

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
(2023-2024 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 2023-2024 Onwards)

Semester	Part	Course	Course Title	Course Code	Inst. Hrs. / week	Credits	Exam			Total	
							Hrs.	Marks			
								Int	Ext		
I	I	Language Course – I (LC)	பொதுத்தமிழ் - I	23ULT1	6	3	3	25	75	100	
			Hindi Ka Samanya Gyan Aur Nibandh	23ULH1							
			Poetry, Grammar and History of Sanskrit Literature	23ULS1							
			Foundation Course: Paper I-French I	23ULF1							
	II	English Language Course – I (ELC)	General English-I	23UE1	6	3	3	25	75	100	
	III	Core Course – I (CC)	Algebra and Trigonometry	23UMA1CC1	4	4	3	25	75	100	
			Core Course – II (CC)	Differential Calculus	23UMA1CC2	5	4	3	25	75	100
			First Allied Course – I (AC)	Mathematical Statistics	23UMA1AC1	5	4	3	25	75	100
			First Allied Course – II (AP)	Programming Language using MATLAB (P)	23UMA1AC2P	2	2	3	40	60	100
	IV	Ability Enhancement Compulsory Course – I (AECC)	Value Education	23UGVE	2	2	-	100	-	100	
Total					30	22				700	
II	I	Language Course – II (LC)	பொதுத்தமிழ் -II	23ULT2	6	3	3	25	75	100	
			Hindi Literature and Grammar II	22ULH2							
			Prose, Grammar and History of Sanskrit Literature	23ULS2							
			Basic French-II	22ULF2							
	II	English Language Course – II (ELC)	General English-II	23UE2	6	3	3	25	75	100	
	III	Core Course – III (CC)	Differential Equations and Laplace Transforms	23UMA2CC3	4	4	3	25	75	100	
			Core Course – IV (CC)	Integral Calculus	23UMA2CC4	4	4	3	25	75	100
			Core Practical –I (CP)	Statistics with Excel (P)	23UMA2CC1P	2	2	3	40	60	100
			First Allied Course – III (AC)	Applied Statistics	23UMA2AC3	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	22				800	

I	Language Course – III (LC)	பொதுத்தமிழ் -III	23ULT3	6	3	3	25	75	100
		Hindi Literature & Grammar III	22ULH3						
		Drama, Grammar and History of Sanskrit Literature	23ULS3						
		Intermediate French – I	22ULF3						
II	English Language Course – II (ELC)	Learning Grammar Through Literature – I	23UE3	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)	Vector Calculus and Fourier Series	23UMA3CC6	5	4	3	25	75
	Second Allied Course – I (AC)	Python Programming	23UMA3AC4	4	3	3	25	75	100
	Second Allied Course–II (AP)	Python Programming (P)	23UMA3AC5P	3	3	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	22				700

15 Days INTERNSHIP during Semester Holidays

I	Language Course-IV (LC)	பொதுத்தமிழ் –IV	23ULT4	6	3	3	25	75	100
		Hindi Literature & Functional Hindi	22ULH4						
		Alankara, Didactic and Modern Literatures and Translation	23ULS4						
		Intermediate French - II	22ULF4						
II	English Language Course – IV (ELC)	Learning Grammar Through Literature – II	23UE4	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	23UMA4CC8	5	4	3	25	75
	Second Allied Course – III (AC)	Internet of Things	22UMA4AC6	4	3	3	25	75	100
IV	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	24				800

V	III	Core Course – IX (CC)	Abstract Algebra	23UMA5CC9	6	5	3	25	75	100
		Core Course – X (CC)	Real Analysis	22UMA5CC10	5	5	3	25	75	100
		Core Course – XI (CC)	Statics	23UMA5CC11	5	4	3	25	75	100
		Core Course – XII (CC)	Discrete Mathematics	23UMA5CC12	5	4	3	25	75	100
		Discipline Specific Elective – I (DSE)	A. Operations Research	23UMA5DSE1A	5	3	3	25	75	100
	B. Astronomy		23UMA5DSE1B							
	C. Artificial Intelligence		23UMA5DSE1C							
	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	25				700	
VI	III	Core Course – XIII (CC)	Linear Algebra	23UMA6CC13	5	4	3	25	75	100
		Core Course – XIV(CC)	Complex Analysis	23UMA6CC14	5	4	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	23UMA6DSE2A	5	3	3	25	75	100
	B. Number Theory		23UMA6DSE2B							
	C. Fundamentals of Big Data Analytics		23UMA6DSE2C							
	Project	Project Work	22UMA6PW	5	4	-	-	100	100	
	V	Gender Studies	Gender Studies	22UGGS	1	1	-	100	-	100
		Extension activity		22UGEA	0	1	-	-	-	-
Total				30	25				700	
Grand Total				180	140				4400	

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	69	99
	Project Work	1	4	
	Internship	1	2	
	First Allied	3	9	
	Second Allied	3	9	
	DSE	2	6	
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		140

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)
ALGEBRA AND TRIGONOMETRY
(2023-2024 Onwards)

Semester I	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
23UMA1CC1	ALGEBRA AND TRIGONOMETRY	CORE	4	4

Course Objective

- Basic ideas on the Theory of Equations, Matrices and Number Theory.
- Knowledge to find expansions of trigonometry functions, solve theoretical and applied problems.
- Understanding of how Hyperbolic functions can be used as a powerful tool in solving problems in science.

