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Group Theory: Definition of a Group- Some Examples of Groups- Some Preliminary Lemmas-Subgroups.	18	CO1, CO2, CO3, CO4, CO5	K1 K2, K3, K4
II	Group Theory: A Counting Principle – Normal Subgroups and Quotient Groups - Homomorphisms.	18	CO1, CO2, CO3, CO4, CO5	K1 K2, K3, K4
III	Group Theory: Automorphisms - Cayley's Theorem - Permutation Groups.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	Ring Theory: Definition and Examples of Rings – Some Special Classes of Rings – Homomorphisms – Ideals and Quotient Rings - More Ideals and Quotient Rings.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	Ring Theory: The Field of Quotient of an Integral Domain - Euclidean Rings – A Particular Euclidean Ring – Polynomial Rings – Polynomials over the Rational Field.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	Self-Study for Enrichment: (Not included for End Semester Examinations) Set theory – Mappings – Another Counting Principle – Polynomial Rings Over Commutative Rings.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Book

Herstein .I.N (Reprint 2016), *Topics in Algebra* (2nd Edition), Wiley, New Delhi.

Chapters and Sections

UNIT-I	Chapter 2:	Sections 2.1-2.4
UNIT-II	Chapter 2:	Sections 2.5-2.7
UNIT-III	Chapter 2:	Sections 2.8-2.10
UNIT- IV	Chapter 3:	Sections 3.1-3.5
UNIT- V	Chapter 3:	Sections 3.6 – 3.10

Reference Books

1. Arumugam. S & Thangapandi Isaac. A (May 2017), *Modern Algebra*, Scitech Publications India (Pvt) Ltd, Chennai.
2. BhatV K(2014), *Modern Algebra and Applications*, Narosa Publishing House, New Delhi.
3. Santiago M L (2001), *Modern Algebra*, Tata Mcgraw - Hill Publishing Company Limited, New Delhi.

Web References

1. <https://youtu.be/CJpZJLYKk0I>
2. <https://youtu.be/mcX0sMnYyMU>
3. <https://youtu.be/lrQMV4zGF44>
4. <https://youtu.be/7LtpPI46O0Q>
5. <https://youtu.be/K1iuXqHFWRw>
6. <https://math.berkeley.edu/~apaulin/AbstractAlgebra.pdf>

Pedagogy

Power Point Presentations, Group Discussions, Seminar, Quiz and Assignment.

Course Designer

Ms. V. ManiMozhi

CORE COURSE - X(CC)
REAL ANALYSIS
(2022-2023 and Onwards)

Semester V	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS / WEEK	CREDITS
22UMA5CC10	REAL ANALYSIS	CORE	5	5

Course Objectives

- **Enable** the students to understand the basic concepts of Analysis.
- **Impart** knowledge in concepts of solving various problems regarding field axioms.
- **Construct** a proof that involves different problem solving ideas and expertise in them.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Recall the basic concepts of Sequences and Series.	K1
CO2	Interpret the fundamental ideas in limits and functions.	K2
CO3	Relate the concepts of Continuity with limits.	K3
CO4	Determine the implementation of open sets and closed sets.	K4
CO5	Deduce mathematical notions in Metric Spaces.	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	2	3	3	3	3	3	3

“1” – Slight (Low) Correlation –

“3” – Substantial (High) Correlation –

“2” – Moderate (Medium) Correlation –

“-” indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	SETS AND FUNCTIONS: Operations on sets- Functions – Real-valued functions – Equivalence, Countability – Real numbers - Least upper bounds.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	LIMITS AND METRIC SPACES: Limit of a function on the real line – Metric spaces – Limits in metric spaces.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	CONTINUOUS FUNCTIONS ON METRIC SPACES: Functions continuous at a point on the real line – Reformulation – Functions continuous on a metric space – Open sets – Closed sets.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	CONTINUOUS FUNCTIONS ON METRIC SPACES: Discontinuous functions on $\mathbb{R}^1$. CONNECTEDNESS, COMPLETENESS AND COMPACTNESS: More about open sets – Connected sets – Bounded sets and totally bounded sets – Complete metric spaces.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	CONNECTEDNESS, COMPLETENESS AND COMPACTNESS: Compact metric spaces – Continuous functions on compact metric spaces – Continuity of the inverse function – Uniform continuity.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	Self Study for Enrichment: (Not included for End Semester Examinations) Sets and elements – Definition of a sequence and subsequence -Limit of a sequence- Convergent sequences-Divergent sequences-Monotone sequences.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Richard R. Goldberg (2019), *Methods of Real Analysis*, Oxford & IBH Publishing Co. Pvt.Ltd, New Delhi.

Chapters and Sections

- UNIT-I Chapter 1: Sections 1.2 - 1.7
UNIT-II Chapter 4: Sections 4.1 - 4.3
UNIT-III Chapter 5: Sections 5.1-5.5
UNIT-IV Chapter 5: Sections 5.6
Chapter 6: Sections 6.1 – 6.4
UNIT-V Chapter 6: Sections 6.5 – 6.8

Reference Books

1. Tom M. Apostol, (2002), *Mathematical Analysis(second edition)*, Addison-Wesley Publishing Company.
2. Robert G. Bartle, Donald R. Sherbert(2007), *Introduction to Real Analysis*, John Wiley & Sons. Private Ltd.,
3. Singal M. K., Asha Rani Singal(2018), *A First Course in Real Analysis*, R. Chand & Co.

Web References

1. <https://youtu.be/XjiT88Czx5c?t=15>
2. <https://youtu.be/1diSwLMJpvs?t=626>
3. <https://youtu.be/YEG18ISnThE?t=4>
4. <https://youtu.be/4TzGkHFnn7g?t=3>
5. <https://youtu.be/y5tni8My-VY?t=4>

Pedagogy

Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

Course Designer

Dr. S. Saridha

CORE COURSE –XI (CC)
STATICS
(2022-2023 and Onwards)

Semester V	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UMA5CC11	STATICS	CORE	5	5

Course Objective

- **Explore** the basic skills of the students with mathematical methods formatted for their major concepts and the basic knowledge of equilibrium of a particle.
- **Apply** the knowledge to **interpret** and **solve** the problems.
- **Evaluate** the fundamental concepts of static objects and their applications.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	On the successful completion of the course, students will be able to Explain the concepts of static objects .	K1, K2
CO2	Classify the problem models in the respective area.	K3
CO3	Solve various types of problems in the corresponding stream.	K3
CO4	Identify the properties of solutions in the core area.	K3
CO5	Discover the applications of Statics.	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2	3	3	2	2	3
CO2	3	2	2	2	2	3	3	2	2	3
CO3	3	2	2	2	2	3	3	3	3	3
CO4	3	2	2	2	2	3	3	3	2	3
CO5	3	2	2	2	2	3	3	3	2	3

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –
“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Forces and Equilibrium of a particle: Newton's laws of motion-Resultant of two forces on a particle - Equilibrium of a particle.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	Forces on a rigid body: Moment of a force – General motion of a rigid body- Equivalent (or equipollent) systems of forces- Parallel forces – Forces along the sides of a Triangle – Couples.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	(a) Coplanar Forces: Resultant of several coplanar forces - Equation of the line of action of the resultant (b) A specific Reduction of forces: Reduction of coplanar forces into a force and a couple – Problems involving frictional forces.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	Virtual Work: Virtual Work- Principle of Virtual Work – Applied to a body or a system of bodies in equilibrium –Equation of Virtual Work –Simple Problems.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	Hanging Strings: Equilibrium of a uniform Homogeneous String – Suspension bridge.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	Self -Study for Enrichment: (Not included for End Semester Examination) Basic Units- Limiting equilibrium of a particle on an inclined plane- Equilibrium of a rigid body under three coplanar forces –Tilting of a body .	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Book

1. Duraipandiyan.P., Laxmi Duraipandiyan., Muthamizh Jayapragasam., (2020). *Mechanics*. S.Chand & Company Pvt Ltd.

Chapters and Sections

UNIT-I	Chapter 2 ,3	:	Sections 2.1,2.2,3.1
UNIT-II	Chapter 4	:	Sections 4.1-4.6
UNIT-III	Chapter 4 ,5	:	Sections 4.7,4.8and 5.1,5.2(Omit 5.2.1)
UNIT-IV	Chapter 8	:	Sections 8.1
UNIT-V	Chapter 9	:	Sections 9.1,9.2

Reference Books

1. Venkataraman.M.K.(2002). *Statics*. Agasthiyar Publications.
2. Dharmapadham.A.V. (2006). *Statics*. S. Viswanathan Publishers Pvt Ltd.
3. Ramsey.A.S.(2004). *Statics*. CBS Publishers and Distributors Private Ltd.

