K.M.G. COLLEGE OF ARTS AND SCIENCE

(AUTONOMOUS)

Approved by the Government of Tamil Nadu
Permanently Affiliated to Thiruvalluvar University, Vellore
Recognized under Section 2(f) and 12(B) of the UGC Act 1956
Accredited by NAAC (2nd Cycle) with (CGPA of 3.24/4) 'A' Grade

PG DEPARTMENT OF MATHEMATICS

B.Sc., MATHEMATICS

SYLLABUS

(CHOICE BASED CREDIT SYSTEM)

Under

LEARNING OUTCOMES-BASED CURRICULUM

FRAMEWORK (LOCF)

(Effective for the Batch of Students Admitted from 2024-2025)

PREFACE

The curriculum of undergraduate Mathematics is the study of quantity, structure, space and change, focusing on problem solving, with wider scope of application in science, engineering, technology, social sciences etc. The purpose of the outcome-based education is meant to provide an exposure to the fundamental aspects in different branches of Mathematics and its applications, keeping in mind the growing needs for higher education, employability, entrepreneurship and social responsibility. The periodical restructuring of the syllabi is carried out to fulfill the requirements of graduate attributes, qualification descriptors, programme learning outcomes and course outcomes. The outcome-based education enriches the curriculum to deliver the basic principles, synthetic strategies, mechanisms and application-oriented learning for the benefit of students. It also includes self-learning module, minor projects and industrial internship to enable students to get equipped for higher studies and employment. The programme also includes training to students for seminar presentation, preparation of internship reports, hands-on training in lab courses, synthesis and its analysis, developing leadership qualities, organization and participation in the interdepartmental academic competitions. The allied papers provide a platform to strengthen the understanding of the core subjects. The non-major elective courses offer chances to learn and augment interest in other related fields. The outcome-based curriculum is intended to enrich the learning pedagogy to global standards. ICT enabled teaching-learning platforms are provided to students along with the interaction of international Mathematicians. The seminars periodically delivered by subject experts and former professors would certainly help the students to update with latest technology/trends in different fields of Mathematics. The OBE based evaluation methods will reflect the true cognitive levels of the students as the curriculum is designed with course outcomes and cognitive level correlations as per BLOOM's Taxonomy.

In pursuit of the Higher Education Department Policy Note 2022-23 Demand 20, Section 1.4, Tamil Nādu State Council for Higher Education took initiative to revamp the curriculum. On

27 July 2022, a meeting was convened by the Member-Secretary Dr. S. Krishnasamy enlightening the need of the hour to restructure the curriculum of both Undergraduate and Post-graduate programmes based on the speeches at the Tamil Nādu Legislative Assembly Budget meeting by the Honourable Higher Education Minister Dr K. Ponmudy and Honourable Finance Minister Dr. P. Thiagarajan. At present there are three different modes of imparting education in most of the educational institutions throughout the globe. Outcome Based Education, Problem Based Education, and Project Based Education.

Now our Honourable Higher Education Minister announced Industry Aligned Education. During discussion, Member Secretary announced the importance of question papers and evaluation as envisaged by the Honourable Chief Secretary to Government Dr, V. IraiAnbu. This is very well imbedded in Revised Bloom's Taxonomy forms three learning domains: the cognitive (knowledge), affective(attitude), and psychomotor (skill). This classification enables to estimate the learning capabilities of students.

Briefly, it is aimed to restructure the curriculum as student-oriented, skill-based, and institution industry- interaction curriculum with the various courses under "Outcome Based Education with Problem Based Courses, Project Based Courses, and Industry Aligned Programmes" having revised Bloom's Taxonomy for evaluating students skills. Three domains:

(i)Cognitive Domain

(Lower levels: K1: Remembering ; K2: Understanding ; K3: Applying; Higher levels: K4: Analysing ; K5: Evaluating; K6: Creating)

(ii) Affective Domain

(iii) Psychomotor Domain

ABOUT THE COLLEGE

The College was founded in the new millennium 2000 by the vision of late Shri.K.M.Govindarajan fondly known as Iyah, with a mission to offer higher education in the fields of Arts and Science to the needy and the poor middle class students of this area and make them fully employable and economically self-reliant. With a humble beginning of launching an elementary school named Thiruvalluvar Elementary School in the year 1952, Iyah groomed it into a Higher Secondary School and later into a college. Education was his soul and breath. The college has grown into a full-fledged educational hub offering 12 under graduate programmes, 8 post graduate programmes, 5 M.Phil research programmes and 4 Ph.D programmes. The college has been accredited with 'A' grade by NAAC in 2nd cycle and recognized under section 2(f) & 12(B) of the UGC act 1956. The College is permanently affiliated to Thiruvalluvar University. The College is also acquired the status of Autonomous from the academic year 2024-2025. The College is an associate member of ICT Academy and registered member of NPTEL and Spoken Tutorials of IIT Bombay. The college is also a member of INFLIBNET and NDL.

VISION OF THE COLLEGE

Empower young men and women by educating them in the pursuit of excellence, character building and responsible citizen.

MISSION OF THE COLLEGE

Offer higher education in the fields of Arts, Science & Management to the needy and make them fully self-dependent.

QUALITY POLICY OF THE COLLEGE

KMG Students achieve the best learning results and personal growth with modern education that equip them for working life and a changing society to become deserving citizens.

ABOUT THE DEPARTMENT

The Department of Mathematics was Established in the Year 2007 and made a Steady Growth to the Height of Establishing Post Graduate Level in the Year 2010. The Department offers Research Programme (M.Phil) from 2013. Our Aim is to Promote Students in the field of Mathematics and working Knowledge of Mathematics. Every Year Department Organizes National Conference/Seminar, Association Activities and Special Lecturers

VISION OF THE DEPARTMENT

- To Emerge as a Global Center of Learning, Academic Excellence, and Innovative Research.

MISSION OF THE DEPARTMENT

- Imparting of Quality Mathematics Education and the inculcating of the spirit of Research through Innovative Teaching and Research Methodologies.

- To Provide an Environment where Students can Learn, become Competent users of Mathematics, and Understand the use of Mathematics in Other Disciplines.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

1. Professional Excellence: Graduates will demonstrate competency and excellence in their chosen fields of study, applying theoretical knowledge to practical situations effectively.

2. Character Development: Graduates will exhibit strong moral and ethical character, upholding values of integrity, honesty, and respect for others in both personal and professional endeavors.

3. Leadership and Citizenship: Graduates will emerge as responsible leaders and active citizens, contributing positively to their communities and society at large through their actions and initiatives.

4. Continuous Learning: Graduates will engage in lifelong learning and professional development activities, adapting to evolving technologies, methodologies, and societal needs.

5. Self-Dependency and Entrepreneurship: Graduates will possess the skills and mindset necessary to be self-reliant and entrepreneurial, capable of creating opportunities for themselves and others through innovation and initiative.

6. Effective Communication and Collaboration: Graduates will demonstrate proficiency in communication skills, both verbal and written, and exhibit the ability to collaborate effectively with diverse teams and stakeholders.

7. Global Perspective: Graduates will have a broad understanding of global issues and perspectives, demonstrating cultural sensitivity and adaptability in multicultural environments.

PROGRAM OUTCOMES (POs)

On successful completion of the programme, the students will be able to:

POs	Graduate Attributes	Statements
PO1	Disciplinary Knowledge	Acquire detailed knowledge and expertise in all the disciplines of the subject.
PO2	Communication Skills	Ability to express thoughts and ideas effectively in writing, listening and confidently Communicate with others using appropriate media
PO3	Critical Thinking	Students will develop aptitude Integrate skills of analysis, critiquing, application and creativity.
PO4	Analytical Reasoning	Familiarize to evaluate the reliability and relevance of evidence, collect, analyze and interpret data.
PO5	Problem Solving	Capacity to extrapolate the learned competencies to solve different kinds of non-familiar problems.
PO6	Employability and Entrepreneurial Skill	Equip the skills in current trends and future expectations for placements and be efficient entrepreneurs by accelerating qualities to facilitate startups in the competitive environment.
PO7	Individual and Team Leadership Skill	Capability to lead themselves and the team to achieve organizational goals and contribute significantly to society.
PO8	Multicultural Competence	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.
PO 9	Moral and Ethical awareness/reasoning	Ability to embrace moral/ethical values in conducting one's life.
PO10	Lifelong Learning	Identify the need for skills necessary to be successful in future at personal development and demands of work place.

PROGRAM SPECIFIC OUTCOMES (PSOs)

On successful completion of the B.Sc., Mathematics, the students will be able to:

PSOs	Statements
PSO1	Acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics.
PSO2	Understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields.
PSO3	To prepare the students who will demonstrate respectful engagement with other's ideas, behaviors, beliefs and apply diverse frames of references to decisions and actions. To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations.

Correlation Rubrics:

High	Moderate	Low	No Correlation
3	2	1	-

Mapping of PSOs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
PSO1	3	3	3	3	3	3	2	-	-	2
PSO2	3	2	3	3	3	3	2	-	-	2
PSO3	3	3	3	3	3	3	2	-	-	3

K.M.G. COLLEGE OF ARTS AND SCIENCE

(AUTONOMOUS)

Subject and Credit System- B.Sc., Mathematics

(Effective for the Batch of Students Admitted from 2024-2025)

Semester	Part	Category	Course Code	Course Title	Ins.Hrs/ Week	Credit	Maximum Marks		
							Internal	External	Total
SEMESTER - I	I	Language	AULT10 / AULU 10	General Tamil -I / Urdu - I	6	3	25	75	100
	II	English	AULE10	English- I	6	3	25	75	100
	III	Core – 1	AUCMA11	Algebra & Trigonometry	5	5	25	75	100
	III	Core – 2	AUCMA12	Differential Calculus	5	5	25	75	100
	III	Elective-I (Choose any One)	AUEPH13A	Physics – I	4	3	25	75	100
			AUEMA13B1	Numerical Methods -I					
	IV	Skill Enhancement	AUSMA14	Mathematics For Competitive Examinations-I	2	2	25	75	100
	IV	Foundation Course	AUFMA15	Bridge Mathematics	2	2	25	75	100
				Semester Total	**30**	**23**			
SEMESTER - II	I	Language	AULT20 / AULU 20	General Tamil -II / Urdu - II	6	3	25	75	100
	II	English	AULE20	English – II	6	3	25	75	100
	III	Core - 3	AUCMA21	Analytical Geometry (Two & Three Dimensions)	5	5	25	75	100
	III	Core – 4	AUCMA22	Integral Calculus	5	5	25	75	100
	III	Elective-II (Choose any One)	AUEPH23A	Physics – II	4	3	25	75	100
			AUEMA23B	Numerical Methods -II					
	IV	Skill Enhancement	AUSMA24	Office Automation	2	2	25	75	100
	IV	Skill Enhancement	AUSMA25	Mathematics For Competitive Examinations-II	2	2	25	75	100
				Semester Total	**30**	**23**			

Semester	Part	Category	Course Code	Course Title	Ins.Hrs/ Week	Credit	Maximum Marks		
							Internal	External	Total
SEMESTER - III	I	Language	AULT30 / AULU30	General Tamil - III / Urdu - III	5	3	25	75	100
	II	English	AULE30	English – III	6	3	25	75	100
	III	Core - 5	AUCMA31	Vector Calculus and Applications	5	5	25	75	100
	III	Core – 6	AUCMA32	Differential Equations and Applications	5	5	25	75	100
	III	Elective-III (Choose any One)	AUEMA33A1	Mathematical Statistics-I	4	3	25	75	100
			AUECH33B	Chemistry – I					
	IV	Skill Enhancement	AUSMA34	Entrepreneurial Skill	1	1	25	75	100
	IV	Skill Enhancement	AUSPMA35	Georgebra	2	2	25	75	100
	IV	Compulsory	AUES30	Environmental Studies	2	2	25	75	100
				Semester Total	**30**	**24**			
SEMESTER - IV	I	Language	AULT40 / AULU 40	General Tamil -IV / Urdu - IV	6	3	25	75	100
	II	English	AULE40	English – IV	6	3	25	75	100
	III	Core - 7	AUCMA41	Optimization Techniques	5	5	25	75	100
	III	Core – 8	AUCMA42	Elements of Mathematical Analysis	5	5	25	75	100
	III	Elective-IV (Choose any One)	AUEMA43A1	Mathematical Statistics-II	4	3	25	75	100
			AUECH43B	Chemistry – II					
	IV	Skill Enhancement	AUSMA44	Python Programming	2	2	25	75	100
	IV	Skill Enhancement	AUSPMA45	R Programming for Statistics	2	2	25	75	100
				Semester Total	**30**	**23**			