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 and interpret on reciprocal equations	K1, K2
CO2	Illustrate the sum of binomial, exponential and logarithmic series	K3
CO3	Compute Eigen values, eigen vectors, verify Cayley – Hamilton theorem and diagonalize a given matrix.	K3
CO4	Determine the powers and multiples of trigonometric functions in terms of sine and cosine.	K4
CO5	Evaluate the relationship between circular and hyperbolic functions and the summation of trigonometric series.	K5

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	3	2	3	3	3	2	2
CO2	3	3	3	2	2	3	2	2	2	2
CO3	3	3	3	3	3	3	2	2	2	2
CO4	3	2	3	3	2	3	3	3	2	2
CO5	2	2	3	2	2	3	3	2	2	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	Reciprocal Equations - Standard form - To increase or decrease the roots of a given equation by a given quantity- Removal of terms- Horner's method – related problems.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	Binomial Series– The following are the deductions from the Binomial Series - Approximations using Binomial Series- The Exponential Series – The Logarithmic series- related problems.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	Inverse matrix -Characteristic equation – Eigen values and Eigen Vectors-Similar matrices - Cayley – Hamilton Theorem (Statement only) - Finding powers of square matrix, Inverse of a square matrix up to order 3, Diagonalization of square matrices - related problems.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	Expansions of $\cos n\theta$ and $\sin n\theta$ - Expansion of $\tan n\theta$ in powers of $\tan \theta$ - Expansion of $\tan(A+B+C+\dots)$ - Powers of sines and cosines of θ in terms of functions of multiples of θ , Expansions of $\cos^n \theta$, $\sin^n \theta$, $\sin^n \theta \cos^n \theta$ when n is a positive integer - Expansions of $\sin \theta$ and $\cos \theta$ in a series of ascending powers of θ - related problems.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	Hyperbolic functions – Relation between circular and hyperbolic functions - Inverse hyperbolic functions - Logarithm of complex quantities - related problems.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	Self Study for Enrichment: (Not included for End Semester Examination) Symmetric function of the roots - Partial Fractions- Rank of a matrix - To resolve into factors the expression $x^n - a^n, x^n + a^n$ - Summation of trigonometric series.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Manicavachagom Pillay, T.K, Natarajan T, Ganapathy K S (2018). *Algebra, Volume I*. S.Viswanathan (Printers &Publishers), Pvt. Ltd.

2. Sudha S (1998). *Algebra, Analytical Geometry(2D) and Trigonometry*. Emerald Publishers.
3. Manicavachagom Pillay, T.K, Natarajan T, Ganapathy K S (2015). *Algebra, Volume II*. S.Viswanathan (Printers &Publishers), Pvt. Ltd.
4. Narayanan, S, Manicavachagom Pillay, T.K (2013). *Trigonometry*. S.Viswanathan (Printers &Publishers), Pvt. Ltd.

Chapters and Sections

UNIT-I	Chapter VI: Sections 16-17,19, 30 [1]
UNIT-II	Chapter I: Sections 1.1-1.5 [2]
UNIT-III	Chapter II: Sections 8, 16 [3]
UNIT- IV	Chapter III: Sections 1-5 [4]
UNIT- V	Chapter IV: Fully [4] Chapter V : Section 5 [4]

Reference Books

1. David C. Lay, *Linear Algebra and its Applications*, 3rd Ed., Pearson Education Asia, Indian Reprint, 2020.
2. Frank Ayres JR, *Theory and Problems of Plane and Spherical Trigonometry*, Schaum's Outline Series McGraw-Hill Book Company, 1954.
3. Vittal P.R, Malini V, *Algebra, Analytical Geometry and Trigonometry*, Margham Publications, 2010.

Web References

1. <https://www.youtube.com/watch?v=0HwGGTdrBzg>
2. <https://www.youtube.com/watch?v=BydVprh9NgQ>
3. <https://www.youtube.com/watch?v=r-b4m2-yCt0>
4. <https://www.youtube.com/watch?v=IcBXhQNx4fY>
5. <https://www.youtube.com/watch?v=ZjBcmEeUWXg>

Pedagogy

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

Course Designer

Dr. R.Divya

CORE COURSE – II (CC)
DIFFERENTIAL CALCULUS
(2023-2024 Onwards)

Semester I	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
23UMA1CC2	DIFFERENTIAL CALCULUS	CORE	5	4

Course Objective

- **Explore** the basic skills of the students with mathematical methods formatted for their major concepts and train them in basic Differentiation.
- **Analyze** mathematical statements and expressions.
- **Evaluate** the fundamental concepts of differentiation, successive differentiation, and their applications.

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 Calculus.	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 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	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	Successive Differentiation: Introduction (Review of basic concepts) – The n^{th} derivative – Standard results – Fractional expressions – 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	K1, K2, K3, K4
II	Partial Differentiation: Partial derivatives – Successive partial derivatives – Function of a function rule – Total differential coefficient – A special case – Implicit Functions.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	Partial Differentiation (Continued): Homogeneous functions – Partial derivatives of a function of two functions – Maxima and Minima of functions of two variables – Lagrange's method of undetermined multipliers.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	Envelope: Method of finding the envelope – Another definition of envelope – Envelope of family of curves which are quadratic in the parameter – Family of curves will contain two parameters and the two parameters are connected by a relation.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	Curvature: Definition of Curvature – Circle, Radius and Centre of Curvature – Cartesian formula for the radius of curvature – The coordinates of the centre of curvature – Evolutes and Involute – Radius of Curvature when the curve is given in Polar Co-ordinates	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	Self -Study for Enrichment: (Not included for End Semester Examination) Meaning of Derivative : Geometrical interpretation– Feynman's method of differentiation – Taylor's expansion of $f(x,y)$ – p-r equation : pedal equation of a curve.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Book

1. Narayanan.S Manicavachagom Pillay.T.K. (2019). *Calculus Volume-I*. Ananda Book Depot.

Chapters and Sections

UNIT-I	Chapter III	Sections 1.1-1.6, 2.1,2.2
UNIT-II	Chapter VIII	Sections 1.1-1.5
UNIT-III	Chapter VIII	Sections 1.6 ,1.7,4,5
UNIT-IV	Chapter X	Sections 1.1-1.4
UNIT-V	Chapter X	Sections 2.1-2.6