Web References

1. https://youtu.be/FdJF_4uZkSQ
2. https://youtu.be/JJX3-af_JQw
3. https://uomustansiriyah.edu.iq/media/lectures/5/5_2021_01_20!01_38_47_AM.pdf
4. <https://youtu.be/YqtrfQ4H7V8>
5. <https://youtu.be/QBWk996hg5E>
6. <https://www.iitg.ac.in/kd/Lecture%20Notes/ME101-Lecture19-KD.pdf>
7. <https://youtu.be/xP1lpCIe1VM>

Pedagogy

Chalk and Talk, Power point presentation, Group Discussion, Seminar, Assignment and Quiz.

Course Designer

Dr.L.Mahalakshmi

CORE COURSE- XII (CC)
DISCRETE MATHEMATICS
(2022-2023 onwards)

Semester V	Internal Marks: 25		External Marks: 75	
COURSECODE	COURSE TITLE	CATEGORY	HOURS / WEEK	CREDITS
22UMA5CC12	DISCRETE MATHEMATICS	CORE	5	5

Course Objectives

- **Understand** the basics of discrete mathematics.
- **Apply** the method of logical reasoning to solve a variety of problems.
- **Introduce** the concepts of Lattices and Boolean Algebras.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Understand concepts on statements and truth tables, mathematical logic, mathematical reasoning and to study about the validity of the arguments and also prove mathematical theorems .	K2
CO2	Determine properties of binary relations; identify equivalence and partial order relations, sketch relations and familiarize with algebraic structures.	K2
CO3	Convert logical statements from informal language to propositional (and quantified) logic expressions and apply formal methods of symbolic propositional logic, such as calculating validity of formulae and computing normal forms.	K3
CO4	Use truth tables and laws of identity, distributive, commutative, and domination and rules of inference to construct proofs in propositional logic.	K3
CO5	Compute sum of products, product of sum expansions, the inference theory of predicate calculus and its characteristics. Analyze and apply the theory of lattices and Boolean expressions.	K3

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	2	3	3	3	3	3	3
CO2	3	3	2	1	3	3	2	3	3	3
CO3	3	3	2	2	3	3	3	3	3	3
CO4	3	3	2	2	3	3	3	3	2	3
CO5	3	3	2	2	3	2	3	3	3	3

“1” – Slight (Low) Correlation

“2” – Moderate (Medium) Correlation

“3” – Substantial (High) Correlation

“-” indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Statements and Notation – Connectives: Negation – Conjunction – Disjunction – Statement formulas and Truth Tables – Conditional and Biconditional – Well-Formed Formulas– Tautologies – Equivalence of formulas – Duality Law –Tautological Implications – Formulas with Distinct Truth Tables – Functionally complete sets of connectives.	15	CO1, CO2, CO3, CO4, CO5	K2, K3
II	Normal Forms: Disjunctive Normal Forms – Conjunctive Normal Forms – Principal Disjunctive Normal Forms – Principal Conjunctive Normal Forms – Ordering and Uniqueness of Normal Forms.	15	CO1, CO2, CO3, CO4, CO5	K2, K3
III	The Predicate Calculus: Predicates – The Statement Function, Variables and Quantifiers– Predicate Formulas – Free and Bound Variables – The Universe of Discourse – Inference Theory of the Predicate Calculus – Valid Formulas and Equivalences – Some Valid Formulas over Finite Universe – Special Valid Formulas Involving Quantifiers – Theory of Inference for the Predicate Calculus –Binary and n-ary Operations – Characteristic Function of a Set.	15	CO1, CO2, CO3, CO4, CO5	K2, K3
IV	Lattices as Partially Ordered Sets: Definition and Examples – Some Properties of Lattices – Lattices as Algebraic Systems – Sub Lattices, Direct Product and Homomorphism – Some Special Lattices.	15	CO1, CO2, CO3, CO4, CO5	K2, K3
V	Boolean Algebra: Definition and Examples – Sub Algebra, Direct Product and Homomorphism – Boolean Functions: Boolean Forms and Free Boolean Algebras – Values of Boolean Expressions and Boolean Functions.	15	CO1, CO2, CO3, CO4, CO5	K2, K3
VI	Self-Study for Enrichment: (Not included for End Semester Examinations) Formulas Involving More Than One Quantifier – Hashing Functions – Representation and Minimization of Boolean Functions: Representation of Boolean Functions – Minimization of Boolean Functions.	-	CO1, CO2, CO3, CO4, CO5	K2, K3

Text Books

1. J.P. Trembley & R. Manohar (2011), *Discrete Mathematical Structures With Applications to Computer Science*, Tata McGraw Hill.

Chapters and Sections

UNIT-I	Chapter 1:	Sections 1.1
	Chapter 1:	Sections 1.2.1 – 1.2.4, 1.2.6 – 1.2.13
UNIT-II	Chapter 1:	Sections 1.3.1-1.3.5
UNIT-III	Chapter 1:	Sections 1.5.1 – 1.5.5, 1.6.1-1.6.5
	Chapter 2:	Sections 2.4.4-2.4.5
UNIT-IV	Chapter 4:	Sections 4.1.1 – 4.1.5
UNIT-V	Chapter 4:	Sections 4.2.1-4.2.2, 4.3.1-4.3.2

Reference Books

1. Chandrasekhara Rao K (2012), *Discrete Mathematics*, Narosa Publishing House, India.
2. Thomas Koshy (2012), *Discrete Mathematics with applications*, Elsevier, a division of Reed Elsevier India Private Limited.
3. T Veerarajan (2007), *Discrete Mathematics with Graph Theory and Combinatorics*, The McGraw-Hill Companies, New Delhi.

Web References

1. <https://youtu.be/i3m0hV157Ro>
2. <https://youtu.be/5cyocztOtq4>
3. <https://youtu.be/w9DyAVrU8j0>
4. <https://youtu.be/qPtGlrbsXg>
5. <https://youtu.be/MH2uTVgG1bo>
6. <https://home.iitk.ac.in/~aralal/book/mth202.pdf>
7. <https://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf>

Pedagogy

Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

Course Designer

Dr. G.Janaki

DISCIPLINE SPECIFIC ELECTIVE – I (DSE)**OPERATIONS RESEARCH****(2022-2023 Onwards)**

Semester V	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hours/Week	CREDITS
22UMA5DSE1A	OPERATIONS RESEARCH	DISCIPLINE SPECIFIC ELECTIVE	5	4

Course Objectives

- **Impart** knowledge in concepts and tools of Operations Research.
- **Equip** mathematical methods formatted for major concepts.
- **Apply** these techniques constructively to make effective business making.