Semester	Part	Category	Course Code	Course Title	Ins.Hrs/ Week	Credit	Maximum Marks		
							Internal	External	Total
SEMESTER - V	III	Core – 9	AUCMA51	Abstract Algebra	5	4	25	75	100
	III	Core – 10	AUCMA52	Real Analysis	5	4	25	75	100
	III	Core – 11	AUCMA53	Mathematical Modelling	5	4	25	75	100
	III	Core – 12	AUPMA54	Project with Viva voce	5	4	25	75	100
	III	Elective-V (Choose any One)	AUEMA55A	Transform Techniques	4	3	25	75	100
			AUEMA55B	Special Functions					
	III	Elective-VI (Choose any One)	AUEMA56A	Graph Theory	4	3	25	75	100
			AUEMA56B	Number Theory					
	IV	Compulsory	AUVE50	Value Education	2	2	25	75	100
	IV	Compulsory	AUIMA57	Internship / Industrial Training (Summer vacation at the end of IV semester activity)	-	2	100	-	100
				Semester Total	**30**	**26**			
SEMESTER - VI	III	Core – 13	AUCMA61	Linear Algebra	6	4	25	75	100
	III	Core – 14	AUCMA62	Complex Analysis	6	4	25	75	100
	III	Core – 15	AUCMA63	Mechanics	6	4	25	75	100
	III	Elective-VII (Choose any One)	AUEMA64A	Object Oriented Programming Concepts Using C++	5	3	25	75	100
			AUEMA64B	Financial Analytics					
	III	Elective-VIII (Choose any One)	AUEMA65A	Discrete mathematics	5	3	25	75	100
			AUEMA65B	Big Data Analytics					
	IV	Extension Activity	AUEA60	Extension Activity	-	1	100	-	100
	V	Professional Competency Skill	AUPCMA66	Professional Competency Skill	2	2	25	75	100
				Semester Total	**30**	**21**			

Consolidated Semester wise and Component wise Credit distribution

Parts	Semester-I	Semester-II	Semester-III	Semester-IV	Semester-V	Semester-VI	Total Credits
Part-I	03	03	03	03	-	-	12
Part-II	03	03	03	03	-	-	12
Part-III	13	13	13	13	22	18	92
Part-IV	04	04	05	04	04	01	22
Part-V	-	-	-	-	-	02	2
Total	23	23	24	23	26	21	**140**

*Part I. II , and Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programme and the other components. IV, V has to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree.

COURSE DESCRIPTORS

Title of the Course	ALGEBRA & TRIGONOMETRY	Hours/Week	05
Course Code	AUCMA11	Credits	04
Category	CORE M1	Year & Semester	I & I
Prerequisites	12th Standard Mathematics	Regulation	2024

Objectives of the course:

- Basic ideas on the Theory of Equations, Matrices and Number Theory.
- Knowledge to find expansions of trigonometry functions, solve theoretical and applied problems

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UNITS	Contents	COs	Cognitive Levels
UNIT-I	Reciprocal Equations-Standard form–Increasing or decreasing the roots of a given equation- Removal of terms–Approximate solutions of roots of polynomials by Horner's method – Related Problems. **Chapter-6: Sections: 16, 16.1, 17, 19, 30**	CO1	K1 K2 K3
UNIT-II	Summation of Series: Binomial– Exponential –Logarithmic series (Theorems without proof) –Related Problems. **Chapter-3: Sections: 10 Chapter -4: Sections 3 to 7**	CO2	K1 K2 K3
UNIT-III	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. **Chapter-2: Sections: 16, 16.1 to 16.4**	CO3	K1 K2 K3
UNIT-IV	. Expansions of sin nθ, cos nθ in powers of sinθ, cosθ - Expansion of tan nθ in terms of tan θ– Expansions of cosnθ, sinnθ, cosmθ sinnθ – Expansions of tan(θ1 +θ2 +,…,+θn) – Expansions of sinθ, cosθ and tanθ in terms of θ –Related Problems. **Chapter 2 :Sections : 2.1, 2.1.1, 2.1.2** **Chapter 3: Sections: 3.1, 3.1.1, 3.2.1, 3.4, 3.4.1 to 3.4.3**	CO4	K1 K2 K3
UNIT-V	Hyperbolic functions – Relation between circular and hyperbolic functions Inverse hyperbolic functions. **Chapter 4: Sections: 4.1 to 4.7**	CO5	K1 K2 K3

Recommended Text Books

1. Algebra, **Volume I** by T.K.Manicavachagom Pillay,T.Natarajan, K.S.Ganapathy, Viswanathan Publication 2007, **Unit – 1** and **Unit – 2**

2. Algebra, **Volume II** by T.K.Manicavachagom Pillay, T.Natarajan, K.S.Ganapathy, Viswanathan Publication 2008 **Unit -3**

3. Trigonometry by P.Duraipandian and Kayalal Pachaiyappa, Muhil publishers, **Unit – 4, Unit – 5**

Reference Books

1. W.S. Burnstine and A.W. Panton, Theory of equations
2. David C. Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007
3. G.B. Thomas and R.L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005
4. C.V.Durell and A. Robson, Advanced Trigonometry, Courier Corporation, 2003
5. J.Stewart, L. Redlin, and S. Watson, Algebra and Trigonometry, Cengage Learning, 2012.

Calculus and Analytical Geometry, G.B. Thomas and R. L. Finny, Pearson Publication, 9th Edition, 2010.

Website and e-learning source

https://nptel.ac.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Classify and Solve reciprocal equations	K1,K2,K3
CO2	Find the sum of binomial, exponential and logarithmic series	K1,K2,K3
CO3	Find Eigen values, Eigen vectors, verify Cayley – Hamilton theorem and diagonalize a given matrix	K1,K2,K3
CO4	Expand the powers and multiples of trigonometric functions in terms of sine and cosine	K1,K2,K3
CO5	Determine relationship between circular and hyperbolic functions	K1,K2,K3,

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	-	-	-	1	-	-	1	3	2	1
CO2	2	1	3	1	-	-	1	-	-	1	3	2	1
CO3	3	1	3	1	-	-	1	-	-	1	3	2	1
CO4	3	1	3	-	-	-	1	-	-	1	3	2	1
CO5	3	1	3	-	-	-	1	-	-	1	3	2	1

COURSE DESCRIPTORS

Title of the Course	**DIFFERENTIAL CALCULUS**	**Hours/Week**	05
Course Code	AUCMA12	**Credits**	04
Category	CORE M2	**Year & Semester**	I & I
Prerequisites	12thStandard Mathematics	**Regulation**	2024

Objectives of the course:

- The basic skills of differentiation, successive differentiation, and their applications.
- Basic knowledge on the notions of curvature, evolutes, involutes and polar co-ordinates and in solving related problems.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Successive Differentiation:** Introduction (Review of basic concepts) – The nth derivative – Standard Results – Fractional Expressions – Trigonometrically Transformation – Formation of Equations Involving Derivatives – Leibnitz Formula for nth Derivative of a Product (Without proof) **Chapter 3 Sections 1.1 – 1.6** and **Section 2.1**	CO1	K1 K2 K3
UNIT-II	**Partial Differentiation:** Partial Derivatives – Successive Partial Derivatives – Function of a Function Rule – Total Differential Coefficient – A special case – Implicit Functions. **Chapter 8 Sections 1.1 – 1.5**	CO2	K1 K2 K3
UNIT-III	**Partial Differentiation (Continued):** Homogeneous Functions – Partial Derivatives of a Function of Two Variables – Maxima And Minima of Functions of Two Variables – Lagrange's Method of Undetermined Multipliers. **Chapter 8: Sections 1.6, 1.7, Sections: 4** and **5**	CO3	K1 K2 K3
UNIT-IV	**Envelope:** Method of Finding Envelope – Another Definition of Envelope – Envelope of Family of Curves Which are Quadratic in the Parameter. **Chapter: 10 Sections: 1.1 – 1.4**	CO4	K1 K2 K3
UNIT-V	**Curvature:** Definition of a Curvature – Circle, Radius and Centre of Curvature – Evolutes and Involutes – Radius of Curvature in Polar Coordinates, p - r equations; pedal equation of a curve. **Chapter: 10 Sections: 2.1–2.7**.	CO5	K1 K2 K3

Recommended Text Books

1.Calculus Volume I -S. Narayanan and T.K. Manickavachagom Pillay, S. Viswanathan Publishers Pvt. Ltd. 2015

Reference Books

1. R. Courant and F. John, Introduction to Calculus and Analysis (Volumes I & II), Springer- Verlag, New York, Inc., 1989.
2. T. Apostol, Calculus, Volumes I and II.

S. Goldberg, Calculus and mathematical analysis

Website and e-learning source

https://nptel.ac.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Find the nth derivative, form equations involving derivatives and apply Leibnitz formula	K1,K2,K3
CO2	Find the partial derivative and total derivative coefficient	K1,K2,K3
CO3	Determine maxima and minima of functions of two variables and to use the Lagrange's method of undetermined multipliers	K1,K2,K3
CO4	Find the envelope of a given family of curves	K1,K2,K3
CO5	Find the evolutes and involutes and to find the radius of curvature using polar co-ordinates	K1,K2,K3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	-	-	-	1	-	-	1	3	2	1
CO2	2	1	3	-	-	-	1	-	-	1	3	2	1
CO3	3	2	3	2	-	-	1	-	-	1	3	2	1
CO4	3	2	3	2	1	-	1	-	-	1	3	2	1
CO5	3	2	3	2	1	-	1	-	-	1	3	2	1

COURSE DESCRIPTORS

Title of the Course	**Numerical Methods -I**	**Hours/Week**	04
Course Code	AUEMA13B1	**Credits**	03
Category	ELECTIVE COURSE -I	**Year & Semester**	I & I
Prerequisites	12thStandard Mathematics	**Regulation**	2024

Objectives of the course:

- To know the methods of solving simultaneous linear equations.
- To acquire knowledge about forward differences and Backwarddifferences and their relationship.
- Knowledge about central difference operators and problems basedon various central differences formulae.
- To study Newton‟s divided difference formula and problemsbased on Lagrange‟s interpolation formula.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Solutions of Algebraic and Transcendental Equations: Bisection Method- Iteration Method- Regula-Falsi Method- Newton-Raphson Method. **Chapter -1 :Section 1.1 to1.4**	CO1	K1 K2 K3
UNIT-II	Solutions of Simultaneous Linear Equations: Gauss-Elimination Method, Gauss-Jordan Method, Crout's Method. **Chapter 2 :Section 2.1 to 2.3**	CO2	K1 K2 K3
UNIT-III	Finite Differences: E Operators and Relation between them-Differences of Polynomial-Factorial Polynomials. **Chapter 3 :Section 3.1 to 3.4**	CO3	K1 K2 K3
UNIT-IV	Interpolation with Equal Intervals:Newton's Forward andBackward Interpolation formulae. Central Differences Formulae: Gauss-Forward and Backward Formulae. **Chapter 4 :Section 4.1to 4.3 (omit 4.1a)** **Chapter 5 :Section 5.1to 5.4**	CO4	K1 K2 K3
UNIT-V	Interpolation with Unequal Intervals: Divided Differences - Newton's Divided Differences Formula for Interpolation -Lagrange's Formula for Interpolation. **Chapter 6 :Section 6.1, 6.2, 6.5&6.7**	CO5	K1 K2 K3

Recommended Text Books

1. P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite differences &Numerical Analysis, S. Chand & Company Ltd., New Delhi-55.