Reference Books

1. Rawat.K.S.(2006). *An Differential Calculus*.1st Edition, Daryaganj, Newdelhi-2:AdhyayanPulishers and distributors, j m d House,Murarlal stre.
2. Arumugam. S and Issac. (2014). *Calculus*. New Gamma Publishing House.
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://freevideolectures.com/course/4224/npTEL-integral-vector-calculus/34>
3. <https://www.youtube.com/watch?v=IQJ0UiM91Z4>
4. <https://www.youtube.com/watch?v=AXqhWeUEtQU>
5. <https://www.youtube.com/watch?v=j5VGo1n8KBY&list=PLpklqhIbn1jrIbgS6UckW39WE04bAFjOS>
6. <https://archive.nptel.ac.in/courses/111/104/111104095/>

Pedagogy

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

Course Designer

Dr.L.Mahalakshmi

FIRST ALLIED COURSE –I (AC)
MATHEMATICAL STATISTICS
(2023-2024 Onwards)

Semester I	Internal Marks:25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs/Week	CREDITS
23UMA1AC1	MATHEMATICAL STATISTICS	ALLIED	5	4

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 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	2
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	<p>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–Pair wise Independent Events–Mutually Independent Events– Baye’s theorem.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	<p>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.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

III	<p>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.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	<p>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.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	<p>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.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	<p>Self-Study for Enrichment: (Not included for End Semester Examinations) Extension of Multiplication Law of Probability– Independent Random Variables –Generating Functions– Poisson distribution –Exponential Distribution.</p>	-	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 to 4.8 (omit 4.7.1) [1]
UNIT-II	Chapter 5: Sections 5.1 to 5.5.3, 5.5.5 [1]
UNIT-III	Chapter 6: Sections 6.1 to 6.8 [1]
UNIT-IV	Chapter 8: Sections 8.1 to 8.3, 8.4 (8.4.1 to 8.4.7) [2]
UNIT-V	Chapter 9: Sections 9.1 and 9.2 (9.2.1 to 9.2.8, 9.2.14) [2]

Reference Books

1. Pillai.R.S.N & 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=PLpEFfNAthorfhzYYKNREgtWJp2R1vTZfi>
2. <https://www.youtube.com/watch?v=jmqZG6roVqU>
3. <https://www.youtube.com/watch?v=gHBL5Zau3NE>
4. <https://www.youtube.com/watch?v=3PWKOiLK41M>
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 Designers

1. Dr. S. Sasikala
2. Dr. R. Radha

FIRST ALLIED COURSE –II (AP)
PROGRAMMING LANGUAGE USING MATLAB (P)
(2023-2024 Onwards)

Semester I	Internal Marks: 40		External Marks: 60	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
23UMA1AC2P	Programming Language Using MATLAB (P)	ALLIED PRACTICAL	2	2

Course Objective

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

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 fundamental concepts of MATLAB.	K2
CO2	Illustrate a great numbers of MATLAB commands and how to use them in programming and in many applications of 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. Operations using Matrices (Addition, Subtraction, Multiplication, Transpose and Inverse)
2. Basic plotting of variables (Simple and multiple data set).
3. Sorting of given data.
4. Finding the sum of 'n' numbers, sum of square of 'n' numbers, sum of 'n' odd numbers.
5. Finding the roots of a polynomial equation.
6. Solving system of equations using matrices.
7. Finding the Eigen vectors and Eigen values.
8. Generating Fibonacci series.
9. Vector operations.
10. Evaluation of integrals.
11. Finding the derivatives of given order.
12. Operations on sets.
13. Finding rank of a matrix.
14. Solving ordinary differential equations.

Web References

1. <https://www.youtube.com/watch?v=EF4wmV5xBM0>
2. <https://www.youtube.com/watch?v=XsrhAO3r3VY>
3. <https://www.youtube.com/watch?v=aEjeuj5jfLU>
4. <https://www.youtube.com/watch?v=ZBafH5fss1E>
5. <https://www.youtube.com/watch?v=XtiAC4adozQ>
6. <https://www.youtube.com/watch?v=kt8QSkM6c>
7. <https://www.youtube.com/watch?v=pi6Dkvs6rP4>
8. <https://www.youtube.com/watch?v=YzEp0jiVvYs>
9. <https://www.youtube.com/watch?v=LFoutvnfP6A>
10. <https://youtu.be/rqWPw21E90A>
11. <https://youtu.be/CUdL4-tJy58>

Pedagogy

Power point presentations, Live Demo, Hands on Training.

Course Designer

Dr. C. Saranya

II SEMESTER

CORE COURSE – III (CC)
DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS
(2023-2024 Onwards)

Semester II	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
23UMA2CC3	DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS	CORE	4	4

Course Objective

- **Explain** the basics of Ordinary Differential Equations.
- **Evaluate** 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
	On the successful completion of the course, students will be able to	
CO1	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	<p>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.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	<p>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.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	<p>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 .</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	<p>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.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	<p>Inverse laplace transforms: The Inverse Transforms –Modification of results in Laplace Transform to get the inverse Laplace Transform - Use of Laplace Transforms in solving ODE with constant coefficients – The Laplace transform can also be used to solve systems of differentiable equations- Laplace transforms can be used to solve differential equations with variable coefficients.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

VI	<p>Self Study for Enrichment: (Not included for End Semester Examination) Equations that do not contain x explicitly- Equations that do not contain y explicitly - Special method of evaluating the P.I. when X is of the form x^m –Solving of few standard forms from Charpit’s method - Certain equations involving integrals can also be solved by Laplace transform.</p>	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
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Text Books

1. Narayanan, S and Manicavachagom Pillay, T.K (2016). *Differential Equations And Its Applications*. S.Viswanathan Publishers Pvt. Ltd.