Course Outcomes**Course Outcome and Cognitive Level Mapping**

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, the students will be able to	
CO1	Understand the objectives, phases, models, used in operation research.	K1,K2
CO2	Construct mathematical model of a particular problem	K3
CO3	Develop analytical problem solving and decision-making thinking.	K3
CO4	Discover the practical skills in problem solving.	K4
CO5	Analyze solutions to real life problems using Operations Research.	K4

Mapping with Programme Outcomes

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

“1” – Slight (Low) Correlation –

“3” – Substantial (High) Correlation –

“2” – Moderate (Medium) Correlation –

“-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Operations Research - An Overview: Introduction – Origin and Development of O.R- Nature and Features of O.R-Scientific Method in O.R- Modelling in O.R-Advantages and Limitations of Models –General Solution Methods for O.R models- Methodology of O.R- O.R and Decision Making –Applications of O.R - Opportunities and shortcomings of O.R. Linear Programming Problem: Introduction – Linear Programming Problem - Mathematical formulation of the problem– Illustrations on Mathematical formulation of Linear Programming Problems. Linear Programming Problem-Graphical solution and Extension Introduction – Graphical Solution Method – Some Exceptional Cases – General Linear Programming Problem - Standard Forms of Linear Programming Problem.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	Linear Programming Problem-Simplex Method Introduction – Fundamental Properties of Solutions – The Computational Procedure – Use of Artificial Variables. Duality in Linear Programming Introduction-General Primal Dual Pair – Formulating a Dual Problem –Dual simplex method.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	Transportation Problem: The Transportation table-Solution of a Transportation Problem – Finding an initial basic feasible solution –Test for optimality-Economic Interpretation of u_j's and v_j's- Degeneracy in Transportation Problem-Transportation Algorithm (MODI Method). Assignment problem: Introduction – Mathematical formulation of the problem - Solution Methods of Assignment Problem – Special cases in Assignment Problem – A typical Assignment Problem- The Travelling Salesmen problem.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	Sequencing Problem: Introduction- Problem of sequencing- Basic terms used in Sequencing-Processing n jobs through Two Machines - Processing n jobs through k Machines. Games and Strategies: Introduction- Two-Person Zero-sum Games –Some Basic Terms– The Maximin - Minimax Principle –Games without Saddle Points – Mixed Strategies – Graphical Solution of $2 \times n$ and $m \times 2$ games.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	Network Scheduling by PERT/CPM: Introduction-Network : Basic components – Logical sequencing – Rules of network construction – Concurrent activities-Critical Path Analysis-Probability Considerations in PERT-Distinction between PERT & CPM-Application of Network Techniques – Advantages of Network Techniques.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

VI	Self Study for Enrichment: (Not included for End Semester Examinations) Canonical Forms- – Degeneracy in Linear Programming. -Unbalanced Transportation and Assignment Problem- Processing of 2 jobs through k Machine –Limitations and difficulties in using Network.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
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Text Book

1. Kanti Swaroop, Gupta.P.K, & Manmohan (2014 Reprint), Operations Research, 16th Edition, Sultan Chand & Sons.

Chapters and Sections

UNIT-I	Chapter 1:	Sections 1.1-1.11
	Chapter 2:	Sections 2.1- 2.4
	Chapter 3:	Sections 3.1- 3.5
UNIT-II	Chapter 4:	Sections 4.1- 4.4
	Chapter 5:	Sections 5.1-5.3, 5.9
UNIT-III	Chapter 10:	Sections 10.5, 10.8-10.13
	Chapter 11:	Sections 11.1-11.5, 11.7
UNIT-IV	Chapter 12:	Sections 12.1-12.5
	Chapter 17:	Sections 17.1-17.6
UNIT-V	Chapter 25:	Sections 25.1-25.10

Reference Books

1. Hamdy A. Taha (2002), Operations Research, Prentice Hall of India.
2. Richard Bronson (2001), Theory and Problems of Operations Research, Tata McGraw Hill Publishing Company.
3. V Sundaresan, K S Ganapathy Subramanian, K Ganesan (2015), Resource Management Techniques, AR Publications.

Web References

1. https://youtu.be/O6QO3J_85as
2. <https://youtu.be/GhplZYVCpkU>
3. <https://youtu.be/npJNx0jXbNI>
4. https://youtu.be/FdaXNmUxz_I
5. <https://youtu.be/vUMGvpsb8dc>
6. https://youtu.be/hwGFu_M_yHY

Pedagogy

Chalk and Talk, PPT, Discussion, Assignment, Quiz and Seminar.

Course Designer

Dr. P.SARANYA

DISCIPLINE SPECIFIC ELECTIVE-I (DSE)
ASTRONOMY
(2022-2023 Onwards)

Semester V	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UMA5DSE1B	ASTRONOMY	DISCIPLINE SPECIFIC ELECTIVE	5	4

Course Objective

- **Explain** the basic concepts of spherical trigonometry in the field of astronomy.
- **Emphasize** the movements of the celestial objects.
- **Explore** the concept of terrestrial latitudes and longitudes.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, the students will be able to	
CO1	Identify spherical triangle, latitudes, equation of time, heliocentric parallax and age of moon.	K1
CO2	Explain the concepts of celestial sphere, diurnal motion, twilight, refraction, aberration and eclipses.	K2
CO3	Classify triangles, circumpolar stars, refraction, parallax and eclipses.	K3
CO4	Determine napier's rules, reduction of latitude, laws of refraction, effects of geocentric parallax and elongation.	K4
CO5	Ascertain diurnal motion, dip of horizon, Kepler's laws, aberration and eclipses. .	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2	3	3	2	2	3
CO2	3	2	2	2	2	3	3	2	2	3
CO3	3	2	2	2	2	3	3	3	3	3
CO4	3	2	2	2	2	3	3	3	2	3
CO5	3	2	2	2	2	3	3	3	2	3

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –
“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	Cos	COGNITIVE LEVEL
I	Spherical Trigonometry – Celestial Sphere, Diurnal Motion.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	Zones of Earth- Terrestrial Latitudes and Longitudes – Radius of Earth – Rotation of Earth – Dip of Horizon – Twilight.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	Refraction – Kepler's Laws - Equation of Time – Seasons.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	Geocentric Parallax – Heliocentric Parallax – Aberration.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	The Moon – Eclipses.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	Self -Study for Enrichment: (Not included for End Semester Examination) Formulae in plane Trigonometry – Another method to determine the radius of earth – Arguments in favour of earth's rotation – Influence of temperature and pressure of atmosphere on Refraction – Aberration and stellar parallax compared –Earth shine – The Tides – Occultations. .	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Book

1. Kumaravelu. S, Susheela Kumaravelu. (2011). *Astronomy* (Revised and enlarged edition). S.Kumaravelu Publications, Nagercoil.

Chapters and Sections

UNIT-I	Chapter 1: Art 1- 36,38
	Chapter 2 : Art 39- 86
UNIT-II	Chapter 3: Art 87 – 102, 105-116
UNIT-III	Chapter 4: Art 117- 133
	Chapter 6: Art 146 – 165
	Chapter 7: Art 166 - 174
UNIT- IV	Chapter 5: Art 135 - 145
	Chapter 8: Art 190 - 194
	Chapter 9: Art 195 – 201,203
UNIT- V	Chapter 12: Art 229 – 253
	Chapter 13: Art 256 - 283

Reference Books

1. Dennis Morris (2015). *The Special Theory of Relativity*. Scientific International Pvt Ltd, New Delhi.
2. Abhyankar. K. D. (2012). *Astrophysics of the Solar System* (Reprinted 2009,2012). Universities Press. India.
3. Padmanabhan. T. (2010). *Theoretical Astrophysics Volume II: Stars and Stellar Systems* (First South Asian edition). Cambridge University Press, Tokyo.

Web References

1. <https://youtu.be/F2NqTiej98Q?si=ekaNnpb4up1zPvPb>
2. <https://youtu.be/iPp2KZWBR5k?si=japVt5BngfSnabqo>
3. <https://youtu.be/OBHFjvjsKyA?si=q4ao5liitob998J0>
4. <https://youtu.be/ETzUpoqZIHY?si=vTiFgcY-8ipYh4OC>
5. <https://youtu.be/GnZ3dogED7w?si=jZPZYuJRiNbO8GXW>
6. <file:///C:/Users/Administrator/Downloads/planetary.pdf>

Pedagogy

Power point presentation, Group Discussion, Seminar, Assignment.