Reference Books

1.B.D. Gupta.(2001) *Numerical Analysis.*Konark Pub. Ltd., Delhi
2. M.K. Venkataraman. (1992) *Numerical methods for Science andEngineering* National Publishing Company, Chennai.
3. S. Arumugam. (2003) *Numerical Methods*, New Gamma Publishing,Palayamkottai.
4. H.C. Saxena. (1991) *Finite differences and Numerical analysis*
S.Chand& Co., Delhi

Website and e-learning source

https://ocw.mit.edu/courses/22-15-essential-numerical-methods-fall- 2014/pages/syllabus/
https://ocw.mit.edu/courses/18-330-introduction-to-numerical- analysis-spring-2004/

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	After studied unit -1, the student will be able to solve Iteration method- Regula-falsi method- Newton-Raphson method**.**	K1,K2,K3
CO2	After studied unit -2, the student will be able to calculate interpolation values by applying Gauss-Elimination method, Gauss-Jordan method.	K1,K2,K3
CO3	After studied unit -3, the student will be able to calculate Differences of a polynomial- Factorial polynomials	K1,K2,K3
CO4	After studied unit -4, the student will be able to estimate Central Differences Formulae.	K1,K2,K3
CO5	After studied unit -5, the student will be able to estimate the interpolation value for unequal intervals based on Lagrange's formula.	K1,K2,K3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	2	2	1	1	-	-	1	3	2	1
CO2	2	1	3	1	2	-	1	-	-	1	3	2	1
CO3	3	1	3	1	2	1	1	-	-	1	3	2	1
CO4	3	1	3	2	2	-	1	-	-	1	3	2	1
CO5	3	1	3	2	2	1	1	-	-	1	3	2	1

COURSE DESCRIPTORS

Title of the Course	**MATHEMATICS FOR COMPETIVE EXAMINATIONS-I**	**Hours/Week**	02
Course Code	AUSMA14	**Credits**	02
Category	Skill Enhancement Course-I	**Year & Semester**	I & I
Prerequisites	12thStandard Mathematics	**Regulation**	2024

Objectives of the course:

- Remembering the meaning of HCF and LCM of numbers
- Understanding the concept of percentage on simple problems.
- Analyzing the concepts of ratio and proportion

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Numbers - H.C.F and L.C.M. of Numbers. **(Chapter – 1 & 2)**	CO1	K1 K2 K3
UNIT-II	Decimal Fractions – Simplification. **(Chapter – 3 & 4)**	CO2	K1 K2 K3
UNIT-III	Square Roots and Cube Roots – Average. **(Chapter – 5 & 6)**	CO3	K1 K2 K3
UNIT-IV	Problems on Numbers - Problems on Ages. **(Chapter – 7 & 8)**	CO4	K1 K2 K3
UNIT-V	Percentage **(Chapter – 10)**	CO5	K1 K2 K3

Recommended Text Books 1. R.S. Aggarwal, Quantitative Aptitude for Competitative Examinations, S.Chand co Ltd., 152. Anna Salai, Chennai,2010
Reference Books 1. Quantitative Aptitude ‘’by Abhijit Guha, Tata McGraw Hill Publishing Company Limited, New Delhi (2005)
Website and e-learning source **https://nptel.ac.in/**

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Perform basic mathematics in Numbers.	K1,K2,K3
CO2	Understand Decimal Fractions and Simplification.	K1,K2,K3
CO3	Develop basic concept of Square Roots and Cube Roots and Average.	K1,K2,K3
CO4	Explain Problems on Numbers - Problems on Ages.	K1,K2,K3
CO5	Critique and evaluate quantitative arguments that utilize mathematics, statistical and quantitative informations.	K1,K2,K3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	-	-	-	1	-	-	1	3	2	1
CO2	2	1	3	1	-	-	1	-	-	1	3	2	1
CO3	3	1	3	1	-	-	1	-	-	1	3	2	1
CO4	3	1	3	-	-	-	1	-	-	1	3	2	1
CO5	3	1	3	-	-	-	1	-	-	1	3	2	1

COURSE DESCRIPTORS

Title of the Course	**Bridge Mathematics**	**Hours/Week**	02
Course Code	AUFMA15	**Credits**	02
Category	Foundation course	**Year & Semester**	I & I
Prerequisites	12thStandard Mathematics	**Regulation**	2024

Objectives of the course:

- To bridge the gap and facilitate transition from higher secondary to tertiary education;
- To instill confidence among stakeholders and inculcate interest for Mathematics;

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Algebra: Binomial theorem, General term, middle term,problems based on these concepts.	CO1	K1 K2 K3
UNIT-II	Sequences Series (Progression).Fundamental Principle of counting. Factorial n	CO2	K1 K2 K3
UNIT-III	Permutations and combinations, Derivation of formulae and their connections, simple applications, combinations with repetitions, arrangements within groups, formation of groups.	CO3	K1 K2 K3
UNIT-IV	Trigonometry: Introduction to trigonometric ratios, proof of sin(A+B), cos(A+B), tan(A+B) formulae, multiple and sub multiple angles, sin(2A), cos(2A), tan(2A) etc., transformations sum into product and product into sum formulae, inverse trigonometric functions, sine rule and cosine rule	CO4	K1 K2 K3
UNIT-V	Calculus: Limits, standard formulae and problems, differentiation, first principle, uv rule, u/v rule, methods of differentiation, application of derivatives, integration - product rule and substitution method.	CO5	K1 K2 K3

Recommended Text Books
1.NCERT class XI and XII text books Any State Board Mathematics text books of class XI and XII
Website and e-learning source
https://nptel.ac.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Prove the binomial theorem and apply it to find the expansions of any (x + y)n and also, solve the related problems	K1,K2,K3
CO2	Find the various sequences and series and solve the problems related to them. Explain the principle of counting.	K1,K2,K3
CO3	Find the number of permutations and combinations in different cases. Apply the principle of counting to solve the problems on permutations and combinations	K1,K2,K3
CO4	Explain various trigonometric ratios and find them for different angles, including sum of the angles, multiple and sub multiple angles, etc. Also, they can solve the problems using the transformations.	K1,K2,K3
CO5	Find the limit and derivative of a function at a point, the definite and indefinite integral of a function. Find the points of min/max of a function.	K1,K2,K3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	1	1	-	-	1	3	2	1
CO2	2	1	1	2	2	1	1	-	-	1	3	2	1
CO3	2	1	1	2	2	1	1	-	-	1	3	2	1
CO4	1	1	1	1	1	1	1	-	-	1	3	2	1
CO5	1	1	1	1	1	1	1	-	-	1	3	2	1

COURSE DESCRIPTORS

Title of the Course	**NUMERICAL METHODS-I** (For B.Sc., Computer Science)	**Hours/Week**	04
Course Code	AUEMA13B	**Credits**	03
Category	ELECTIVE COURSE -I	**Year & Semester**	I & I
Prerequisites	12thStandard Mathematics	**Regulation**	2024

Objectives of the course:

- To Solve Practical Technical Problems using various Numerical Method Formulae
- To derive appropriate Numerical Methods to solve Algebraic, Transcendental Equations
- To know the Numerical Methods of Solving Simultaneous Linear Equations
- To Acquire Knowledge about Forward Difference and Backward Differences and their Relationship Knowledge about Central Difference Operators and Problems based on Various Central Difference Formulae

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Curve Fitting- Principle of Least square** Fitting of straight line $y = ax + b$ parabola$y = ax^2 + bx + c$ exponential curves of forms$y = ax^b, y = e^{bx}$, and $y = ab^x$.	CO1	K1 K2 K3
UNIT-II	**The solution of numerical algebraic and transcendental Equations:** Bisection method – Iteration Method – Regula Falsi Method – Newton– Raphson method	CO2	K1 K2 K3
UNIT-III	**Solution of simultaneous linear algebraic equations:** Gauss elimination method – Gauss Jordan method – Method of Triangularization – Gauss Jacobi method – Gauss Seidel method.	CO3	K1 K2 K3
UNIT-IV	**Finite differences** Operators Δ, ∇and E - relation between them — factorial polynomials. **Interpolation with equal intervals:** Gregory-Newton forward and backward- interpolation formulas.	CO4	K1 K2 K3
UNIT-V	**Central differences formulae** OperatorsΔ, ∇ and E relation with the other operators. Gauss forward and backward formulae, Stirling's formula and Bessel's formula.	CO5	K1 K2 K3

Recommended Text Books

1. P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite differences &Numerical Analysis, S. Chand & Company Ltd., New Delhi-55.

Reference Books

1. B.D. Gupta.(2001) *Numerical Analysis.*Konark Pub. Ltd., Delhi
5. M.K. Venkataraman. (1992) *Numerical methods for Science andEngineering* National Publishing Company, Chennai.
6. S. Arumugam. (2003) *Numerical Methods*, New Gamma Publishing,Palayamkottai.
7. H.C. Saxena. (1991) *Finite differences and Numerical analysis* S.Chand& Co., Delhi

Website and e-learning source

https://nptel.ac.in/courses/111107105

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Solve the problems of fitting of straight lines, parabolas and the different form of exponential curves	K1,K2,K3
CO2	Solve algebraic equations using various methods like Bisection method, Iteration method, Regula Falsi method and Newton – Raphson method	K1,K2,K3
CO3	Estimate the solution of simultaneous linear equations using different numerical methods	K1,K2,K3
CO4	Define basic concept of operators Δ, ∇and E, Solving interpolation with equal intervals problems using Gregory Newton‟s forward formula and Newton‟s backward formula	K1,K2,K3
CO5	Estimate the solution of central difference formula using the methods Gauss's forward, backward formula,Stirling's formula and Bessel,s formula	K1,K2,K3,

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	1	-	-	1	1	2	2
CO2	3	3	2	3	3	3	1	-	-	1	1	2	2
CO3	3	2	2	3	2	3	1	-	-	1	1	2	2
CO4	3	3	3	2	2	3	1	-	-	1	1	2	2
CO5	3	2	3	2	3	2	1	-	-	1	1	2	2

COURSE DESCRIPTORS

Title of the Course	**DISCRETE MATHEMATICS-I** (For B.Sc., Computer Science)	**Hours/Week**	04
Course Code	AUEMA13C	**Credits**	03
Category	ELECTIVE COURSE -I	**Year & Semester**	I & I
Prerequisites	12thStandard Mathematics	**Regulation**	2024

Objectives of the course:

- To make the students understand the Mathematical Logic and truth table.
- To know about how and when to use set theory.
- To understand the discrete structure, storage structure.
- To understand the methods of Relations and ordering.
- To understand the functions, classifications, and types.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Mathematical logic-:** Connectives, well formed formulas, Tautology,Equivalence of formulas, Tautological implications, Duality law, Normal forms.	CO1	K1 K2 K3
UNIT-II	**Set Theor**y: Basic Concept of Set Theory – Operations on Sets – Venn Diagram	CO2	K1 K2 K3
UNIT-III	**Representation of Discrete Structure** : Data Structure – Storage Structure -Sequential Allocation – Pointers and Linked Allocation – An Application of Bit Represented Sets	CO3	K1 K2 K3
UNIT-IV	**Relations and Ordering:** Relations – Properties of Binary Relations in a set – Relation Matrix and the Graph of a Relation – Partition and Covering of a set – Equivalence Relations – Compatibility Relations – Composition of Binary Relations –Partial Ordering – Partially Ordered set.	CO4	K1 K2 K3
UNIT-V	**Functions** Definitions of functions and its Classification – Types – Examples – Composition of functions – Inverse functions – Binary and nary operations – Characteristic function of a set – Hashing functions –Recursive functions	CO5	K1 K2 K3

Recommended Text Books

1. Discrete Mathematical Structures with applications to computer Science J.P Tremblay and R.P Manohar (Mc.Graw Hill, 1997.)

Reference Books

1. P.R. Vittal,Mathematical Foundations– Margham Publication,Chennai.

2.Discrete Mathematics-Oscar Levin(3rd Edition)

Website and e-learning source

https://nptel.ac.in/courses/106106094
https://nptel.ac.in/courses/111107058

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Solve problems in Mathematical logic and truth table	K1,K2,K3
CO2	Know and understand about set theory.	K1,K2,K3
CO3	Know and understand about discrete structure, storage structure.	K1,K2,K3
CO4	Know and understand about Relations and Ordering	K1,K2,K3
CO5	Understand the functions, classification and types.	K1,K2,K3,

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	1	-	-	1	1	1	1
CO2	2	2	3	3	2	3	1	-	-	1	1	1	1
CO3	3	3	3	3	3	3	1	-	-	1	1	2	2
CO4	3	2	2	3	3	3	1	-	-	1	1	2	2
CO5	3	2	3	3	3	2	1	-	-	1	1	2	2

COURSE DESCRIPTORS

Title of the Course	**STATISTICAL METHODS AND ITS APPLICATIONS-I** (For BCA)	**Hours/Week**	04
Course Code	AUEMA12A	**Credits**	03
Category	ELECTIVE COURSE -I	**Year & Semester**	I & I
Prerequisites	12thStandard Mathematics	**Regulation**	2024

Objectives of the course:

- Understand basic concepts of Statistical Methods
- Have a basic understanding of measures of location
- Have a basic understanding of measures of dispersion
- Understand about Measures of Skewness
- Understand about correlation