Chapters and Sections

- UNIT-I Chapter IV: Sections 1 – 3.
Chapter II: Section 6.
- UNIT-II Chapter V: Sections 1-5 (Omit 5.5).
Chapter VIII: Section 4.
- UNIT-III Chapter XII: Sections 1-6.
- UNIT- IV Chapter IX: Sections 1-5.
- UNIT- V Chapter IX: Sections 6-10.

Reference Books

1. Raisinghania M.D. (2008). *Ordinary and Partial Differential Equations*.S.Chand & Company.
2. Zafar Ahsan.(2006). *Differential Equation and Their Applications* (Second Edition). Prentice Hall of India Private Limited.
3. Dr.S.Arumugam, A Thangapandi Isaac (2014). *Differential Equations and Applications*. New Gamma Publishing House.

Web References

1. <https://youtu.be/aYrsPeE7NLO>
2. https://youtu.be/913LV_0QDO0
3. <https://youtu.be/JEyzQtRPnjk>
4. <https://youtu.be/2LyY4t0Gfvs?si=Bq9dFIA4dHSQdSRg>
5. <https://youtu.be/UzaBAA3VJOY?si=MUQxwUgrvkVZzkSt>

Pedagogy

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

Course Designer

Dr. R.Divya

CORE COURSE – IV (CC)
INTEGRAL CALCULUS
(2023-2024 Onwards)

Semester II	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
23UMA2CC4	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	Identify the integrals of algebraic, trigonometric and logarithmic functions and to find the reduction formulae.	K1, K2
CO2	Solve multiple integrals and to find the areas of curved surfaces and volumes of solids of revolution.	K3
CO3	Evaluate double and triple integrals and problems using change of order of integration.	K4
CO4	Explain beta and gamma functions and to use them in solving problems of integration.	K5
CO5	Discover the applications of Integral Calculus.	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 – Rule(a), Rule(b), Rule(c) – Integration of irrational functions – Case(i), Case(ii) only.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	Integration: Integration by parts – Reduction formulae – Bernoulli's formula.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	Multiple Integrals: Definition of the double integral – Evaluation of the double integral – Double integrals in polar co-ordinates – Triple integrals.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	Improper integrals: Beta and Gamma functions: Definitions – Convergence to $\Gamma(n)$ - Recurrence formula of Gamma functions – Properties of Beta functions - Relation between Beta and Gamma functions.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	Geometrical Applications of Integration: Areas under plane curves: Cartesian co-ordinates – Area of a closed curve – Areas in polar co-ordinates.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	Self -Study for Enrichment: (Not included for End Semester Examination) Integration of the form $\sqrt{ax^2 + bx + c}$ and $(px + q)\sqrt{ax^2 + bx + c}$ - Integration as summation - Applications of multiple integrals - Applications of Gamma functions to multiple integrals – Approximate Integration: Trapezoidal rule.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Book

1. Narayanan.S Manicavachagom Pillay.T.K. (2021). *Calculus Volume II*. Ananda Book Depot.

Chapters and Sections

UNIT-I	Chapter 1	:	Sections 7.1- 7.4, 8(Page No. 40-46)
UNIT-II	Chapter 1	:	Sections 12, 13, 14, 15.1.
UNIT-III	Chapter 5	:	Sections 2.1, 2.2, 3.1, 3.2, 4.
UNIT-IV	Chapter 7	:	Sections 2.1 - 2.3, 3, 4.
	:	:	
UNIT-V	Chapter 2	:	Sections 1.1 – 1.4

Reference Books

1. Shanti Narayan & Mittal, P. K (2008). *Integral Calculus*, S. Chand & Company Ltd.
2. Singh. U. P. Srivastava, R. J & Siddiqui, N. H. (2011). *A Text Book of Integral Calculus*, Wistom Press.
3. Singh. J. P. (2014) *Calculus*, Ane Books Pvt. Ltd.

Web References

1. <https://youtu.be/GIGJdvdrdhs?si=-zflb8uCpb7Aw0WT>
2. <https://youtu.be/ocgjff2AboA?si=8NMu-wdGBn9Yij9F>
3. <https://youtu.be/5SuPKa3Q9BM?si=taJPIYim2zdBJqZA>
4. <https://youtu.be/rCQZjpoVJ-o?si=VCw5630f1FEcLRh->
5. <https://youtu.be/xU1HBisdJJs?si=nChZzYPOKF8foCPT>
6. https://math.mit.edu/~nehcili/data/mat136_integration.pdf
7. https://www.academia.edu/31132415/MA_210_lecture_notes_INTEGRATION_TECHNIQUES_pdf

Pedagogy

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

Course Designer

Dr. P. Sudha

CORE PRACTICAL –I (CP)
STATISTICS WITH EXCEL (P)
(2023-2024 Onwards)

Semester II	Internal Marks: 40		External Marks:60	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
23UMA2CC1P	STATISTICS WITH EXCEL (P)	CORE PRACTICAL	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 different types of statistical problems using Excel.	K3
CO3	Make use of formulas, including the use of built-in functions.	K3
CO4	Compute Statistical data's using Excel.	K3
CO5	Analyze the concepts of statistical methods and apply it to the real-life problems.	K4

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. Moments and Kurtosis.
6. Fitting of a Binomial Distribution.
7. Fitting of a poisson distribution.
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.

Web References

1. <https://youtu.be/rRGJZp6GLsY>
2. <https://youtu.be/6dw3KNn0dYw>
3. <https://youtu.be/L9TiYC6tQmU>
4. <https://youtu.be/rAKu30EtVg8>
5. <https://youtu.be/GzUNF0PspYw>
6. <https://youtu.be/vqvBX0fe0S8>
7. <https://youtu.be/bcUW8kELOLw>
8. <https://youtu.be/sPgm9e8pDQM>
9. <https://youtu.be/7Y1g340tcbU>
10. https://youtu.be/L_a8Z0BVjvM
11. <https://youtu.be/0Bjf8LKnSOA>
12. https://youtu.be/BIS11D2VL_U

Pedagogy

Power point presentations, Live Demo, Hands on training.