Course Designers

Dr.S.Premalatha

DISCIPLINE SPECIFIC ELECTIVE – I (DSE)
ARTIFICIAL INTELLIGENCE
(2022-2023 Onwards)

Semester V	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UMA5DSE1C	ARTIFICIAL INTELLIGENCE	DISCIPLINE SPECIFIC ELECTIVE	5	4

Course Objective

- **Learn** the methods of solving problems using Artificial Intelligence.
- **Apply** AI techniques to real-world problems to develop intelligent systems.
- **Develop** an understanding of modern concepts in AI and where they can be used.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	On the successful completion of the course, students will be able to Identify problems where artificial intelligence techniques are applicable	K1, K2
CO2	Solve basic AI based problems.	K3
CO3	Explain the concept of Knowledge Representation	K3
CO4	Examine the issues involved in knowledge bases, reasoning systems and planning	K4
CO5	Summarize appropriate AI methods to solve a given problem. Familiar with Artificial Intelligence, its foundation and principles	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	2	3	3	3
CO2	3	2	3	3	2	3	3	2	3	2
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	2	3	3	2	3	3	3	2	3
CO5	3	3	3	3	3	2	3	3	3	3

“1” – Slight (Low) Correlation → “2” – Moderate (Medium) Correlation →
“3” – Substantial (High) Correlation → “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	What is Artificial Intelligence?: The AI Problems – The Underlying Assumption – What is an AI Technique? – The Level of the Model – Criteria for Success. Problems, Problems Spaces, and Search: Defining the Problem as a State Space Search – Production Systems – Problem Characteristics – Production System Characteristics – Issues in the Design of Search Programs – Additional Problems.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	Heuristic Search Techniques: Generate-and-Test – Hill Climbing – Best-first Search – Problem Reduction – Constraint Satisfaction – Means-ends Analysis.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	Knowledge Representation Issues: Representations and Mappings – Approaches to Knowledge Representation. Using Predicate Logic: Representing Simple Facts in Logic – Representing Instance and ISA Relationships – Computable Functions and Predicates.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	Representing Knowledge Using Rules: Procedural Versus Declarative Knowledge – Logic Programming – Forward Versus Backward Reasoning – Matching – Control Knowledge. Symbolic Reasoning Under Uncertainty: Introduction to Nonmonotonic Reasoning - Logics for Nonmonotonic Reasoning – Implementation Issues – Augmenting a Problem-solver.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	Statistical Reasoning: Probability and Bayes' Theorem – Certainty Factors and Rule-based Systems – Bayesian Networks – Dempster-Shafer Theory. Weak Slot-and-Filler Structures: Semantic Nets – Frames	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	Self -Study for Enrichment: (Not included for End Semester Examination) Conceptual Dependency – Scripts – CYC – Syntactic-semantic Spectrum of Representation – Logic and Slot-and-filler Structures – Other Representational Techniques – Summary of the Role of Knowledge	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Book

1. Elaine Rich, Kevin Knight and Shivashankar B Nair (2014). *Artificial Intelligence*, Third Edition, McGraw Hill Education (India) Private Limited.

Chapters and Sections

UNIT-I	Chapter 1 :	Sections 1.1 – 1.5
	Chapter 2 :	Sections 2.1- 2.6
UNIT-II	Chapter 3 :	Sections 3.1 – 3.6
UNIT-III	Chapter 4 :	Sections 4.1 – 4.2
	Chapter 5 :	Sections 5.1 – 5.3
UNIT-IV	Chapter 6 :	Sections 6.1 – 6.5
	Chapter 7 :	Sections 7.1 – 7.4
UNIT-V	Chapter 8 :	Sections 8.1 – 8.4
	Chapter 9 :	Sections 9.1 – 9.2

Reference Books

1. Stuart Russell and Peter Norvig (2003). *Artificial Intelligence A Modern Approach*, Pearson Education.
2. Patrick Henry Winston (2000). *Artificial Intelligence*, Pearson Education.
3. Dan W. Patterson (2008). *Introduction to Artificial Intelligence and Expert Systems*, Pearson Education.

Web References

1. <https://www.oracle.com/in/artificial-intelligence/what-is-ai/>
2. <https://www.ibm.com/topics/artificial-intelligence>
3. <https://www.techopedia.com/definition/190/artificial-intelligence-ai>
4. <https://www.simplilearn.com/tutorials/artificial-intelligence-tutorial/what-is-artificial-intelligence>
5. <https://www.gartner.com/en/topics/artificial-intelligence>

Pedagogy

Chalk and Talk, Power point presentation, Group Discussion, Seminar, Assignment and Quiz.

Course Designer

Ms. R. Soundaria

SKILL ENHANCEMENT COURSE – II (SEC)**LaTeX (P)****(2022 - 2023 Onwards)**

Semester V	Internal Marks: 40		External Marks:60	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UMA5SEC2P	LaTeX (P)	SKILL ENHANCEMENT COURSE – II (SEC)	2	2

Course Objectives

- **Introduce** the basic concepts of LaTeX, a typesetting software.
- **Get knowledge** about creating a bibliographic database.
- **Write** mathematical documents in LaTeX.

Course Outcomes**Course Outcome and Cognitive Level Mapping**

CO Number	CO Statement	Cognitive Level
CO1	On the successful completion of the course, students will be able to Define and use new commands within LaTeX.	K1
CO2	Apply mathematical formulae using LaTeX.	K2
CO3	Create a table using LaTeX.	K3
CO4	Classify various types of formulae, equations, matrix etc. by using LaTeX.	K4
CO5	Prepare a bibliography for a particular document.	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	2	2	3	3	2	2	2
CO2	3	3	3	2	2	2	3	2	2	3
CO3	2	2	2	2	2	2	2	2	2	2
CO4	2	3	2	3	2	3	2	3	2	2
CO5	2	2	2	2	2	2	2	2	2	2

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

LIST OF PROGRAMS

1. Create a Latex document for the given Mathematical Expression.
2. Create a table in Latex document.
3. Construct a Latex document involving sums, integrals and limits.
4. Construct a differential equation and integral equation.
5. Create a Latex document having the following: Title – Author’s name – Abstract – Introduction – Sections.
6. Create a Matrix.
7. Create a Latex document with colored text.
8. Draw a Graph.
9. Create a flowchart / flow diagram.
10. Create a Bibliography.

Web References

1. <https://www.youtube.com/watch?v=0ivLZh9xK1Q>
2. <https://www.youtube.com/watch?v=bCumVPGR4ts>
3. <https://www.youtube.com/watch?v=kefvRACdXHs>
4. https://www.youtube.com/watch?v=8byt3ywt1H8&list=RDCMUCGCHc7LsEYT6_2dQauh2NYw&index=8
5. <https://www.javatpoint.com/latex-matrix>
6. <https://www.javatpoint.com/latex-colors>
7. <https://www.javatpoint.com/latex-smart-diagrams>
8. <https://www.javatpoint.com/latex-graphs>

Pedagogy

Power point presentations and Hands on Training.

Course Designer

Dr. P. Sudha

VI SEMESTER

CORE COURSE –XIII (CC)**LINEAR ALGEBRA****(2022-2023 Onwards)**

Semester VI	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDIT S
22UMA6CC13	LINEAR ALGEBRA	CORE COURSE	5	5

Course Objective

- **Explore** the basic skills of the students with mathematical methods formatted for their major concepts and to analyze the problems in linear algebra.
- **Evaluate** mathematical expressions to compute quantities that deal with linear systems and eigenvalue problems.
- **Apply** solution methods of linear system for various problems.