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction - scope and limitations of statistical methods - classification of data -Tabulation of data- Diagrammatic and Graphical representation of data – Graphical, determination of Quartiles ,Deciles and Percentiles	CO1	K1 K2 K3
UNIT-II	Measures of location: Arithmetic mean, median, mode, geometric mean and Harmonic mean and their properties.	CO2	K1 K2 K3
UNIT-III	Measures of dispersion: Range, Quartile deviation, mean deviation, Standard deviation, combined Standard deviation, and their relative measures	CO3	K1 K2 K3
UNIT-IV	Measures of Skewness: Karl Pearson's, Bowley's, and kelly's and co-efficient of Skewness and kurtosis based on moments.	CO4	K1 K2 K3
UNIT-V	Correlation - Karl Pearson - Spearman's Rank correlation - concurrent deviation methods. Regression Analysis:Simple Regression Equations.	CO5	K1 K2 K3 K4

Recommended Text Books

1. Fundamental of Mathematical Statistics-S.C.Gupta &V.K.Kapoor-Sultan Chand
2. Statistical Methods-Snedecor G.W.& Cochran W.G.oxford &+DII

Reference Books

1. Elements of Statistics -Mode. E.B.-Prentice Hall
2. Statistical Methods-Dr.S.P.Gupta-Sultan Chand &Sons

Website and e-learning source

https://www.simplilearn.com/what-is-statistical-analysis-article

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Learn the basics of statistical methods	K1,K2,K3
CO2	Understanding of measures of location	K1,K2,K3
CO3	understanding of measures of dispersion	K1,K2,K3
CO4	Understand about Measures of skewness	K1,K2,K3
CO5	Understand about correlation	K1,K2,K3,K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	2	2	1	1	-	-	1	2	1	3
CO2	2	1	3	1	2	-	1	-	-	1	2	1	2
CO3	3	1	3	1	2	1	1	-	-	1	2	1	3
CO4	3	1	3	2	2	-	1	-	-	1	2	1	2
CO5	3	1	3	2	2	1	1	-	-	1	2	1	2

COURSE DESCRIPTORS

Title of the Course	**NUMERICAL METHODS** (For BCA)	**Hours/Week**	04
Course Code	AUEMA12B	**Credits**	03
Category	ELECTIVE COURSE -I	**Year & Semester**	I & I
Prerequisites	12thStandard Mathematics	**Regulation**	2024

Objectives of the course:

- To Solve Practical Technical Problems using various Numerical Method Formulae
- To derive appropriate Numerical Methods to solve Algebraic, Transcendental Equations
- To know the Numerical Methods of Solving Simultaneous Linear Equations
- To Acquire Knowledge about Forward Difference and Backward Differences and their Relationship Knowledge about Central Difference Operators and Problems based on Various Central Difference Formulae

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Curve Fitting- Principle of Least square** Fitting of straight line $y = ax + b$ parabola$y = ax^2 + bx + c$ exponential curves of forms$y = ax^b, y = e^{bx}$, and $y = ab^x$.	CO1	K1 K2 K3
UNIT-II	**The solution of numerical algebraic and transcendental Equations:** Bisection method – Iteration Method – Regula Falsi Method – Newton– Raphson method	CO2	K1 K2 K3
UNIT-III	**Solution of simultaneous linear algebraic equations:** Gauss elimination method – Gauss Jordan method – Method of Triangularization – Gauss Jacobi method – Gauss Seidel method.	CO3	K1 K2 K3
UNIT-IV	**Finite differences** Operators Δ, ∇and E - relation between them — factorial polynomials. **Interpolation with equal intervals:** Gregory-Newton forward and backward- interpolation formulas.	CO4	K1 K2 K3
UNIT-V	**Central differences formulae** OperatorsΔ, ∇ and E relation with the other operators. Gauss forward and backward formulae, Stirling's formula and Bessel's formula.	CO5	K1 K2 K3

Recommended Text Books

1. P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite differences &Numerical Analysis, S. Chand & Company Ltd., New Delhi-55.

Reference Books

1. B.D. Gupta.(2001) *Numerical Analysis.*Konark Pub. Ltd., Delhi
8. M.K. Venkataraman. (1992) *Numerical methods for Science andEngineering* National Publishing Company, Chennai.
9. S. Arumugam. (2003) *Numerical Methods,* New Gamma Publishing,Palayamkottai.
10. H.C. Saxena. (1991) *Finite differences and Numerical analysis* S.Chand& Co., Delhi

Website and e-learning source

https://nptel.ac.in/courses/111107105

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Solve the problems of fitting of straight lines, parabolas and the different form of exponential curves	K1,K2,K3
CO2	Solve algebraic equations using various methods like Bisection method, Iteration method, Regula Falsi method and Newton – Raphson method	K1,K2,K3
CO3	Estimate the solution of simultaneous linear equations using different numerical methods	K1,K2,K3
CO4	Define basic concept of operators Δ, ∇and E, Solving interpolation with equal intervals problems using Gregory Newton‟s forward formula and Newton‟s backward formula	K1,K2,K3
CO5	Estimate the solution of central difference formula using the methods Gauss's forward, backward formula,Stirling's formula and Bessel,s formula	K1,K2,K3,

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	1	-	-	1	2	1	3
CO2	3	3	2	3	3	3	1	-	-	1	2	1	2
CO3	3	2	2	3	2	3	1	-	-	1	2	1	3
CO4	3	3	3	2	2	3	1	-	-	1	2	1	2
CO5	3	2	3	2	3	2	1	-	-	1	2	1	2

COURSE DESCRIPTORS

Title of the Course	**STATISTICAL METHODS AND ITS APPLICATIONS** (For AI)	**Hours/Week**	04
Course Code	AUEMA12A	**Credits**	03
Category	ELECTIVE COURSE -I	**Year & Semester**	I & I
Prerequisites	12thStandard Mathematics	**Regulation**	2024

Objectives of the course:

- Understand basic concepts of Statistical Methods
- Show an understanding of measures of location
- Show an understanding of measures of dispersion
- Show an Understand about Measures of Skewness
- Knowledge about correlation

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction - scope and limitations of statistical methods - classification of data -Tabulation of data- Diagrammatic and Graphical representation of data – Graphical, determination of Quartiles ,Deciles and Percentiles	CO1	K1 K2 K3
UNIT-II	Measures of location: Arithmetic mean, median, mode, geometric mean and Harmonic mean and their properties.	CO2	K1 K2 K3
UNIT-III	Measures of dispersion: Range, Quartile deviation, mean deviation, Standard deviation, combined Standard deviation, and their relative measures	CO3	K1 K2 K3
UNIT-IV	Measures of Skewness: Karl Pearson's, Bowley's, and kelly's and co-efficient of Skewness and kurtosis based on moments.	CO4	K1 K2 K3

UNIT-V	Correlation - Karl Pearson - Spearman's Rank correlation - concurrent deviation methods. Regression Analysis:Simple Regression Equations.	CO5	K1 K2 K3 K4

Recommended Text Books

3. Fundamental of Mathematical Statistics-S.C.Gupta &V.K.Kapoor-Sultan Chand
4. Statistical Methods-Snedecor G.W.& Cochran W.G.oxford &+DII

Reference Books

1. Elements of Statistics -Mode. E.B.-Prentice Hall
2. Statistical Methods-Dr.S.P.Gupta-Sultan Chand &Sons

Website and e-learning source

https://www.simplilearn.com/what-is-statistical-analysis-article

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Know the basics of statistical methods	K1,K2,K3
CO2	Understanding of measures of location	K1,K2,K3
CO3	Understanding of measures of dispersion	K1,K2,K3
CO4	Understand about Measures of skewness	K1,K2,K3
CO5	Understand about correlation, concurrent deviation method	K1,K2,K3,K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	2	2	1	1	-	-	1	2	2	1
CO2	2	1	3	1	2	-	1	-	-	1	2	2	1
CO3	3	1	3	1	2	1	1	-	-	1	2	2	1
CO4	3	1	3	2	2	-	1	-	-	1	2	2	1
CO5	3	1	3	2	2	1	1	-	-	1	2	2	1

COURSE DESCRIPTORS

Title of the Course	**RESOURCE MANAGEMENT TECHNIQUES** (For AI)	**Hours/Week**	04
Course Code	AUEMA12C	**Credits**	03
Category	ELECTIVE COURSE -I	**Year & Semester**	I & I
Prerequisites	Higher Secondary Mathematics	**Regulation**	2024

Objectives of the course:

- To learn the basic concept of operation research theory which are frequently applied to business decision making
- To acquire the knowledge about linear programming problems
- Knowledge about simplex methods.
- To acquire knowledge about Mathematical formulation of transportation problem
- Knowledge about Mathematical formulation of transportation problem

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Development of OR -Definition of OR -Modelling in OR -general methods for solving OR models -Main characteristics and phases of OR study -tools, techniques and methods –scientific methods in OR – scope of OR.	CO1	K1 K2 K3
UNIT-II	Linear programming problems-Mathematical formulation of L.P.P.-slack and surplus variables -graphical solution of L.P.P.	CO2	K1 K2 K3
UNIT-III	Simplex methods- Computational procedure- Artificial variables Technique- two phase method-Duality in linear programming	CO3	K1 K2 K3
UNIT-IV	Mathematical formulation of assignment problem,-Method for solving The assignment problem.	CO4	K1 K2 K3
UNIT-V	Mathematical formulation of transportation problem-optimal solution of T.P.-Methods for obtaining initial feasible solution-optimal solution-Degeneracy in T.P.-Unbalanced T.P	CO5	K1 K2 K3 K4

Recommended Text Books

1. Operations Research-S.D.Sharma-KedarNath Ramnath&Co-1997.Chapter1to6(all sections)

Reference Books

1.OperationsResearchGupta,ManMohan,Gandhiswarup-Sulthand-ChandPublications
2.Ackoff R.L. and Sasieni M. W," Fundamentals of Operations Research", John Wiley and sons New York 1968
3.Chames A.CooperW.andHendersenA.,"IntroductiontoLinearProgramming",WileyandSons New York
4.Srinath L.S,"PERT and CPM principles and applications ",Affiliated East West Press Pvt.Ltd. New York.

Website and e-learning source

htt11://ebooks.i11ude.in.011erationsresearch/

htt11://ocw.mit.in/

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	To develop skills for decision making.	K1,K2,K3
CO2	To make use of Linear programming problems	K1,K2,K3
CO3	To make use of Simplex methods	K1,K2,K3
CO4	To make use of Mathematical formulation of assignment problem	K1,K2,K3
CO5	To utilize Mathematical formulation of transportation problem	K1,K2,K3,K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	1	-	-	1	2	2	1
CO2	3	3	2	3	3	3	1	-	-	1	2	2	1
CO3	3	2	2	3	2	3	1	-	-	1	2	2	1
CO4	3	3	3	2	2	3	1	-	-	1	2	2	1
CO5	3	2	3	2	3	2	1	-	-	1	2	2	1

COURSE DESCRIPTORS			
Title of the Course	**MATHEMATICAL STATISTICS-I** (For Data Science)	**Hours/Week**	04
Course Code	AUEMA13A	**Credits**	03
Category	ELECTIVE COURSE -I	**Year & Semester**	I & I
Prerequisites	12thStandard Mathematics	**Regulation**	2024

Objectives of the course:

- Understand basic concepts of Statistical Methods
- Have a basic understanding of measures of location
- Have a basic understanding of measures of dispersion
- Understand about Measures of Skewness
- Understand about correlation

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction - scope and limitations of statistical methods - classification of data -Tabulation of data- Diagrammatic and Graphical representation of data – Graphical, determination of Quartiles ,Deciles and Percentiles	CO1	K1 K2 K3
UNIT-II	Measures of location: Arithmetic mean, median, mode, geometric mean and Harmonic mean and their properties.	CO2	K1 K2 K3
UNIT-III	Measures of dispersion: Range, Quartile deviation, mean deviation, Standard deviation, combined Standard deviation, and their relative measures	CO3	K1 K2 K3
UNIT-IV	Measures of Skewness: Karl Pearson's, Bowley's, and kelly's and co-efficient of Skewness and kurtosis based on moments.	CO4	K1 K2 K3
UNIT-V	Correlation - Karl Pearson - Spearman's Rank correlation - concurrent deviation methods. Regression Analysis: Simple Regression Equations.	CO5	K1 K2 K3 K4

Recommended Text Books

5. Fundamental of Mathematical Statistics-S.C.Gupta &V.K.Kapoor-Sultan Chand

Reference Books

1. Elements of Statistics -Mode. E.B.-Prentice Hall
2. Statistical Methods-Dr.S.P.Gupta-Sultan Chand &Sons

Website and e-learning source

https://www.simplilearn.com/what-is-statistical-analysis-article

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Know the basics of statistical methods	K1,K2,K3
CO2	Understanding of measures of location	K1,K2,K3
CO3	Understanding of measures of dispersion	K1,K2,K3
CO4	Understand about Measures of skewness	K1,K2,K3
CO5	Understand about correlation, concurrent deviation method	K1,K2,K3,K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	2	2	1	1	-	-	1	3	2	1
CO2	2	1	3	1	2	-	1	-	-	1	3	2	1
CO3	3	1	3	1	2	1	1	-	-	1	3	2	1
CO4	3	1	3	2	2	-	1	-	-	1	3	2	1
CO5	3	1	3	2	2	1	1	-	-	1	3	2	1