Course Designer

Dr. C. Saranya

FIRST ALLIED COURSE – III (AC)
APPLIED STATISTICS
(2023-2024 Onwards)

Semester II	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
23UMA2AC3	APPLIED STATISTICS	ALLIED	4	3

Course Objective

- **Define** the notion of measures of central tendency, measures of dispersion.
- **Explore** the fundamental concepts correlation and regression.
- **Apply** the idea of large sample tests and small sample tests in various fields.

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 measures of central tendency, correlation, regression, measures of dispersion, large and small sample tests.	K1
CO2	Explain the basic concepts of measures of central tendency, measures of dispersion, correlation, regression, large and small sample tests.	K2
CO3	Apply the various concepts of correlation, regression, measures of central tendency & dispersion and sampling tests for solving the problems.	K3
CO4	Solve the problems using measures of central tendency and dispersion, correlation, regression, large and small sample tests.	K3
CO5	Examine the given data and interpret the results.	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	2	3	3	3
CO2	3	3	3	3	3	2	3	3	2	3
CO3	3	3	3	3	3	2	3	2	3	3
CO4	3	3	3	3	3	3	3	2	2	3
CO5	3	3	3	3	3	3	2	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	<p>Measures of Central Tendency: Arithmetic Mean – Properties of Arithmetic Mean – Merits and Demerits of Arithmetic Mean – Weighted Mean – Median – Merits and Demerits of Median – Mode – Merits and Demerits of Mode – Geometric Mean - Merits and Demerits of Geometric Mean – Harmonic Mean - Merits and Demerits of Harmonic Mean – Selection of an Average – Partition Values.</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	<p>Measures of Dispersion: Measures of Dispersion – Range – Quartile Deviation – Mean Deviation – Standard Deviation and Root Mean Square Deviation – Relation between Standard Deviation and Root Mean Square Deviation – Different Formulae for Calculating Variance – Theorem (Variance of the Combined Series) - Coefficient of Dispersion – Coefficient of Variation.</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	<p>Correlation and Regression: Karl Pearson Coefficient of Correlation – Limits of Correlation Coefficient – Rank Correlation – Repeated Ranks – Regression – Lines of Regression – Regression Curves – Regression Coefficients – Properties of Regression Coefficients.</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	<p>Sampling and large Sample Tests: Tests of Significance for Large Samples - Sampling of Attributes – Test for Single Proportion – Test of Significance for Difference of Proportions – Test of Significance for Single Mean – Test of Significance for Difference of means – Test of Significance for the Difference of Standard Deviations. (Problems Only).</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	<p>Exact Sampling Distribution: Chi-square Test as a Test for Population Variance – Chi-square Test of Goodness of Fit – Independence of Attributes – Test for Single Mean – F-test for Equality of Population Variance. (Problems Only).</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	<p>Self Study for Enrichment: (Not included for End Semester Examinations) Graphical Location of Partition Values – Moments – Probable Error of Correlation Coefficient – Angle between two Lines of Regression – Standard Error of sample Mean – Applications of Chi-square Distribution – Applications of t-distribution – Applications of F-distribution.</p>	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Book

1. Gupta.S.C and Kapoor.V.K. (2003). *Elements of Mathematical Statistics (Third Edition)*. Sultan Chand & Sons Educational Publishers, New Delhi.

Chapters and Sections

UNIT-I	Chapter 2: Sections 2.5 – 2.11 (Omit 2.11.1)
UNIT-II	Chapter 3: Sections 3.3 – 3.8
UNIT-III	Chapter 10: Sections 10.3, 10.6 & 10.7 (10.7.1 – 10.7.4)
UNIT- IV	Chapter 12: Sections 12.8, 12.9, 12.13 – 12.15
UNIT- V	Chapter 13: Sections 13.5.1 – 13.5.3 Chapter 14: 14.2.6, 14.2.7, 14.3.2

Reference Books

1. Pillai.R.S.N & 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://tinyurl.com/vu57nmb5>
2. <https://youtu.be/pSm9mgi65I4>
3. <https://youtu.be/BiLIcCtXmm0>
4. <https://youtu.be/xTpHD5WLuoA>
5. <https://tinyurl.com/yb57hh5e>
6. <https://tinyurl.com/h3nbyj35>
7. <https://rb.gy/muaxp>

Pedagogy

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

Course Designer

Dr. S. Vidhya

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)
VECTOR CALCULUS AND FOURIER SERIES
(2023-2024 Onwards)

Semester III	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
23UMA3CC6	VECTOR CALCULUS AND FOURIER SERIES	CORE	5	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	Explain the concepts of odd and even functions.	K2
CO3	Solve various types of problems in the Core area.	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	<p>Vector Differentiation: Vector valued function of a single scalar variable</p> <p>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</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	<p>Vector Integration: Vector Integration - Line integrals-Normal Surface Integral $\int_S \vec{F} \cdot \hat{n} \cdot dS$ - Flux across a Surface- Volume Integral $\int_V F \cdot dV$ (Simple Problems only)</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	<p>Vector Integration: Gauss's Divergence Theorem $\int_S \vec{F} \cdot \hat{n} \cdot dS = \int_V \text{div } \vec{F} \cdot dV$ - Stoke's theorem $\int_c \vec{F} \cdot \hat{n} \cdot d\vec{r} = \int_S \text{curl } \vec{F} \cdot \hat{n} \cdot dS$ - Green's theorem - Stoke's theorem in space</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	<p>Fourier series: Fourier series – definition - Fourier Series expansion of periodic functions with Period 2π and period $2a$ – Odd & even functions in Fourier Series.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	<p>Fourier series: Half- range Fourier Series – definition - Development in Cosine series - Development in Sine series - Change of interval</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	<p>Self Study for Enrichment: (Not included for End Semester Examination) Theorems on differentiation- Properties of $\text{grad } \phi$ - Stoke's theorem in Cartesian form - Properties of odd and even functions- Combination of Series.</p>	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Books