Course Outcomes**Course Outcome and Cognitive Level Mapping**

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Explain the concepts of algebra.	K1, K2
CO2	Identify different algebraic structure and classify the problem models in the respective area.	K3
CO3	Solve various types of problems in the corresponding fields.	K3
CO4	Diagnose the properties of solutions in the core area.	K4
CO5	Analyze the applications of Linear algebra.	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	2	3	3	3	3	3	3
CO2	3	2	3	2	2	3	3	2	3	3
CO3	3	3	3	2	3	3	3	3	3	3
CO4	3	2	3	2	2	3	3	3	2	3
CO5	3	2	3	2	3	3	3	3	3	3

“1” – Slight (Low) Correlation –

“2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation

– “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Vector Spaces: Elementary Basic Concepts – Linear Independence and Bases.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	Vector Spaces: Dual Spaces – Inner Product Spaces.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	Algebra of Matrices: Introduction – Matrices – Matrix Addition and Scalar Multiplication – Summation Symbol – Matrix Multiplication – Transpose of Matrix – Square Matrices – Power of Matrices, Polynomials in Matrices – Invertible (Nonsingular) Matrices – Special Types of Square Matrices – Complex Matrices.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	Diagonalization: Eigenvalues Eigenvectors Introduction – Polynomials of Matrices – Characteristic Polynomial, Cayley- Hamilton Theorem – Diagonalization – Eigenvalues and Eigenvectors.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	Diagonalization: Eigenvalues Eigenvectors Computing Eigenvalues and Eigenvectors – Diagonalizing Matrices – Diagonalizing Real Symmetric Matrices – Minimal Polynomial.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	Self -Study for Enrichment: (Not included for End Semester Examination) Modules – Construction with Straight edge and Compass – Block Matrices – Characteristic and Minimal Polynomials of Block Matrices.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Books

1. I.N. Herstein., *Topics in Algebra* (2013). John Wiley & Sons, New Delhi.
2. Seymour Lipschutz, Marc Lars Lipson., *Schaum's Outline of Linear Algebra* (2005). Tata McGraw- Hill Publishing Company Limited.

Chapters and Sections

Unit-I	Chapter 4[1] : Section 4.1 & 4.2
Unit-II	Chapter 4[1] : Section 4.3 & 4.4
Unit-III	Chapter 2[2] : Section 2.1-2.11
Unit-IV	Chapter 9[2] : Section 9.1-9.4
Unit-V	Chapter 9[2] : Section 9.5-9.7

Reference Books

1. Kenneth Hoffman and Ray Kunze (2009), *Linear Algebra*. PHI Learning Private Limited.
2. Gupta, K. P (2008), *Linear Algebra*. Pragati Prakashan Educational Publishers.
3. Dr. Sudhir Kumar Pundir (2019), *A Competitive Approach to Linear Algebra*. CBS Publishers & Distributors Pvt. Ltd.

Web References

1. <https://www.youtube.com/watch?v=IKKxNX3rzuA>
2. <https://web.cortland.edu/jubrani/272ch2.pdf>
3. <https://www.youtube.com/watch?v=7E4sUjJCvnM>
4. <https://www.math.uchicago.edu/~may/VIGRE/VIGRE2009/REUPapers/Gao.pdf>
5. https://www.lkouniv.ac.in/site/writereaddata/siteContent/202005062149153831Pragya_Mishra_maths_MATRICS.pdf
6. https://www.youtube.com/watch?v=0pgdc_igMNw
7. <https://www.youtube.com/watch?v=rBME7tEkav8>

Pedagogy

Chalk and Talk, Power point presentation, Group Discussion, Sseminar, Assignment and Quiz.

Course Designer

Ms. P. Sangeetha

CORE COURSE–XIV(CC)**COMPLEX ANALYSIS****(2022-2023 Onwards)**

Semester VI	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UMA6CC14	COMPLEX ANALYSIS	CORE	5	5

Course Objective

- **Identify** the curves and region in the complex plane defined by simple expressions.
- **Explore** the basic concepts of Complex Variables and Complex Integration
- **Evaluate** the Power Series Expansion, Singularities and Residues of the function.

Course Outcomes**Course Outcome and Cognitive Level Mapping**

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Define the continuity and differentiation of complex functions and C– R equations of analytic functions.	K1, K2
CO2	Explain the elementary transformations in Complex variables.	K2
CO3	Compute Complex Integration through Cauchy's theorem.	K3
CO4	Determine the Power series expansions in complex variables.	K4
CO5	Analyse the singularity concept and residues in complex variables.	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	2	2	2
CO2	3	2	3	3	3	3	3	3	2	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	2	3	3	2	3	3	2	2	3
CO5	3	2	3	3	2	3	3	3	3	2

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Analytical Functions: Limits– Theorems on Limits-Limits Involving the Point at Infinity – Continuity – Derivatives – Cauchy-Riemann Equations – Examples – Sufficient Conditions for Differentiability – Polar Coordinates - Analytic Functions – Further Examples - Harmonic functions.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	Integrals: Definite Integrals of Functions $w(t)$ – Contours – Cauchy- Goursat Theorem – Proof of the Theorem – Simply Connected Domains – Multiply Connected Domain – Cauchy Integral Formula – An Extension of the Cauchy Integral Formula – Some Consequences of the Extension – Liouville’s Theorem and the Fundamental Theorem of Algebra – Maximum Modulus Principle.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	Series: Convergence of Sequences – Convergence of Series – Taylor’s Series – Proof of Taylor’s Theorem – Examples – Laurent Series – Proof of Laurent’s Theorem – Examples. Mapping by Elementary Functions : Linear Transformations – The Transformation $w = 1/z$ – Mappings by $1/z$ – Linear Fractional Transformations – An Implicit Form	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	Residues and Poles: Isolated Singular Points – Residues – Cauchy’s Residue Theorem – Residue at infinity – The Three Types of Isolated Singular Points – Residues at Poles – Examples – Zeros of Analytic Functions – Zeros and Poles – Behaviour of Functions Near Isolated Singular Points.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	Applications of Residues: Evaluation of Improper Integrals – Example – Improper Integrals from Fourier Analysis – Jordan’s Lemma – Indented Paths – An Indentation Around a Branch Point –Definite Integrals Involving Sines and Cosines – Argument Principle – Rouche’s Theorem.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	Self Study for Enrichment: (Not included for End Semester Examination) Uniquely determined analytic functions – Upper bounds for Moduli of contour integrals – Mappings of the Upper Half Plane –The Transformation $w = \sin z$ – Mappings by z^2 and Branches of $z^{1/2}$.– Inverse Laplace transforms – Integration Along a Branch Cut	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Book

1. James Ward Brown and Ruel V. Churchill , (2021). Complex Variables and Applications, McGraw Hill Education (India) Private Limited, Ninth Edition.

Chapters and Sections

UNIT-I	Chapter 2	Sections 15 - 19, 21 - 27
UNIT-II	Chapter 4	Sections 42, 43, 50-55, 57-59
UNIT-III	Chapter 5 and 8	Sections 60– 64, 66, 67 and 96-100
UNIT-IV	Chapter 6	Sections 74 – 78, 80 – 84
UNIT-V	Chapter 7	Sections 85 – 90, 92 – 94

Reference Books

1. S. Arumugam, A. Thangapandi Isaac & A. Somasundaram. (2014), Complex Analysis , Scitech Publications (India) Pvt Ltd
2. T.K. Manicavachagam Pillai, Dr.S.P.Rajagoplan and Dr.R.Sattanathan (2013), Complex Analysis, S. Viswanathan (Printers & Publishers) Pvt Ltd, Chennai.
3. P Duraipandian, , Kayalal Pachaiyappa (2014),. Complex Analysis, S. Chand & company Pvt. Ltd, First Edition, New Delhi.