COURSE DESCRIPTORS

Title of the Course	**NUMERICAL METHODS-I** (For Data Science)	**Hours/Week**	04
Course Code	AUEMA13B	**Credits**	03
Category	ELECTIVE COURSE -I	**Year & Semester**	I & I
Prerequisites	12thStandard Mathematics	**Regulation**	2024

Objectives of the course:

- To Solve Practical Technical Problems using various Numerical Method Formulae
- To derive appropriate Numerical Methods to solve Algebraic, Transcendental Equations
- To know the Numerical Methods of Solving Simultaneous Linear Equations
- To Acquire Knowledge about Forward Difference and Backward Differences and their Relationship Knowledge about Central Difference Operators and Problems based on Various Central Difference Formulae

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Curve Fitting- Principle of Least square** Fitting of straight line $y = ax + b$ parabola$y = ax^2 + bx + c$ exponential curves of forms$y = ax^b, y = e^{bx}$, and $y = ab^x$.	CO1	K1 K2 K3
UNIT-II	**The solution of numerical algebraic and transcendental Equations:** Bisection method – Iteration Method – Regula Falsi Method – Newton– Raphson method	CO2	K1 K2 K3
UNIT-III	**Solution of simultaneous linear algebraic equations:** Gauss elimination method – Gauss Jordan method – Method of Triangularization – Gauss Jacobi method – Gauss Seidel method.	CO3	K1 K2 K3
UNIT-IV	**Finite differences** Operators Δ, ∇ and E - relation between them — factorial polynomials. **Interpolation with equal intervals:** Gregory-Newton forward and backward- interpolation formulas.	CO4	K1 K2 K3
UNIT-V	**Central differences formulae** Operators μ, δ and relation with the other operators,Gauss forward and backward formulae, Stirling's formula and Bessel's formula.	CO5	K1 K2 K3

Recommended Text Books

1. P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite differences &Numerical Analysis, S. Chand & Company Ltd., New Delhi-55.

Reference Books

1. B.D. Gupta.(2001) *Numerical Analysis.*Konark Pub. Ltd., Delhi
11. M.K. Venkataraman. (1992) *Numerical methods for Science andEngineering* National Publishing Company, Chennai.
12. S. Arumugam. (2003) *Numerical Methods*, New Gamma Publishing,Palayamkottai.
13. H.C. Saxena. (1991) *Finite differences and Numerical analysis* S.Chand& Co., Delhi

Website and e-learning source

https://nptel.ac.in/courses/111107105

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Solve the problems of fitting of straight lines, parabolas and the different form of exponential curves	K1,K2,K3
CO2	Solve algebraic equations using various methods like Bisection method, Iteration method, Regula Falsi method and Newton – Raphson method	K1,K2,K3
CO3	Estimate the solution of simultaneous linear equations using different numerical methods	K1,K2,K3
CO4	Define basic concept of operators Δ, ∇and E, Solving interpolation with equal intervals problems using Gregory Newton‟s forward formula and Newton‟s backward formula	K1,K2,K3
CO5	Estimate the solution of central difference formula using the methods Gauss's forward, backward formula,Stirling's formula and Bessel,s formula	K1,K2,K3,

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	1	-	-	1	3	2	1
CO2	3	3	2	3	3	3	1	-	-	1	3	1	1
CO3	3	2	2	3	2	3	1	-	-	1	3	1	1
CO4	3	3	3	2	2	3	1	-	-	1	3	2	1
CO5	3	2	3	2	3	2	1	-	-	1	3	1	1

COURSE DESCRIPTORS

Title of the Course	**MATHEMATICS–I (For Chemistry)**	**Hours/Week**	04
Course Code	AUEMA 13	**Credits**	03
Category	ELECTIVE COURSE -I	**Year & Semester**	I & I
Prerequisites	12thStandard Mathematics	**Regulation**	2024

Objectives of the course:

- To discuss and analyze the concept of Binomial series-Exponential series- Logarithmic series.
- To be familiar with Computation of inverse of matrix using Cayley-Hamilton theorem.
- To solve the Newton's forward and back ward interpolation formulae.
- To solve the Successive differentiation ,nth derivatives ,Leibnitz theorem

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Summation of series**: Binomial series-Exponential series-Logarithmic series-Simple Problems. **Chapter2: Sections: 2.1.3, 2.2, 2.2.1, 2.3, 2.3.3.**	CO1	K1 K2 K3
UNIT-II	**Matrices**: Symmetric–Skew-Symmetric–Hermitian–Skew –Hermitian–Orthogonal and Unitary matrices–Cayley- Hamilton theorem (with out proof) – Verification- Computation of inverse of matrix using Cayley-Hamilton theorem. **Chapter4: Sections: 4.1.1–4.1.6,4.5.2and4.5.3.**	CO2	K1 K2 K3
UNIT-III	**Numerical Methods:** Newton's method to find a root approximately. **Finite Differences** :Interpolation :Operators ,Δ, ∇,E, E^{-1}differencetables.Interpolationformulae:Newton's forward and back ward interpolation formulae for equal intervals, Lagrange's interpolation formula. **Chapter3:Sections3.4.1.Chapter5:Sections:5.1and5.2.**	CO3	K1 K2 K3
UNIT-IV	**Trigonometry**: Expansions of $\sin^n\theta$,$\cos^n\theta$, in a series of powers of sinθ and cosθ- Expansions of sin(nθ) and cos(nθ) in a series sines and cosines of multiples of "θ"-Expansions of sinθ, cosθ and tanθ in a series of powers of "θ"– Hyperbolic and inverse hyperbolic functions . **Chapter6:Section6.1–6.3**	CO4	K1 K2 K3

UNIT-V	**Differential Calculus:** Successive differentiation, nth derivatives, Leibnitz theorem (with out proof) and applications, Jacobians, maxima and minima of functions of two variables-Simple problems **Chapter1, Section1.1to1.3.1.**	CO5	K1 K2 K3

Recommended Text Books

1.Allied Mathematics, Volume I and Volume II by P. Duraipandian and S.Udayabaskaran, S. Chand Publications

Volume-I:UnitI–IV, Volume-II–Unit-V

Reference Books

1. Ancillary Mathematics by S .Narayanan and T.K.Manickavachagom Pillay,S.ViswanathanPinters,1986,Chennai
2. Allied Mathematics by A.Singaravel
3. Allied Mathematics by P.R.Vittal

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Understand the concepts of Summation of Series.	K1,K2,K3
CO2	Understand the concepts of Cayley Hamilton Theorem and inverse matrices.	K1,K2,K3
CO3	Understand the concepts of finite differences.	K1,K2,K3
CO4	Understand the knowledge about expansions, hyperbolic and inverse hyperbolic functions	K1,K2,K3
CO5	Understand the concept of Leibnitz theorem and functions of two variables	K1,K2,K3,

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	1	3	1	1	1	-	-	1	2	2	1
CO2	3	2	1	3	1	1	1	-	-	1	2	2	1
CO3	3	2	1	3	1	1	1	-	-	1	2	2	1
CO4	3	3	1	3	1	1	1	-	-	1	2	2	1
CO5	3	2	1	3	1	1	1	-	-	1	2	2	1

COURSE DESCRIPTORS

Title of the Course	ANALYTICAL GEOMETRY (Two & Three Dimensions)	Hours/Week	05
Course Code	AUCMA21	Credits	05
Category	Core - 3	Year & Semester	I & II
Prerequisites	12th Standard Mathematics	Regulation	2024

Objectives of the Course:

- To understand and apply the concept of homogeneous equations of second degree to represent straight lines in different forms.
- To derive polar equations for straight lines, circles, and conic sections, and analyze their geometric properties.
- To formulate general equations of planes, calculate angles between two planes, and determine perpendicular distances.
- To calculate the angle between a line and a plane, determine the length of perpendiculars, and analyze coplanar and skew lines.
- To originate equations of spheres, determine lengths of tangents, and analyze sections of spheres.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Pair of Straight lines** Introduction – Homogeneous equation of second degree – Angle between the lines – Equation for the bisector of the angle between the lines – Condition for a second degree equation to represent a pair of straight lines. **(Chapter 3: Sections 3.1 - 3.5 Pages: 89 - 129).**	CO1	K1 K2 K3 K4
UNIT-II	**Polar Coordinates** Introduction – Definition of polar coordinates – Relation between Cartesian coordinates and Polar coordinates – polar equation of a straight line – circle – Polar equation of a conic. **(Chapter 9: Sections: 9.1 – 9.7.1 Pages: 480 - 500).**	CO2	K1 K2 K3 K4,K5
UNIT-III	**Plane** Introduction – General equations of plane – Angle between two planes - Perpendicular distance – Plane passing through: Three given points, Intersection of two given planes – Condition for a second degree equation to represent a pair of planes. **(Chapter 12: Sections: 12.1 – 12.12 Pages 585 - 629).**	CO3	K1 K2 K3 K4,K5
UNIT-IV	**Straight Lines** Introduction – Equations of straight Lines – Angle between a line and plane – Length of the perpendicular – Coplanar lines – Skew lines – Intersection of three planes. **(Chapter 13: Sections: 13.1 – 13.12 Pages: 630 – 647, 648 - 686).**	CO4	K1 K2 K3 K4,K5

UNIT-V	**Sphere** Equations of sphere – Length of the tangent – Section of a sphere – Equation of circle – Intersection of two spheres – Condition for the orthogonality – Radical planes. **(Chapter 14: Sections: 14.1 – 14.11 Pages: 687 – 695, 699 - 727).**	CO5	K1 K2 K3 K4 K5

Recommended Text Books

1.P.R.Vittal, Analytical Geometry 2D and 3D, Pearson Publications,Chennai.

Reference Books

1. P.Duraipandian and Laxmi Duraipandian, Analytical Geometry Two dimensions, Emerald Publication.
2. Shanti Narayan and P.K.Mittal, Analytical Solid Geometry of3D, S. Chand Publication
3. Manicavasagam Pillay&Natarajan, Analytical Geometry of Two dimensions, S. Viswanathan (printers & publication) Pvt Ltd.
4. Manicavasagam Pillay & Natarajan, Analytical Geometry of Three dimensions, S. Viswanathan (printers & publication) Pvt Ltd.

Website and e-learning source

https://mathworld.wolfram.com/
http://www.univie.ac.at/future.media/moe/galarie.html/

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Apply the concept of homogeneous equations of second degree to represent straight lines indifferent forms.	K1,K2,K3,K4
CO2	Derive polar equations for straight lines, circles, and conic sections, and analyze their geometric properties.	K1,K2,K3,K4,K5
CO3	Formulate general equations of planes, calculate angles between two planes, and determine perpendicular distances.	K1,K2,K3,K4,K5
CO4	Calculate the angle between a line and a plane, determine the length of perpendiculars, and analyze coplanar and skew lines.	K1,K2,K3,K4,K5
CO5	Formulate equations of spheres, determine lengths of tangents, and analyze sections of spheres.	K1,K2,K3,K4,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	1	1	-	-	1	3	2	2
CO2	3	2	3	2	2	-	1	-	-	1	3	2	2
CO3	3	2	3	2	2	1	1	-	-	1	3	2	2
CO4	3	2	3	2	2	-	1	-	-	1	3	2	2
CO5	3	2	3	2	2	1	1	-	-	1	3	2	2

COURSE DESCRIPTORS

Title of the Course	INTEGRAL CALCULUS	Hours/Week	05
Course Code	AUCMA22	Credits	05
Category	Core - 4	Year & Semester	I & II
Prerequisites	12th Standard Mathematics	Regulation	2024

Objectives of the Course:

- Knowledge on integration and its geometrical applications, double,triple integrals and improper integrals.
- Knowledge about Beta and Gamma functions and their applications.
- Skills to Determine Fourier series expansions.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Reduction formulae -Types, integration of product of powers of algebraic and trigonometric functions, integration of product of powers of algebraic and logarithmic functions - Bernoulli's formula. **Chapter 1 : Sections : 13, 13.1 to 13.10, 14, 15.1**	CO1	K1 K2 K3 K4,K5
UNIT-II	Multiple Integrals - definition of double integrals - evaluation of double integrals – double integrals in polar coordinates - Change of order of integration. **Chapter 5 : Sections : 1, 2.1, 2.2, 3.1**	CO2	K1 K2 K3 K4,K5
UNIT-III	Triple integrals –applications of multiple integrals - volumes of solids of revolution - areas of curved surfaces–change of variables – Jacobian **Chapter 5 : Sections : 4, 5.1 to 5.3,6.1,6.2** **Chapter 6 : Sections : 1.1,1.2,2.1 to 2.3**	CO3	K1 K2 K3 K4,K5
UNIT-IV	Beta and Gamma functions – infinite integral - definitions–recurrence formula of Gamma functions – properties of Beta and Gamma functions- relation between Beta and Gamma functions - Applications. **Chapter 7: Sections 1.1 to 1.4, 2.1, 2.3 , 3 to 6**	CO4	K1 K2 K3 K4,K5
UNIT-V	**Geometric Applications of Integrations** Areas in polar co-ordinate, Trapezoidal Rule, Simpson's Rule, Length of a curve–Cartesian co-ordinate–Polar co-ordinate–Area of surface of revolution. **Chapter2:Sections :1.4,2.1,2.2,4,4.1,4.2&5**	CO5	K1 K2 K3 K4,K5

Recommended Text Books

1. Calculus, Volume II, by S. Narayanan and T.K Manicavachagom Pillay.–S.Viswanathan, Publishers-2016

Reference Books

1. H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons,Inc., 2002.
2. G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2007.
3. D.Chatterjee, Integral Calculus and Differential Equations, Tata- McGraw Hill Publishing Company Ltd.
4. P. Dyke, An Introduction to Laplace Transforms and Fourier Series,Springer Undergraduate Mathematics Series,2001(second edition).