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

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

SECOND ALLIED COURSE – I (AC)
PYTHON PROGRAMMING
(2023-2024 Onwards)

Semester III	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
23UMA3AC4	PYTHON PROGRAMMING	Allied Course	4	3

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
	On the successful completion of the course, students will be able to	
CO1	Understand Python’s core data types while writing new programs.	K1, 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.	K3
CO4	Compare algorithmic solutions to simple computational problems.	K4
CO5	Construct Python programs step-wise and Acquire programming skills in core Python.	K5

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	<p>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.</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	<p>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.</p> <p>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.</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	<p>Loop Control Statements : Introduction – The while Loop – The range() Function – The for Loop – Nested Loops – The break Statement – The continue Statement.</p> <p>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.</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	<p>Strings : Introduction – The str class – Basic Inbuilt Python Functions for String – The index[] Operator – Traversing String with for and while Loop – Immutable Strings – The String Operators – String Operations.</p> <p>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.</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	<p>Tuples, Sets and Dictionaries: Introduction to Tuples – Sets – Dictionaries.</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

VI	Self Study for Enrichment: (Not included for End Semester Examination) File Handling – Exception Handling.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
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Text Book

1. 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

Reference Books

1. Jeeva Jose and Sojan Lal P. (2021), *Introduction to Computing and Problem Solving with PYTHON*, Khanna Book Publishing 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)
(2023-2024 Onwards)

Semester III	Internal Marks: 40		External Marks: 60	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
23UMA3AC5P	PYTHON PROGRAMMING (P)	Allied Course	3	3

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.	K1
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.	K4
CO5	Develop algorithmic solutions to simple computational problems.	K5

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
	On the successful completion of the course, students will be able to	
CO1	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=PL5cSYiJ8KoW GqLLS_w6_G80U5FUEI0T39 .
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=PLOoogDtEDyv s3Qznc3-1DnlpbQSRuWP-z>
5. https://www.youtube.com/watch?v=MV00SQU_f7E&list=PLOoogDtEDyv vDNHO_Ba58OrE567nCzzl2
6. <https://www.youtube.com/watch?v=31qZR-BbPIs>
7. <https://www.youtube.com/watch?v=ev2SkXJVAbA&list=PLOoogDtEDyv sBG38tzlj1Zkd0PLxgZwXV>

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 Book

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/Ejrb8f-assM?si=Hsn2y6rGxAS4AU-V>
5. <https://youtu.be/jmZIEvabJIU?si=PQB-8QllG1OGxEvy>

Pedagogy

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

Course Designer

Dr. R.Divya

CORE COURSE – VIII (CC)
METHODS IN NUMERICAL ANALYSIS
2023-2024 Onwards

Semester IV	Internal Marks: 25	External Marks:75		
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
23UMA4CC8	METHODS IN NUMERICAL ANALYSIS	CORE	5	4

Course Objective

- **Explore** the basic concepts of solving algebraic and transcendental equations.
- **Apply** the numerical techniques of interpolation in various intervals.
- **Analyze** the knowledge of numerical techniques of differentiation and integration.

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 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	Compute the numerical solution of ordinary differential equation using different methods.	K3
CO5	Determine the system of algebraic equations by various methods.	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	SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS: Introduction– Bisection Method – Method of False Position – Iteration Method –Newton - Raphson Method – Ramanujan’s Method – Secant Method (Problems only) .	15	CO1, CO2, CO3, CO4, CO5	K1 K2 K3 K4 K5
II	INTERPOLATION: Finite differences – Forward Differences - Backward Differences - Central Differences – Symbolic Relations and Separation of Symbols – Newton’s formulae for interpolation – Interpolation with unevenly spaced intervals – Lagrange’s interpolating Polynomial (Proof not needed).	15	CO1, CO2, CO3, CO4, CO5	K1 K2 K3 K4 K5
III	NUMERICAL DIFFERENTIATION AND INTEGRATION: Introduction – Numerical Differentiation – Numerical Integration: Trapezoidal Rule – Simpson’s 1/3 Rule – Simpson’s 3/8 Rule – Boole’s and Weddle’s Rules – Romberg Integration – Newton-Cotes Integration Formulae.	15	CO1, CO2, CO3, CO4, CO5	K1 K2 K3 K4 K5
IV	NUMERICAL LINEAR ALGEBRA: Introduction – Solution of Linear Systems – Direct Methods : Gauss Elimination – Necessity for pivoting – Gauss-Jordan Method – Modification of the Gauss Method to Compute the Inverse.– Solution of linear systems- Iterative methods.	15	CO1, CO2, CO3, CO4, CO5	K1 K2 K3 K4 K5
V	NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS: Introduction – Solution by Taylor’s Series – Picard’s Method of Successive Approximations – Euler’s Method: Modified Euler’s Method, Runge -	15	CO1, CO2, CO3, CO4, CO5	K1 K2 K3 K4 K5

	Kutta Methods – Predictor - Corrector Methods– Adams-Moulton Method (Problems only).			
VI	Self Study for Enrichment: (Not included for End Semester Examination) Muller’s Method - Divided differences and their properties – Application of Newton’s General Interpolating formula – Numerical Integration with different step size – Use of Cubic Splines –Milne’s method.	-	CO1, CO2, CO3, CO4, CO5	K1 K2 K3 K4 K5