Web References

1. <https://www.youtube.com/watch?v=b5VUnapu-qs>
2. <https://www.youtube.com/watch?v=2v95JHiapxU>
3. <https://www.youtube.com/watch?v=WBvRL-QCEN8>
4. https://www.youtube.com/watch?v=qjpLIIVo_6E
5. <https://www.youtube.com/watch?v=o77UV7YrWvw/>

Pedagogy

Power Point Presentation, Group Discussion, Seminar, Assignment.

Course Designer

Dr.S.Sasikala

CORE COURSE –XV (CC)**DYNAMICS****(2022-2023 Onwards)**

Semester VI	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UMA6CC15	DYNAMICS	CORE	4	4

Course Objective

- **Explore** the basic skills of the students with mathematical methods formatted for their major concepts and to analyze the bodies in motion using the basics of kinematics.
- **Apply** the knowledge to **interpret** and **solve** the problems.
- **Evaluate** the fundamental concepts of dynamic objects and to develop a working knowledge to handle practical problems.

Course Outcomes**Course Outcome and Cognitive Level Mapping**

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Explain the concepts of dynamic objects .	K1, K2
CO2	Classify the problem models in the respective area.	K3
CO3	Solve various types of problems in the corresponding stream.	K3
CO4	Examine the properties of solutions in the core area.	K4
CO5	Analyze the applications of Dynamics.	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2	3	3	3	3	3
CO2	3	2	2	2	2	3	3	2	3	3
CO3	3	2	2	2	2	3	3	3	3	3
CO4	3	2	2	2	2	3	3	3	2	3
CO5	3	2	2	2	2	3	3	3	3	3

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –
 “3” – Substantial (High) Correlation – “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Kinematics: Velocity – Acceleration – Coplanar Motion.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	Rectilinear motion under varying forces: Simple harmonic motion – S.H.M. along a horizontal line – S.H.M. along a vertical line.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	Projectile: Forces on a Projectile – Projectile projected on an inclined plane.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	Impact: Impulsive force – Impact of sphere – Impact of two smooth spheres – Impact of a smooth sphere on a plane.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	Central Orbits: General Orbits– Central Orbit – Conic as a centred orbit.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	Self -Study for Enrichment: (Not included for End Semester Examination) Forces-Basic units – Enveloping parabola or bounding parabola- Oblique Impact of two smooth spheres-Motion under gravity in a resisting medium.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Book

1. Duraipandiyar.P., Laxmi Duraipandiyar., Muthamizh Jayapragasam., (2020). *Mechanics*. S.Chand & Company Pvt Ltd.

Chapters and Sections

UNIT-I	Chapter 1	Sections 1.2-1.4
UNIT-II	Chapter 12	Sections 12.1-12.3
UNIT-III	Chapter 13	Sections 13.1-13.2
UNIT-IV	Chapter 14	Sections 14.1-14.4
UNIT-V	Chapter 16	Sections 16.1-16.3

Reference Books

1. Venkataraman.M.K.(2017). *Dynamics*. Agasthiyar Publications.
2. Dharmapadham.A.V. (2006). *Dynamics*. S. Viswanathan Publishers Pvt Ltd.
3. Narayanamurti.M, Nagaratham.N.(2002). *Dynamics*. Madras: National Publishing Company.

Web References

1. <https://youtu.be/40RU9IWdfTA>
2. <https://youtu.be/qk7KV0lIKrM>
3. https://youtu.be/4HZtV_PGHo0
4. <https://youtu.be/uM2HpLBVAkA>
5. https://youtu.be/MlNmIY_yoZ0
6. <https://youtu.be/NsNUuSxaa2Y>
7. https://unacademy.com/content/wp-content/uploads/sites/2/2022/10/Projectile-Motion_Process_Final.pdf
8. <https://www.masterjeeclases.com/wp-content/uploads/2019/04/CH-12-SIMPLE-HARMONIC-MOTION.pdf>

Pedagogy

Chalk and Talk, Power point presentation, Group Discussion, Seminar, Assignment and Quiz.

Course Designer

Dr.L.Mahalakshmi

CORE COURSE –XVI (CC)**CYBER SECURITY****(2022-2023 Onwards)**

Semester: VI	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS/WEEK	CREDITS
22UGCS	CYBER SECURITY	CORE	3(T) + 2(P)	4

Course Objective

- To understand the concept of Cyber security and the issues and challenges associated with it.
- To develop an understanding of cyber crimes, their nature, and legal remedies.
- To appreciate various privacy and security concerns on online Social media.
- To analyze and evaluate the basic concepts related to E-Commerce and digital payments.
- To analyze and evaluate the basic security aspects related to Computer and Mobiles.

Course Outcomes**Course Outcome and Cognitive Level Mapping**

CO Number	CO Statement	Cognitive Level
CO1	On the successful completion of the course, students will be able to Outline the concept of cyber security, cyber crime, cyber law and the issues and challenges	K1
CO2	Deeper understanding and familiarity with cyber crimes, their nature, and legal remedies using case studies	K2
CO3	Apply various privacy and security concerns on Social media & online payments	K3
CO4	Analyze the tools & techniques for cyber security	K4
CO5	Evaluate the security aspects of Computer, Mobiles & Other digital devices	K5

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	1	3	3	3	3	1	2	3	3
CO2	3	2	3	3	3	3	2	2	3	3
CO3	3	2	3	3	3	3	2	3	3	3
CO4	3	2	3	3	3	3	2	3	3	3
CO5	3	2	3	3	3	3	2	3	3	3

“1”- Slight (Low) Correlation

“3”- Substantial (High) Correlation

“2”– Moderate (Medium) Correlation

“-”- Indicates there is no Correlation

Syllabus

Theory

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Introduction to Cyber Security: Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet, World wide web, Advent of internet, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security.	9	CO1 CO2 CO3	K1 K2 K3
II	Cyber Crime and Cyber Law: Classification of cyber crimes, Common cyber crimes- cyber crime targeting computers and mobiles, cyber crime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cybercriminals modus-operandi , Reporting of cyber crimes, Remedial and mitigation measures, Legal perspective of cyber crime, IT Act 2000 and its amendments, Cyber crime and offences, Organisations dealing with Cyber crime and Cyber security in India.	9	CO1 CO2 CO3 CO4	K1 K2 K3 K4
III	Social Media Overview and Security: Introduction to Social networks. Types of Social media, Social media platforms, Social media monitoring, Hashtag, Viral content, Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of Social media.	9	CO1 CO2 CO3 CO4	K1 K2 K3 K4
IV	E-Commerce and Digital Payments: Definition of E- Commerce, Main components of E-Commerce, Elements of E-Commerce security, E-Commerce threats, E-Commerce security best practices, Introduction to digital payments, Components of digital payment and stake holders, Modes of digital payments- Banking Cards, Unified Payment Interface (UPI), e-Wallets, Unstructured Supplementary Service Data (USSD), Aadhar enabled payments, Digital payments related common frauds and preventive measures. RBI guidelines on digital payments and customer protection in unauthorized banking transactions. Relevant provisions of Payment Settlement Act,	9	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5

	2007.			
V	Digital Devices Security , Tools and Technologies for Cyber Security: End Point device and Mobile phone security, Password policy, Security patch management, Data backup, Downloading and management of third party software, Device security policy, Cyber Security best practices, Significance of host firewall and Ant-virus, Management of host firewall and Anti-virus, Wi-Fi security, Configuration of basic security policy and permissions.	9	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5
VI	Self Study for Enrichment (Not included for End Semester Examinations) Case Studies: Parliament Attack Cyber Crime - Pune Citibank Mphasis Call Center Fraud, Yahoo Data Breach, Equifax Data Breach	-	CO2 CO3 CO4 CO5	K2 K3 K4 K5

Reference Books

1. R. C Mishra, (2010) *Cyber Crime: Impact on the New Millennium*, Authors Press. Edition 2010.
2. Sunit Belapure and Nina Godbole, (2011). *Cyber Security Understanding Cyber Crimes*, Computer Forensics and Legal Perspectives, Wiley India Pvt. Ltd., First Edition.
3. Henry A. Oliver, (2015) *Security in the Digital Age: Social Media Security Threats and Vulnerabilities*, Create Space Independent Publishing Platform, Pearson.
4. Elias M. Awad, (2001) *Electronic Commerce*, Prentice Hall of India Pvt Ltd.
5. Krishna Kumar, (2011) *Cyber Laws: Intellectual Property & E-Commerce Security*, Dominant Publishers.
6. Eric Cole, Ronald Krutz, (2011) *Network Security Bible*, Wiley India Pvt. Ltd, 2nd Edition.
7. E. Maiwald , (2017) *Fundamentals of Network Security*, McGraw Hill.