Website and e-learning source

https://nptel.ac.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Determine the integrals of algebraic, trigonometric and logarithmic functions and to find the reduction formulae	K1,K2,K3,K4,K5
CO2	Evaluate double and triple integrals and problems using change of order of integration	K1,K2,K3,K4,K5
CO3	Solve multiple integrals and to find the areas of curved surfaces and volumes of solids of revolution	K1,K2,K3,K4,K5
CO4	Explain beta and gamma functions and to use them in solving problems of integration	K1,K2,K3,K4,K5
CO5	Explain Geometric and Physical applications of integral calculus	K1,K2,K3,K4,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	-	-	-	1	-	-	1	3	2	2
CO2	2	2	3	-	-	-	1	-	-	1	3	2	2
CO3	3	2	3	2	-	-	1	-	-	1	3	2	2
CO4	3	2	3	2	2	-	1	-	-	1	3	2	2
CO5	3	2	3	2	2	-	1	-	-	1	3	2	2

COURSE DESCRIPTORS

Title of the Course	**NUMERICAL METHODS –II** (For B.Sc., Mathematics, B.Sc., Computer Science and B.Sc., Data Science)	**Hours/Week**	04
Course Code	**AUEMA23B**	**Credits**	03
Category	Elective Course -II	**Year & Semester**	I & II
Prerequisites	12th Standard Mathematics	**Regulation**	2024

Objectives of the Course:

- To evaluate derivatives using Newton's forward and backward differences formulae
- To acquire the knowledge about evaluation of numerical integration.
- To evaluate the solution of linear homogeneous difference equations with constant coefficients.
- To obtain numerical solutions to the ordinary differential equations.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Numerical Differentiation:** Derivatives using Newton's Forward and Backward Difference Formulae Derivatives using Stirling's Formula- Derivatives using Divided Difference Formula- Maxima and Minima using the above Formulae. **(Chapter 7 :Section 7.1 to 7.4 & 7.6)**	CO1	K1 K2 K3 K4,K5
UNIT-II	**Numerical Integration:** Trapezoidal Rule-Simpson's One-Third Rule - Simpson's Three-Eighth Rule- Weddle's Rule. **(Chapter 7 :Section 7.9 & 7.13 to 7.15)**	CO2	K1 K2 K3 K4,K5
UNIT-III	**Difference Equations:** Linear Homogenous and Non Homogenous Difference Equation with constant coefficients- particular integrals for a^x, x^m, sin kx, cos kx $a^x F(x)$. **(Chapter 8 :Section 8.1 to 8.4 & 8.6)**	CO3	K1 K2 K3 K4,K5
UNIT-IV	**Numerical solution of Ordinary Differential Equations (I order only):** Taylor's series method- Picard's method. **(Chapter 9: Section 9.5 ,9.6)**	CO4	K1, K2, K3 K4,K5
UNIT-V	**Numerical solution of Ordinary Differential Equations (I order only):** Euler's Method- Modified Euler's Method-Runge-Kutta Method (Fourth Order only). **(Chapter 9 : Section 9.7,9.9 to 9.11)**	CO5	K1 K2 K3 K4,K5

Recommended Text Book:

1. P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite differences & Numerical Analysis, S. Chand & Company Ltd., New Delhi-55.

Reference Books:

1.Dr.P.Kandasamy, Dr.K.Thilagavathy Dr.Gunavathi –Numerical Methods, S. Chand Publications(2023)
2. B.D. Gupta.(2001) *Numerical Analysis.*Konark Pub. Ltd., Delhi
3. M.K. Venkataraman. (1992) *Numerical methods for Science and Engineering* National PublishinCompany, Chennai.
4. S. Arumugam. (2003) *Numerical Methods*, New Gamma Publishing,Palayamkottai.
5. H.C. Saxena. (1991) *Finite differences and Numerical analysis*S.Chand& Co., Delhi

Website and e-learning source

https://ocw.mit.edu/courses/22-15-essential-numerical-methods-fall- 2014/pages/syllabus/
https://ocw.mit.edu/courses/18-330-introduction-to-numerical- analysis-spring-2004

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Evaluate derivatives by applying Newton's forward and backward differences formulae.	K1,K2,K3,K4,K5
CO2	Evaluate integrations by applying the trapezoidal rule, Simpson's rules, and Weddle's rule.	K1,K2,K3,K4,K5
CO3	Find a complete solution to lineardifference equations.	K1,K2,K3,K4,K5
CO4	Estimate approximate numerical solutions of ordinary differential equations by Euler, Picard and Taylor.	K1,K2,K3,K4,K5
CO5	Estimate approximate numerical solutions of ordinary differential equations by Runge-Kutta methods.	K1,K2,K3,K4,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	2	2	1	1	-	-	1	3	2	1
CO2	2	1	3	1	2	-	1	-	-	1	3	2	1
CO3	3	1	3	1	2	1	1	-	-	1	3	2	1
CO4	3	1	3	2	2	-	1	-	-	1	3	2	1
CO5	3	1	3	2	2	1	1	-	-	1	3	2	1

COURSE DESCRIPTORS

Title of the Course	OFFICE AUTOMATION	Hours/Week	02
Course Code	AUSMA24	Credits	02
Category	Skill Enhancement Course	Year & Semester	I & II
Prerequisites	12th Standard Mathematics	Regulation	2024

Objectives of the Course:

- The major objective in introducing the Computer Skills course is to impart training for students in Microsoft Office which has different components like MS Word, MS Excel and Power point. Applying the concept of time and distance.
- The course is highly practice oriented rather than regular class room teaching.
- To acquire knowledge on editor, spread sheet and presentation software.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introductory concepts: Hardware and Software - Memory unit – CPU-Input Devices: Key board, Mouse and Scanner. Output devices: Monitor, Printer. Introduction to Operating systems.	CO1	K1 K2 K3 K4
UNIT-II	Word Processing: File menu operations - Editing text – tools, formatting, bullets and numbering - Document formatting – Paragraph alignment, headers and footers, printing – Preview, options, merge.	CO2	K1 K2 K3 K4
UNIT-III	Spreadsheets: Excel – opening, entering text and data, formatting, navigating; Formulas – entering, handling and copying	CO3	K1 K2 K3 K4
UNIT-IV	Charts – creating, formatting and printing, analysis tables, preparation of financial statements.	CO4	K1 K2 K3K4
UNIT-V	Power point: Introduction to Power point - Features – Understanding slide typecasting & viewing slides – creating slide shows. Applying special object – including objects & pictures – Slide transition – Animation effects.	CO5	K1 K2 K3 K4,K6

Recommended Text Book:

1. Peter Norton, "Introduction to Computers" –Tata McGraw-Hill.

Reference Books:

1. Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, "Microsoft 2003", Tata McGraw- Hill

Website and e-learning source

Web content from NDL / SWAYAM or open source web resources

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Understand the basics of computer systems and its components.	K1,K2,K3,K4
CO2	Understand and apply the basic concepts of a word processing package	K1,K2,K3,K4
CO3	Understand and apply the basic concepts of electronic spreadsheet software	K1,K2,K3,K4
CO4	Understand and apply the basic concepts of database management system	K1,K2,K3,K4
CO5	Understand and create a presentation using PowerPoint tool	K1,K2,K3,K4,K6

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	1	-	-	1	-	-	1	3	2	1
CO2	3	1	3	1	-	-	1	-	-	1	3	2	1
CO3	3	1	3	1	-	-	1	-	-	1	3	2	1
CO4	3	1	3	1	-	-	1	-	-	1	3	2	1
CO5	3	1	3	1	-	-	1	-	-	1	3	2	1

COURSE DESCRIPTORS

Title of the Course	MATHEMATICS FOR COMPETITIVE EXAMINATIONS-II	Hours/Week	02
Course Code	AUSMA25	Credits	02
Category	Skill Enhancement Course	Year & Semester	I & II
Prerequisites	12th Standard Mathematics	Regulation	2024

Objectives of the Course:

- After taking the course, to prepare the students for competitive examinations.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Time and work – Time and distance – Problems onTrains. **(Book-1:Chapters-15,17,18)**	CO1	K1 K2 K3 K4
UNIT-II	Simple interest, Compound Interest–Bar graphs. **(Book-1:Chapters-21, 22, 37)**	CO2	K1 K2 K3 K4
UNIT-III	Logical Sequence of Words–Arithmetical Reasoning– Inserting the Missing Character. **(Book-2,Section:1,Chapters13–15)**	CO3	K1 K2 K3 K4
UNIT-IV	Data Sufficiency–Decision Making– Verification of Truth of the Statement. **(Book-2, Section: 1, Chapters-16, 17, 20)**	CO4	K1 K2 K3 K4,K5
UNIT-V	Non-Verbal Reasoning–Analytical Reasoning– Grouping of Identical Figures. **(Book-2,Section:3,Chapter-3,4,13)**	CO5	K1 K2 K3 K4,K5

Recommended Text Books:

1. R.S.Aggarwal, *Quantitative Aptitude for Competitive Examinations*, Revised Edition, S.Chand and Company Ltd., Ram Nagar, NewDelhi, Reprint 2022.
2.R.S.Agarwal, *A Modern Approach To Verbal And Nonverbal Reasoning*, S..Chand, 2018.