Text Book

1. S.S.Sastry, Introductory Methods of Numerical Analysis, 5th edition, PHI Learning Pvt. Limited, 2018.

Chapters and Sections

- UNIT I Chapter 2: Sections 2.1 – 2.7
- UNIT II Chapter 3: Sections 3.3, 3.3.1-3.3.4, 3.6, 3.9, 3.9.1
- UNIT III Chapter 6: Sections 6.1, 6.2, 6.4, 6.4.1 – 6.4.4, 6.4.6, 6.4.7
- UNIT IV Chapter 7: Sections 7.1, 7.5, 7.5.1- 7.5.4, 7.6
- UNIT V Chapter 8: Sections 8.1, 8.2, 8.3, 8.4, 8.4.2, 8.5, 8.6, 8.6.1

Reference Books

1. S. Arumugam, A. Thangapandi Isaac and A. Somasundaram, (2017), *Numerical Methods*, Second Edition ,Scitech Publications (India) Pvt. Ltd.
2. M.K. Jain, S.R.K. Iyengar and R.K. Jain (1999), *Numerical Methods for Scientific and Engineering Computations*, New Age International Private Limited.
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=PLbzVLFZiGEdQnmR2M2jDmi0nVHUF3WPvG>
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*, McGraw 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)
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
	On the successful completion of the course, students will be able to	
CO1	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

1. 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=VSoJwIYdCWM>

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	Cognitive Level
	On the successful completion of the course, students will be able to	
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
(2023-2024 and Onwards)

Semester V	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
23UMA5CC9	ABSTRACT ALGEBRA	CORE	6	5

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	
COURSECODE	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 – “2” – Moderate (Medium) Correlation –
 “3” – Substantial (High) Correlation – “-” indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	<p>SETS AND FUNCTIONS:</p> <p>Operations on sets- Functions – Real-valued functions – Equivalence, Countability – Real numbers - Least upper bounds.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	<p>LIMITS AND METRIC SPACES:</p> <p>Limit of a function on the real line – Metric spaces – Limits in metric spaces.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	<p>CONTINUOUS FUNCTIONS ON METRIC SPACES:</p> <p>Functions continuous at a point on the real line – Reformulation – Functions continuous on a metric space – Open sets – Closed sets.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	<p>CONTINUOUS FUNCTIONS ON METRIC SPACES:</p> <p>Discontinuous functions on \mathbb{R}^1.</p> <p>CONNECTEDNESS, COMPLETENESS AND COMPACTNESS:</p> <p>More about open sets – Connected sets – Bounded sets and totally bounded sets – Complete metric spaces.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	<p>CONNECTEDNESS, COMPLETENESS AND COMPACTNESS:</p> <p>Compact metric spaces – Continuous functions on compact metric spaces – Continuity of the inverse function – Uniform continuity.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	<p>Self Study for Enrichment: (Not included for End Semester Examinations)</p> <p>Sets and elements – Definition of a sequence and subsequence – Limit of a sequence- Convergent sequences- Divergent sequences-Monotone sequences.</p>	-	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/v5tni8My-VY?t=4>

Pedagogy

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

Course Designer

Dr. S. Saridha

CORE COURSE –XI (CC)

STATICS

(2023-2024 and Onwards)

Semester V	Internal Marks: 25	External Marks:75		
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
23UMA5CC11	STATICS	CORE	5	4

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
	On the successful completion of the course, students will be able to	
CO1	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_JOw
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
(2023-2024 onwards)

Semester V	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS / WEEK	CREDITS
23UMA5CC12	DISCRETE MATHEMATICS	CORE	5	4

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
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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/w9DvAVrU8j0>
4. <https://youtu.be/qPtGlrbsXg>
5. <https://youtu.be/MH2uTVgG1bo>
6. <https://home.iitk.ac.in/~aral/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
(2023-2024 Onwards)

Semester V	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hours/Week	CREDITS
23UMA5DSE1A	OPERATIONS RESEARCH	DISCIPLINE SPECIFIC ELECTIVE	5	3

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 –

“2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation –

“-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	<p>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.</p> <p>Linear Programming Problem: Introduction – Linear Programming Problem - Mathematical formulation of the problem– Illustrations on Mathematical formulation of Linear Programming Problems.</p> <p>Linear Programming Problem-Graphical solution and Extension Introduction – Graphical Solution Method – Some Exceptional Cases – General Linear Programming Problem - Standard Forms of Linear Programming Problem.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	<p>Linear Programming Problem-Simplex Method Introduction – Fundamental Properties of Solutions – The Computational Procedure – Use of Artificial Variables.</p> <p>Duality in Linear Programming Introduction-General Primal Dual Pair – Formulating a Dual Problem –Dual simplex method.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	<p>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).</p> <p>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.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	<p>Sequencing Problem: Introduction- Problem of sequencing- Basic terms used in Sequencing-Processing n jobs through Two Machines - Processing n jobs through k Machines.</p> <p>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.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	<p>Network Scheduling by PERT/CPM: Introduction- Network : Basic components – Logical sequencing – Rules of network construction – Concurrent activities-</p>	15	CO1, CO2, CO3,	K1, K2, K3,

	Critical Path Analysis-Probability Considerations in PERT-Distinction between PERT & CPM-Application of Network Techniques – Advantages of Network Techniques.		CO4, CO5	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

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_vHY

Pedagogy

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

Course Designer

Dr. P.SARANYA

DISCIPLINE SPECIFIC ELECTIVE-I (DSE)
ASTRONOMY
(2023-2024 Onwards)

Semester V	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
23UMA5DSE1B	ASTRONOMY	DISCIPLINE SPECIFIC ELECTIVE	5	3

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=japVt5BnqfSnabqo>
3. <https://youtu.be/OBHFjvjsKvA?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 Designer