Web References

1. <https://www.udacity.com/course/intro-to-cybersecurity-nanodegree--nd545>
2. <https://www.vidhikarya.com/legal-blog/cyber-crime-and-cyber-law-in-india>
3. <https://www.techtarget.com/searchsecurity/definition/cybersecurity>
4. <https://www.financemagnates.com/fintech/payments/the-evolution-of-digital-payments-and-e-commerce/>
5. <https://www.javatpoint.com/cyber-security-tools>
6. <https://www.cyberalegalservices.com/casestudies.php>
7. <https://www.kroll.com/en/insights/publications/cyber/case-studies>

Practical

List of Exercises: (Not included for End Semester Examinations)

1. Checklist for reporting cyber crime at Cyber crime Police Station.
2. Checklist for reporting cyber crime online.
3. Reporting phishing emails.
4. Demonstration of email phishing attack and preventive measures.
5. Basic checklist, privacy and security settings for popular Social media platforms.
6. Reporting and redressal mechanism for violations and misuse of Social media platforms.
7. Configuring security settings in Mobile Wallets and UPIs.
8. Checklist for secure net banking.
9. Setting, configuring and managing three password policy in the computer (BIOS, Administrator and Standard User).
10. Setting and configuring two factor authentication in the Mobile phone.
11. Security patch management and updates in Computer and Mobiles.
12. Managing Application permissions in Mobile phone.
13. Installation and configuration of computer Anti-virus.
14. Installation and configuration of Computer Host Firewall.
15. Wi-Fi security management in computer and mobile.

Web References

1. <https://cybercrime.gov.in/>
2. https://cybercrime.gov.in/webform/crime_online_safetytips.aspx
3. <https://www.digitalvidya.com/blog/social-media-dos-and-donts/>
4. <https://www.medianama.com/2023/02/223-platform-grievance-appellate-committees-social-media/>
5. <https://www.ibm.com/topics/security-controls>
6. <https://docs.oracle.com/cd/E19683-01/817-0365/concept-2/index.html>

Pedagogy

Chalk and Talk, Group discussion, Seminar & Assignment.

Course Designer

From UGC SYLLABUS

DISCIPLINE SPECIFIC ELECTIVE –II (DSE)

GRAPH THEORY

(2022-2023 Onwards)

Semester VI	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UMA6DSE2A	GRAPH THEORY	DISCIPLINE SPECIFIC ELECTIVE	5	4

Course Objectives

- **Explain** the basics of graph theory.
- **Apply** the knowledge to **interpret** and **solve** the problems.
- **Evaluate** the fundamental concepts of graph theory and to develop a working knowledge to handle practical problems.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	On the successful completion of the course, students will be able to Identify various notion of graphs.	K1
CO2	Describe the problems in the respective area.	K2
CO3	Solve various types of problems in the corresponding stream.	K3
CO4	Relate the properties of solutions in the core area.	K3
CO5	Analyze the applications of graph theory.	K4

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2	3	3	3	3	3
CO2	3	2	2	2	2	3	3	2	3	3
CO3	3	2	2	2	2	3	3	3	3	3
CO4	3	2	2	2	2	3	3	3	2	3
CO5	3	2	2	2	2	3	3	3	3	3

“1” – Slight (Low) Correlation “2” – Moderate (Medium) Correlation “3” – Substantial (High) Correlation “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Introduction: Definition of a Graph – Application of Graphs – Finite and Infinite Graphs – Incidence and Degree – Isolated Vertex, Pendant Vertex and Null Graph. Paths and Circuits: Isomorphism – Subgraphs – Walks, Paths and Circuits – Connected Graphs, Disconnected Graphs and Components.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	Paths and Circuits: Euler Graphs – Operations on Graphs – More on Euler Graphs – Hamiltonian Paths and Circuits – The Traveling Salesman Problem.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	Trees and Fundamental Circuits: Trees – Some Properties of Trees – Pendant Vertices in a Tree – Distance and Centers in a Tree – Rooted and Binary Trees – On Counting Trees – Spanning Trees - Spanning Trees in a Weighted Graph.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	Cut - Sets and Cut - Vertices: Cut-Sets – Some Properties of a Cut-Set – All Cut-Sets in a Graph – Fundamental Circuits and Cut-Sets – Connectivity and Separability.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	Planar Graphs: Planar Graphs – Kuratowski's Two Graphs – Different Representations of a Planar Graph.- Geometric Dual. Matrix Representation of Graphs: Incidence Matrix – Submatrices of $A(G)$ – Circuit Matrix – Cut-Set Matrix.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	Self -Study for Enrichment: (Not included for End Semester Examination) Brief History of Graph Theory – A Puzzle with Multicolored Cubes – Fundamental Circuits – Network Flows – An Application to a switching network.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Book

1. Narsingh Deo.(2022). *Graph Theory with applications to Engineering and Computer Science*. PHI Learning Private Limited, New Delhi.

Chapters and Sections

UNIT – I	Chapter 1	: Sections 1.1 -1.5
	Chapter 2	: Sections 2.1, 2.2, 2.4 ,2.5
UNIT – II	Chapter 2	: Sections 2.6- 2.10
UNIT – III	Chapter 3	: Sections 3.1- 3.7,3.10
UNIT – IV	Chapter 4	: Sections 4.1-4.5
UNIT – V	Chapter 5	: Sections 5.2- 5.4, 5.6
	Chapter 7	: Sections 7.1-7.3, 7.6

Reference Books

1. Arumugam. S., Ramachandran. S., (2020). *Invitation to Graph Theory*. SciTech Publications (India) Pvt. Ltd., Chennai.
2. Gary Chartrand and Ping Zhang. (2006). *Introduction to Graph Theory*. Tata McGraw-Hill Publishing Company Limited, New Delhi.
3. Frank Harary. (2001). *Graph Theory*. Narosa Publishing House. PVT LTD, New Delhi.

Web References

1. <https://youtu.be/AtDgXyluW-Y>
2. <https://youtu.be/mm9YUqZTsNE>
3. <https://www.youtube.com/watch?v=b233VKD6udo>
4. <https://youtu.be/R5LZIpz-oIE>
5. <https://youtu.be/wnYtITkWAYA>
6. <https://courses.engr.illinois.edu/cs173/fa2011/Lectures/planargraphs.pdf>
7. <https://mathcircle.berkeley.edu/sites/default/files/archivedocs/2015/lecture/Graph%20Theory%20Intermediate%20I%20and%20II-2.pdf>

Pedagogy

Chalk and Talk, Power point presentation, Group Discussion, Seminar, Assignment and Quiz.

Course Designer

Dr.P.Geethanjali

DISCIPLINE SPECIFIC ELECTIVE –II (DSE)**NUMBER THEORY****(2022-2023 and Onwards)**

Semester VI	Internal Marks:25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs/Week	CREDITS
22UMA6DSE2B	NUMBER THEORY	DISCIPLINE SPECIFIC ELECTIVE	5	4

Course Objective

- Highlight the details and distinctions in the world of numbers.
- Equip the students with basic concepts of congruences formatted for their major concepts.
- Prepare the students for coding through congruences.