Reference Books:

1.V.V.K.Subbiraj,*Test of Reasoning–Verbal/Non-Verbal & General Intelligence for Competitive Examinations*, Sura Books,2007

Website and e-learning source:

www.tcyonline.com/tests/mathematics-competitive-examhttp://www.indiabix.com/online-test/non-verbal-reasoning-test/http://books.tamilcube.com/career/aptitude-test/non-verbal-reasoning/non-verbal-reasoning-questions-001.aspx

https://www.kent.ac.uk/careers/tests/spatialtest.htmhttp://www.careerbless.com/aptitude/qa/home.phphttp://www.careerride.com/online- aptitude-test.aspx

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Make critique of quantitative information using Proportional reasoning	K1,K2,K3,K4
CO2	Interpret and compare weighted averages, indices, ranking.	K1,K2,K3,K4
CO3	Identify uses and misuses of percentages related to a proper Understanding of the bases.	K1,K2,K3,K4
CO4	Examining and estimating percentages a sratesper100	K1,K2,K3,K4,K5
CO5	Solve for an unknown quantity in proportional situation	K1,K2,K3,K4,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	-	-	-	1	-	-	1	3	2	1
CO2	2	1	3	1	-	-	1	-	-	1	3	2	1
CO3	3	1	3	1	-	-	1	-	-	1	3	2	1
CO4	3	1	3	-	-	-	1	-	-	1	3	2	1
CO5	3	1	3	-	-	-	1	-	-	1	3	2	1

COURSE DESCRIPTORS

Title of the Course	**DISCRETE MATHEMATICS-II** (For B.Sc., Computer Science)	**Hours/Week**	04
Course Code	**AUEMA23C**	**Credits**	03
Category	Elective Course -II	**Year & Semester**	I & II
Prerequisites	12th Standard Mathematics	**Regulation**	2024

Objectives of the Course:

- This course aims to develop mathematical maturity and ability to dealwith abstraction.
- To develop construction and verification of Formal logical manipulation.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**RECURRENCE RELATIONS AND GENERATING FUNCTIONS** Recurrence - Polynomials and their Evaluations - Recurrence Relations - Solution of Finite Order Homogeneous [linear] Relations - Solutions of Non-homogeneous Relations. **(Chapter -V. Sections:1 to 5)**	CO1	K1 K2 K3 K4
UNIT-II	**MATHEMATICAL LOGIC** TF Statements - Connectives - Atomic and Compound Statements - Well-formed [Statement Formulae]- Truth Table of a Formula- Tautology-Tautological Implications and Equivalence of Formulae. **(Chapter - IX . Sections:1 to 8)**	CO2	K1 K2 K3 K4
UNIT-III	**MATHEMATICAL LOGIC [CONTD..]** Replacement process - Functionally complete sets of connectives and Duality law – Normal Forms-Principal Normal Forms. **(Chapter - IX . Sections:9 to 12)**	CO3	K1 K2 K3 K4
UNIT-IV	**LATTICES** Lattices [omit example 15 PpNo.10.6]- Some properties of Lattices - New Lattices (omit remark Pp 10.14)-Modular and Distributive Lattices (omit theorem 10 and 17,Example 4-Pp10.23, Example 11-Pp10.24) **(Chapter - X . Sections:1 to 4)**	CO4	K1 K2 K3 K4
UNIT-V	**BOOLEAN ALGEBRA** Boolean Algebra (omit theorem 25) - Boolean Polynomials- Karnaugh Maps (omit K- map for 5 and 6 variables) **(Chapter - X . Sections:5 to 7)**	CO5	K1 K2 K3 K4,K5

Recommended Text Book:

1. M.K.Venkataraman, N.Sridharan and N.Chandrasekaran, [2003] Discrete Mathematics, The National Publishing company, chennai

Reference Books:

1. Oscar Levin, Discrete Mathematics, 3rd Edition,2016.
2. B. A. Davey & H. A. Priestley (2002). *Introduction to Lattices and Order* (2nd edition). Cambridge University Press.
3. Edgar G. Goodaire& Michael M. Parmenter (2018). *Discrete Mathematics with Graph Theory* (3rd edition). Pearson Education.
4. Rudolf Lidl& Günter Pilz (1998). *Applied Abstract Algebra* (2nd edition). Springer.
5. Kenneth H. Rosen (2012). *Discrete Mathematics and its Applications*: *WithCombinatorics and Graph Theory* (7th edition). McGraw-Hill.
6.C. L. Liu (1985). *Elements of Discrete Mathematics* (2nd edition).McGraw-Hill.

Website and e-learning source

https://nptel.ac.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Analyze and perceive various graph theoretic concepts and familiarize with their applications.	K1,K2,K3,K4
CO2	Describe about partially ordered sets, Boolean algebra, lattices and their types.	K1,K2,K3,K4
CO3	Apply Karnaugh map for simplifying the Boolean expression	K1,K2,K3,K4
CO4	Demonstrate the skill to construct simple mathematical proofs and to validate.	K1,K2,K3,K4
CO5	Achieve greater accuracy, clarity of thought and language.	K1,K2,K3,K4,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	1	1	-	-	1	1	1	1
CO2	2	2	3	3	2	-	1	-	-	1	1	1	1
CO3	3	3	3	3	2	1	1	-	-	1	1	2	1
CO4	3	2	3	3	2	-	1	-	-	1	1	2	1
CO5	3	2	3	3	2	1	1	-	-	1	1	2	1

COURSE DESCRIPTORS

Title of the Course	**STATISTICAL METHODS AND ITS APPLICATIONS-II** (For BCA)	**Hours/Week**	04
Course Code	**AUEMA22A**	**Credits**	03
Category	Elective Course -II	**Year & Semester**	I & II
Prerequisites	12th Standard Mathematics	**Regulation**	2024

Objectives of the Course:

- To increase the span of attention of concepts
- . To link concepts related to one unit with other units
- Give clarity on the intended learning outcomes of the unit.
- To acquire knowledge about Test of Significance-and Analysis of variance.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Probability** Sample Space-events-probability-Addition and Multiplication Theorem-conditional probability - Baye's Theorem and simple problems	CO1	K1 K2 K3 K4
UNIT-II	**Probability Distribution** Binomial, Poisson, Normal distribution and fitting distribution	CO2	K1 K2 K3 K4
UNIT-III	**Index Number** Weighted and UN weighted Index Numbers – Cost of Living Index Number – Average of Relative Price Indices-Quality Index Number-Teston index Numbers- Time reversal test, Factors reversal test.	CO3	K1 K2 K3 K4
UNIT-IV	**Test of Significance (Small Samples Tests)** Small sample tests with regard to Mean, Difference between Means andPaired _t- test , F-test - Definition of Chi-square test – Assumptions – Characteristics– Chi-square tests for Goodness of fit and Independenceof attributes – Simple Problems.	CO4	K1 K2 K3 K4
UNIT-V	Analysis of variance –One and Two way classifications-Basic principleof design of Experiments Randomization, L.S.D.	CO5	K1 K2 K3 K4

Recommended Text Book:

1. Fundamental of Mathematical Statistics-S.C. Gupta&V.K. Kapoor-SultanChand

Reference Books:

1. Fundamental of Applied Statistics-S.C.Gupta& V.K.Kapoor–Sultan Chand
2. Statistical Methods-Snedeco rG.W.& Cochran W.G. oxford &+DII

Website and e-learning source

https://nptel.ac.in/courses/111107105

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Increase the span of attention of concepts	K1,K2,K3,K4
CO2	Understand Probability Distribution	K1,K2,K3,K4
CO3	Understand about Index Number	K1,K2,K3,K4
CO4	Acquire knowledge about Test of Significance.	K1,K2,K3,K4
CO5	Knowledge about Analysis of variance.	K1,K2,K3,K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	2	2	1	1	-	-	1	2	1	3
CO2	2	1	3	1	2	-	1	-	-	1	2	1	2
CO3	3	1	3	1	2	1	1	-	-	1	2	1	3
CO4	3	1	3	2	2	-	1	-	-	1	2	1	2
CO5	3	1	3	2	2	1	1	-	-	1	2	1	2

COURSE DESCRIPTORS

Title of the Course	**RESOURCE MANAGEMENT TECHNIQUES** (For BCA)	**Hours/Week**	04
Course Code	**AUEMA22C**	**Credits**	03
Category	Elective Course -II	**Year & Semester**	I & II
Prerequisites	12th Standard Mathematics	**Regulation**	2024

Objectives of the Course:

- To learn the basic concept of operation research theory which are frequently applied to business decision making
- To acquire the knowledge about linear programming problems
- Knowledge about simplex methods.
- To acquire knowledge about Mathematical formulation of transportation problem.
- Knowledge about Mathematical formulation of transportation problem

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction to Operation Research - Scope - LPP - Graphical Method -Simplex Method of solving Linear Programming Problems (Simple problems only)	CO1	K1 K2 K3 K4,K5
UNIT-II	Transportation Model - Basic Feasible Solution –Northwest corner-leastcost method – VAM- balanced & unbalanced TP.	CO2	K1 K2 K3 K4,K5
UNIT-III	Assignment Model and Assignment Algorithm –Unbalanced Maximization & minimization - Restricted Assignment problems.	CO3	K1 K2 K3 K4,K5
UNIT-IV	Project Management - Network Analysis – CPM - Network Construction- Critical Path and Duration - PERT - Time Estimates for PERT –projectlength - distinction Between PERT and CPM.	CO4	K1 K2 K3 K4,K5

UNIT-V	Game Theory - Meaning - Rules of Game - Saddle Point - Pure strategies– value of the game – Dominance Property - Different Methods ofSolving Game Theory problems (No LPP Method).	CO5	K1 K2 K3 K4,K5

Recommended Text Book:

1. P.R. Vittal &V.Malini Operation Research, Margham publications, Chennai 2018.
2. V.K Kapoor , Operation Research Techniques for Management, Sultan Chand & sons, New Delhi 2017.

Reference Books:

1. M.Sathya Narayana & Lalitha Raman, Operations Research, Himalaya publishing house, Mumbai, 2001
2. Dr.P.K Gupta & DR. Manmohan, problems in Operations Research, Sultan Chand & sons New Delhi 2018.

Website and e-learning source

htt11://ebooks.i11ude.in.011erationsresearch/

https://www.onlinemathlearning.com › linear-programming-example

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Apply quantitative techniques to formulate business problems into linear programming problems for optimization of results.	K1,K2,K3,K4,K5
CO2	Utilize transportation model to maximize profit and minimize cost in business	K1,K2,K3,K4,K5
CO3	Utilize Assignment model to maximize profit and minimize cost in business	K1,K2,K3,K4,K5
CO4	Use CPM and PERT to plan, schedule and control project activities.	K1,K2,K3,K4,K5
CO5	Propose the best strategy and predict how firms behave in a specific strategic situation	K1,K2,K3,K4,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	1	-	-	1	2	2	1
CO2	2	3	2	3	3	3	1	-	-	1	2	2	1
CO3	3	2	2	3	2	3	1	-	-	1	2	2	1
CO4	3	3	3	2	2	3	1	-	-	1	2	2	1
CO5	3	2	3	2	3	2	1	-	-	1	2	2	1

COURSE DESCRIPTORS

Title of the Course	**NUMERICAL METHODS** (For B.Sc., Artificial Intelligence)	**Hours/Week**	04
Course Code	**AUEMA22B**	**Credits**	03
Category	Elective Course -II	**Year & Semester**	I & II
Prerequisites	12th Standard Mathematics	**Regulation**	2024

Objectives of the Course:

- To Solve Practical Technical Problems using various Numerical Method Formulae
- To derive appropriate Numerical Methods to solve Algebraic, Transcendental Equation. To link concepts related to one unit with other units
- To know the Numerical Methods of Solving Simultaneous Linear Equations
- To Acquire Knowledge about Forward Difference and Backward Differences and their Relationship Knowledge about Central Difference Operators and Problems based on Various Central Difference Formula.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Curve Fitting- Principle of Least square:** Fitting of straight line $y = ax + b$ parabola $y = ax^2 + bx + c$ exponential curves of forms $y = ax^b$, $y = e^{bx}$, and $y = ab^x$.	CO1	K1 K2 K3 K4,K5
UNIT-II	**The solution of numerical algebraic and transcendental Equations:** Bisection method – Iteration Method – Regula Falsi Method – Newton–Raphson method.	CO2	K1 K2 K3 K4,K5
UNIT-III	**Solution of simultaneous linear algebraic equations:** Gauss elimination method – Gauss Jordan method – Method of Triangularization – Gauss Jacobi method – Gauss Seidel method.	CO3	K1 K2 K3 K4,K5
UNIT-IV	**Finite differences:** Operators Δ, ∇and E - relation between them — factorial polynomials. **Interpolation with equal intervals:** Gregory-Newton forward and backward- interpolation formulas.	CO4	K1 K2 K3 K4,K5
UNIT-V	**Central differences formulae** Operators μ, δ and relation with the other operators, Gauss forward and backward formulae, Stirling's formula and Bessel's formula.	CO5	K1 K2 K3 K4,K5

Recommended Text Book:

1. P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite differences &Numerical Analysis, S. Chand & Company Ltd., New Delhi-55.