Dr.S.Premalatha

DISCIPLINE SPECIFIC ELECTIVE – I (DSE)
ARTIFICIAL INTELLIGENCE
(2023-2024 Onwards)

Semester V	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
23UMA5DSE1C	ARTIFICIAL INTELLIGENCE	DISCIPLINE SPECIFIC ELECTIVE	5	3

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
	On the successful completion of the course, students will be able to	
CO1	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	<p>What is Artificial Intelligence?: The AI Problems – The Underlying Assumption – What is an AI Technique? – The Level of the Model – Criteria for Success.</p> <p>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.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	<p>Heuristic Search Techniques: Generate-and-Test – Hill Climbing – Best-first Search – Problem Reduction – Constraint Satisfaction – Means-ends Analysis.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	<p>Knowledge Representation Issues: Representations and Mappings – Approaches to Knowledge Representation.</p> <p>Using Predicate Logic: Representing Simple Facts in Logic – Representing Instance and ISA Relationships – Computable Functions and Predicates.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	<p>Representing Knowledge Using Rules: Procedural Versus Declarative Knowledge – Logic Programming – Forward Versus Backward Reasoning – Matching – Control Knowledge.</p> <p>Symbolic Reasoning Under Uncertainty: Introduction to Nonmonotonic Reasoning - Logics for Nonmonotonic Reasoning – Implementation Issues – Augmenting a Problem-solver.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	<p>Statistical Reasoning: Probability and Bayes' Theorem – Certainty Factors and Rule-based Systems – Bayesian Networks – Dempster-Shafer Theory.</p> <p>Weak Slot-and-Filler Structures: Semantic Nets – Frames.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	<p>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.</p>	-	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
	On the successful completion of the course, students will be able to	
CO1	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

(2023-2024 Onwards)

Semester VI	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
23UMA6CC13	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 RayKunze (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=rBME7tEkay8>

Pedagogy

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

Course Designer

Ms. P. Sangeetha

CORE COURSE–XIV(CC)
COMPLEX ANALYSIS
(2023-2024 Onwards)

Semester VI	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
23UMA6CC14	COMPLEX ANALYSIS	CORE	5	4

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	<p>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.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	<p>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.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	<p>Series: Convergence of Sequences – Convergence of Series – Taylor’s Series – Proof of Taylor’s Theorem – Examples – Laurent Series – Proof of Laurent’s Theorem – Examples.</p> <p>Mapping by Elementary Functions : Linear Transformations – The Transformation $w = 1/z$ – Mappings by $1/z$ – Linear Fractional Transformations – An Implicit Form</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	<p>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.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	<p>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 – Rouché’s Theorem.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

VI	Self Study for Enrichment: (Not included for End Semester Examination)		CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
	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			

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/qk7KV0llKrM>
3. https://youtu.be/4HZtV_PGHo0
4. <https://youtu.be/uM2HpLBVAkA>
5. https://youtu.be/MINmLY_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.masterjeeclasses.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
	On the successful completion of the course, students will be able to	
CO1	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 → “2” – Moderate (Medium) Correlation →
 “3” – Substantial (High) 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,	9	CO1 CO2 CO3 CO4	K1 K2 K3 K4

	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.			
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, 2007.	9	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5
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_onlinesafetytips.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

(2023-2024 Onwards)

Semester VI	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
23UMA6DSE2A	GRAPH THEORY	DISCIPLINE SPECIFIC ELECTIVE	5	3

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
	On the successful completion of the course, students will be able to	
CO1	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	<p>Introduction: Definition of a Graph – Application of Graphs – Finite and Infinite Graphs – Incidence and Degree – Isolated Vertex, Pendant Vertex and Null Graph.</p> <p>Paths and Circuits: Isomorphism – Subgraphs – Walks, Paths and Circuits – Connected Graphs, Disconnected Graphs and Components.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	<p>Paths and Circuits: Euler Graphs – Operations on Graphs – More on Euler Graphs – Hamiltonian Paths and Circuits – The Traveling Salesman Problem.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	<p>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.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	<p>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.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	<p>Planar Graphs: Planar Graphs – Kuratowski's Two Graphs – Different Representations of a Planar Graph.- Geometric Dual.</p> <p>Matrix Representation of Graphs: Incidence Matrix – Submatrices of $A(G)$ – Circuit Matrix – Cut-Set Matrix.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	<p>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.</p>	-	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/AtDgXvluW-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%20li-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
(2023-2024 and Onwards)

Semester VI	Internal Marks:25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs/Week	CREDITS
23UMA6DSE2B	NUMBER THEORY	DISCIPLINE SPECIFIC ELECTIVE	5	3

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	<p>Basis Representation: Principle of Mathematical Induction – The Basis Representation Theorem</p> <p>The Fundamental Theorem of Arithmetic: Euclid’s Division Lemma – Divisibility – The Linear Diophantine Equation – The Fundamental Theorem of Arithmetic.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	<p>Combinatorial and Computational Number Theory: Permutations and Combinations – Fermat’s Little Theorem – Wilson’s Theorem – Generating Functions -The Use of Computers in Number Theory.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	<p>Fundamentals of Congruences: Basic Properties of Congruences – Residue Systems – Riffing.</p> <p>Solving Congruences: Linear Congruences – The Theorems of Fermat and Wilson Revisited.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	<p>Solving Congruences: The Chinese Remainder Theorem – Polynomial Congruences.</p> <p>Arithmetic Functions: Combinatorial Study of $\phi(n)$.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	<p>Arithmetic Functions: Formulae for $d(n)$ and $\sigma(n)$ – Multiplicative Arithmetic Function – The Mobius Inversion Formula.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	<p>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.</p>	-	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
2023-2024 Onwards**

Semester – VI	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
23UMA6DSE2C	FUNDAMENTALS OF BIG DATA ANALYTICS	DISCIPLINE SPECIFIC ELECTIVE	5	3

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

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