Course Outcomes**Course Outcome and Cognitive Level Mapping**

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	State and describe various theorems on primes, congruence and residues which are used in cryptography.	K1, K3
CO2	Interpret mathematical induction and other types of techniques to prove theorems or mathematical results.	K2
CO3	Apply the concepts and results of divisibility of integers effectively.	K3
CO4	Analyze the theory of multiplicative arithmetic function and solve polynomial congruences and system of congruences by some techniques.	K4
CO5	Examine unsolved problems for higher study related to number theory.	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	3	3	2	3	2	3
CO2	3	3	3	3	3	3	3	3	2	2
CO3	3	2	3	3	3	3	3	3	2	3
CO4	3	2	2	3	3	3	2	3	2	2
CO5	3	2	3	3	3	3	2	3	2	3

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Basis Representation: Principle of Mathematical Induction – The Basis Representation Theorem The Fundamental Theorem of Arithmetic: Euclid's Division Lemma – Divisibility – The Linear Diophantine Equation – The Fundamental Theorem of Arithmetic.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	Combinatorial and Computational Number Theory: Permutations and Combinations – Fermat's Little Theorem – Wilson's Theorem – Generating Functions -The Use of Computers in Number Theory.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	Fundamentals of Congruences: Basic Properties of Congruences – Residue Systems – Riffing. Solving Congruences: Linear Congruences – The Theorems of Fermat and Wilson Revisited.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	Solving Congruences: The Chinese Remainder Theorem – Polynomial Congruences. Arithmetic Functions: Combinatorial Study of $\phi(n)$.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	Arithmetic Functions: Formulae for $d(n)$ and $\sigma(n)$ – Multiplicative Arithmetic Function – The Mobius Inversion Formula.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	Self -Study for Enrichment: (Not included for End Semester Examination) Properties of Reduced Residue System – Primitive Roots modulo p – Elementary Properties of $\pi(x)$ – Some Unsolved Problems about Primes.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Books

George E. Andrews (1971). *Number Theory*. W.B. Saunders Company Limited.

Chapter and Sections

UNIT-I Chapter 1: Sections 1.1 & 1.2

Chapter 2: Sections 2.1 – 2.4

UNIT-II Chapter 3: Sections 3.1 – 3.5

UNIT-III	Chapter 4: Sections 4.1 - 4.3 Chapter 5: Sections 5.1 & 5.2
UNIT-IV	Chapter 5: Sections 5.3 & 5.4 Chapter 6: Sections 6.1
UNIT-V	Chapter 6: Sections 6.2 – 6.4

Reference Books

1. David M. Burton (2011). *Elementary Number Theory*, 7th Edition. Mc Graw Hill Publishing Company.
2. Joseph H. Silverman (2009). *A Friendly Introduction to Number Theory*. Pearson Education.
3. Telang.S.G. (2003). *Number Theory*. Tata McGraw-Hill Publishing Company Limited.

Web References

1. <https://www.youtube.com/watch?v=ep695eRaAyU>
2. <https://www.youtube.com/watch?v=vPRNx6ry7SM>
3. <https://www.youtube.com/watch?v=zP9t001PXiU>
4. <https://www.youtube.com/watch?v=Owcepi5zoF0>
5. <https://www.youtube.com/watch?v=nT2KAKNDG58>
6. https://www.youtube.com/watch?v=4_1D1BBibzw

Pedagogy

Power point presentation, Group Discussion, Seminar, Assignment.

Course Designer

Dr. G. Janaki

DISCIPLINE SPECIFIC ELECTIVE – II (DSE)
FUNDAMENTALS OF BIG DATA ANALYTICS
2022-2023 Onwards

Semester – VI	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UMA6DSE2C	FUNDAMENTALS OF BIG DATA ANALYTICS	DISCIPLINE SPECIFIC ELECTIVE	5	4

Course Objectives

- **Inculcate** a strong foundation on basic concepts of Big Data.
- **Understand** the components of Hadoop framework and MapReduce
- **Explore** Big Data analytics tools.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, the students will be able to,	
CO1	State and Understand the Big Data phenomenon.	K1, K2
CO2	Explain the various Big Data tools.	K2
CO3	Apply the use of predictive analytics on big data.	K3
CO4	Examine the potential use of Big Data in corporate environment.	K4
CO5	Analyze large scale data.	K4

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	2	3	2	2	3
CO2	3	3	3	3	3	2	3	2	2	3
CO3	3	3	3	3	3	2	3	2	2	3
CO4	3	3	3	3	3	2	3	2	2	3
CO5	3	3	3	3	3	2	3	2	2	3

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

Syllabus

UNIT	CONTENTS	HOURS	COs	COGNITIVE LEVEL
I	OVERVIEW OF BIG DATA: Defining Big data - Big data Types-Analytics-Industry Examples of Big data- Big data and Data Risk- Big data Technologies- The Benefits of Big data.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	BASICS OF HADOOP: Big data and Hadoop- Hadoop Architecture- Main components of Hadoop Framework- Analyzing Big data with Hadoop-Distributed Application concept- Hadoop Distributed File system- Advantages of Hadoop- Ten Big Hadoop Platforms.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	NO SQL DATA MANAGEMENT AND MONGODB: No SQL Data Management- Types of No SQL Databases- Choosing a query model for Big data- Benefits of NoSQL- MongoDB- Advantages of MongoDB over RDBMS.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	HBASE AND CASSANDRA: Introduction to HBASE – Row - Oriented vs. Column - Oriented data stores- HDFS vs. HBase - HBase Architecture- HBASE data model- Cassandra: Introduction- Features of Cassandra- History of Cassandra - Data replication in Cassandra – Components of Cassandra. MAPREDUCE: Introduction to MapReduce – How MapReduce works – Map operations.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	HIVE: THE DATA WAREHOUSE OF HADOOP Introduction to Hive: The Data Warehouse of Hadoop – Hive data models- Hive Building blocks – Hive data file formats. DATA STREAM MINING: Data Stream mining- the Stream Data Model- Streaming Applications.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	Self Study for Enrichment: (Not included for End Semester Examinations) -Indian Big Data Companies – Security over Hadoop – Sharding – Running a MapReduce program -using Hive for data warehousing.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Book

1. V.K. Jain (2017), *Big Data and Hadoop*, Khanna Book Publishing Co.(P) Ltd.

Chapters and Sections

UNIT-I	Chapter 1:	Sections	1.2, 1.4-1.7, 1.10, 1.16
UNIT-II	Chapter 2:	Sections	2.1-2.6, 2.16, 2.20
UNIT-III	Chapter 5:	Sections	5.1-5.6.
UNIT- IV	Chapter 6:	Sections	6.1-6.5, 6.8-6.12
	Chapter 7:	Sections	7.1-7.3
UNIT- V	Chapter 9:	Sections	9.1-9.4
	Chapter 14:	Sections	14.1-14.3

Reference Books

1. Raj Kamal and Preeti Saxena (2019), *Big data Analytics*, McGraw Hill Education Private Ltd.
2. Seema Acharya and Subhashini Chellappan (2017), *Big Data and Analytics*, John Wiley & Sons.
3. Thomas Erl, Wajid Khattak and Paul Buhler (2016), *Big Data Fundamentals: Concepts, Drivers & Techniques*, Pearson Publications.

Web References

1. <https://youtu.be/LkEQQwVsET8>
2. <https://appinventiv.com/blog/hbase-vs-cassandra/#:~:text=HBase%20has%20a%20master%2Dbased,once%20the%20master%20is%20down.>
3. <https://hevodata.com/learn/data-streams-in-data-mining/>
4. <https://youtu.be/aReuLtY0YMI>
5. <https://youtu.be/nJRrNb4ZaUM>
6. <https://youtu.be/DrLJwSci6b8>
7. <https://youtu.be/JZGtV278SvE>

Pedagogy

Chalk and Talk, PPT, Discussion, Assignment, Quiz and Seminar.

Course Designer

Dr.P.SARANYA