Reference Books:

1.Dr.P.Kandasamy, Dr.K.Thilagavathy Dr.Gunavathi –Numerical Methods, S. Chand publications(2023)
2.B.D. Gupta. (2001) Numerical Analysis. Konark Pub. Ltd., Delhi
3. M.K. Venkataraman. (1992) Numerical methods for Science and Engineering National Publishing Company, Chennai.
4. S. Arumugam. (2003) Numerical Methods, New Gamma Publishing ,Palayamkottai.
5. H.C. Saxena. (1991) Finite differences and Numerical analysis S.Chand & Co., Delhi Website and e-learning source

Website and e-learning source

https://nptel.ac.in/courses/111107105

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Solve the problems of fitting of straight lines, parabolas and the different form of exponential curves.	K1,K2,K3,K4,K5
CO2	Solve algebraic equations using various methods like Bisection method, Iteration method, Regula Falsi method and Newton – Raphson method.	K1,K2,K3,K4,K5
CO3	Estimate the solution of simultaneous linear equations using different numerical methods.	K1,K2,K3,K4,K5
CO4	Define basic concept of operators Δ, ∇and E, Solving interpolation with equal intervals problems using Gregory Newton‟s forward formula and Newton‟s backward formula.	K1,K2,K3,K4,K5
CO5	Estimate the solution of central difference formula using the methods Gauss's forward, backward formula,Stirling's formula and Bessel's formula.	K1,K2,K3,K4,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	1	-	-	1	3	2	1
CO2	3	3	2	3	3	3	1	-	-	1	3	1	1
CO3	3	2	2	3	2	3	1	-	-	1	3	1	1
CO4	3	3	3	2	2	3	1	-	-	1	3	2	1
CO5	3	2	3	2	3	2	1	-	-	1	3	1	1

COURSE DESCRIPTORS

Title of the Course	**DISCRETE MATHEMATICS** (For B.Sc., Artificial Intelligence)	**Hours/Week**	04
Course Code	**AUEMA22D**	**Credits**	03
Category	Elective Course -II	**Year & Semester**	I & II
Prerequisites	12th Standard Mathematics	**Regulation**	2024

Objectives of the Course:

- This course aims to develop mathematical maturity and ability to dealwith abstraction.
- To develop construction and verification of Formal logical manipulation.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**RECURRENCE RELATIONS AND GENERATING FUNCTIONS** Recurrence - Polynomials and their Evaluations - Recurrence Relations - Solution of Finite Order Homogeneous [linear] Relations - Solutions of Non-homogeneous Relations. **(Chapter -V. Sections:1 to 5)**	CO1	K1 K2 K3 K4
UNIT-II	**MATHEMATICAL LOGIC** TF Statements - Connectives - Atomic and Compound Statements - Well-formed [Statement Formulae]- Truth Table of a Formula-Tautology-Tautological Implications and Equivalence of Formulae. **(Chapter - IX . Sections:1 to 8)**	CO2	K1 K2 K3 K4,K5
UNIT-III	**MATHEMATICAL LOGIC [CONTD..]** Replacement process - Functionally complete sets of connectives and Duality law – Normal Forms-Principal Normal Forms. **(Chapter - IX . Sections:9 to 12)**	CO3	K1 K2 K3 K4
UNIT-IV	**LATTICES** Lattices [omit example 15 PpNo.10.6]- Some properties of Lattices - New Lattices (omit remark Pp 10.14)-Modular and Distributive Lattices (omit theorem 10 and 17,Example 4-Pp10.23, Example 11-Pp10.24) **(Chapter - X . Sections:1 to 4)**	CO4	K1 K2 K3 K4,K5
UNIT-V	**BOOLEAN ALGEBRA** Boolean Algebra (omit theorem 25) - Boolean Polynomials-Karnaugh Maps (omit K- map for 5 and 6 variables) **(Chapter - X . Sections:5 to 7)**	CO5	K1 K2 K3 K4,K5

Recommended Text Book:

1. M.K.Venkataraman, N.Sridharan and N.Chandrasekaran, [2003] Discrete Mathematics, The National Publishing company, chennai

Reference Books:

1. Oscar Levin, Discrete Mathematics, 3rd Edition,2016.
2. B. A. Davey & H. A. Priestley (2002). *Introduction to Lattices and Order* (2nd edition). Cambridge University Press.
3. Edgar G. Goodaire& Michael M. Parmenter (2018). *Discrete Mathematics with Graph Theory* (3rd edition). Pearson Education.
4. Rudolf Lidl& Günter Pilz (1998). *Applied Abstract Algebra* (2nd edition). Springer.
5. Kenneth H. Rosen (2012). *Discrete Mathematics and its Applications*: *WithCombinatorics and Graph Theory* (7th edition). McGraw-Hill.
6.C. L. Liu (1985). *Elements of Discrete Mathematics* (2nd edition).McGraw-Hill.

Website and e-learning source

https://nptel.ac.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Analyze and perceive various graph theoretic concepts and familiarize with their applications.	K1,K2,K3,K4
CO2	Describe about partially ordered sets, Boolean algebra, lattices and their types.	K1,K2,K3,K4,K5
CO3	Apply Karnaugh map for simplifying the Boolean expression	K1,K2,K3,K4
CO4	Demonstrate the skill to construct simple mathematical proofs and to validate.	K1,K2,K3,K4,K5
CO5	Achieve greater accuracy, clarity of thought and language.	K1,K2,K3,K4,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	1	1	-	-	1	1	1	1
CO2	2	2	3	3	2	-	1	-	-	1	1	1	1
CO3	3	3	3	3	2	1	1	-	-	1	1	2	1
CO4	3	2	3	3	2	-	1	-	-	1	1	2	1
CO5	3	2	3	3	2	1	1	-	-	1	1	2	1

COURSE DESCRIPTORS

Title of the Course	MATHEMATICAL STATISTICS-II (For B.Sc., Data Science)	Hours/Week	04
Course Code	AUEMA23A	Credits	03
Category	Elective Course -II	Year & Semester	I & II
Prerequisites	12th Standard Mathematics	Regulation	2024

Objectives of the Course:

- To test the significance of sampling
- Finding the Goodness of Fit
- To derive the various measures of t and F distributions
- To Analyze the correlation coefficient and Regression lines

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction-Types of Sampling-Parameter and Statistic- Tests of significance-Procedure for testing of hypothesis - Test of significance for large samples - Sampling of attributes-Sampling of variables. **(Chapter -14)**	CO1	K1 K2 K3 K4
UNIT-II	Introduction - Student's t - distribution - Applications of t-distribution. **(Chapter -16 Section-16.1 to 16.3.3)**	CO2	K1 K2 K3 K4,K5
UNIT-III	F-distribution- Applications of F-distribution. **(Chapter -16 Section-16.5 to 16.6.5)**	CO3	K1 K2 K3 K4,K5
UNIT-IV	Meaning of Correlation –Scatter Diagram – Karl Pearsons's Coefficient of Correlation – Rank Correlation. **(Chapter -10 Section-10.1 to 10.4,10.7.1)**	CO4	K1 K2 K3 K4
UNIT-V	Introduction - Linear regression. **(Chapter -11` Section-11.1 to 11.2.5)**	CO5	K1 K2 K3 K4

Recommended Text Book:
1 S.C. Gupta and V.K. Kapoor, Fundamentals of MathematicalStatistics, Sultan Chand & Co, New Delhi, Reprint 2019.
Reference Books:
1. Vittal, P.R. (2004).*Mathematical statistics*. Margham Publications. 2. Kapur, J. N & Saxena, H. C. (2010). *Mathematical statistics* (20th ed.). S. Chand & Company Ltd..
Website and e-learning source
https://nptel.ac.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Recognize the parameters and statistics to test the significance of sampling	K1,K2,K3,K4
CO2	Finding the Goodness of Fit	K1,K2,K3,K4,K5
CO3	Derive the various measures of Chi-square, t and F distributions	K1,K2,K3,K4,K5
CO4	Correlation coefficients between Observed and Estimated values	K1,K2,K3,K4
CO5	Analyze the Regression lines	K1,K2,K3,K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	2	2	1	1	-	-	1	3	2	1
CO2	2	1	3	1	2	-	1	-	-	1	3	2	1
CO3	3	1	3	1	2	1	1	-	-	1	3	2	1
CO4	3	1	3	2	2	-	1	-	-	1	3	2	1
CO5	3	1	3	2	2	1	1	-	-	1	3	2	1

COURSE DESCRIPTORS

Title of the Course	**MATHEMATICS-II** (For B.Sc., Chemistry)	**Hours/Week**	05
Course Code	**AUEMA23**	**Credits**	03
Category	Elective Course -II	**Year & Semester**	I & II
Prerequisites	12th Standard Mathematics	**Regulation**	2024

Objectives of the Course:

- To discuss and analyze the concept of gradient, divergence andcurl and its properties.
- To be familiar with Green's, Gauss and Stoke's theorem invector integrals.
- To find the solution of first order linear partial differentialequations.
- To solve the ordinary differential equations by using Laplaceand Inverse Laplace Transform

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Differentiation of Vectors** Differentiation of vectors – Differential operators – Solenoidal – Irrotational – Directional derivative – Gradient –Divergence and curl – Formula involving operator . **(Chapter 8: Pages: 329 - 363)**	CO1	K1 K2 K3 K4
UNIT-II	**Integration of Vectors** Line integrals – Surface integrals – Volume integrals – Statements of Gauss divergence, Green's, Stoke's theorems and its applications – verifications. **(Chapter 8: Pages: 364 - 390, 395 - 418 excluding Green's theorem in space- problems)**	CO2	K1 K2 K3 K4
UNIT-III	**Partial Differential Equations** Formation of partial differential equations by eliminating arbitrary constants and arbitrary functions – Solutions of standard types of first order equations: $f(p, q) = 0$, $f(x, p) = g(y, q)$, $f(x, p, q) = 0$, $f(y, p, q) = 0$, $f(z, p, q) = 0$: $z = px + qy + f(p, q)$ **(Chapter 6: Pages: 252 - 269)**	CO3	K1 K2 K3 K4,K5
UNIT-IV	**Laplace Transforms** Definition – Laplace transforms of e^{at}, cos at, sin at, cosh at, sinh at, t^n $e^{at}f(t)$, $t^nf(t)$, $f'(t)$, $f''(t)$. **(Chapter 7: Pages: 289 - 298)**	CO4	K1 K2 K3 K4,K5

UNIT-V	**Inverse Laplace transforms** Solving differential equationsof second order with constant coefficients using Laplace transform. **(Chapter 7: Pages: 299 - 317excluding simultaneous equations -problems)**	CO5	K1, K2,K3, K4, K5

Recommended Text Book:

1 .S. Narayanan, P. Kandhasamy, R. Hanumantha Rao and T.K. Manickavasagam Pillai, Ancillary Mathematics, Volume II, S.Viswanathan Printers, Chennai 2010.

Reference Books:

1. P. Balasubramaniyam, K. G. Subramanian, Ancillary Mathematics, Volume – I, Tata McGraw – Hill publishing company limited, New Delhi, 1996.
2. P. DuraiPandian, S. UdayaBaskaran, Allied Mathematics, Volume – I, Muhil publishers, 1st Edition, Chennai, 1997.
3. P. Kandsamy and K. Thilagavathy, Allied Mathematics volume – I, Volume – II, S. Chand & Company, New Delhi, 2004.
4. Shanti Narayan, P.K. Mittal, Differential Calculus, S. Chand &Co, New Delhi, 2005.
5. A. Singaravelu, Allied Mathematics, Meenakshi Agency,Chennai, 2001.
6. P.R.Vittal, Allied Mathematics, Margham Publications,Chennai, 1999.

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Discuss and analyze the concept of gradient, divergence and curl and its properties.	K1,K2,K3,K4
CO2	Recognize the importance of Green's, Gauss and Stoke's theorem in vector integrals.	K1,K2,K3,K4
CO3	Find solution of first order linear partial differential equations using Lagrange's method.	K1,K2,K3,K4,K5
CO4	Solve the ordinary differential equations by using Laplace Transform.	K1,K2,K3,K4,K5
CO5	Develop Fourier series of the periodic functions.	K1,K2,K3,K4,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	1	3	1	1	1	-	-	1	2	2	1
CO2	3	2	1	3	1	1	1	-	-	1	2	2	1
CO3	3	2	1	3	1	1	1	-	-	1	2	2	1
CO4	3	3	1	3	1	1	1	-	-	1	2	2	1
CO5	3	2	1	3	1	1	1	-	-	1	2	2	1

COURSE DESCRIPTORS

Title of the Course	VECTOR CALCULUS	Hours/Week	05
Course Code	AUCMA31	Credits	05
Category	Core - 5	Year & Semester	II & III
Prerequisites	12th Standard Mathematics	Regulation	2024

Objectives of the Course:

- Knowledge about Differentiation of Vectors and on Differential Operators.
- Knowledge about Derivatives of Vector Functions.
- Skills in Evaluating Line, Surface and Volume Integrals.
- The Ability to Analyze the Physical Applications of Derivatives of Vectors.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Derivative of a vector and derivative of a sum of vectors - Derivative of a product of a scalar and a vector point function-Derivative of a scalar product and Vector product. **Chapter 1 :1.1 to 1.6**	CO1	K1 K2 K3 K4
UNIT-II	Vector point function - Scalar point function - The Vector Operator 'del', The Gradient of a Scalar Point Function-Divergence of a Vector-Curl of a Vector-Solenoidal and Irrotational Vectors–Simple Application. **Chapter 2 :2.1 , 2.3 to 2.8 & 2.10 to 2.13**	CO2	K1 K2 K3 K4,K5
UNIT-III	Laplacian Operator, Vector identities-Line Integral-Simple Problems. **Chapter 2 :2.9 , Chapter 3 :3.1 to 3.4**	CO3	K1 K2 K3 K4,K5
UNIT-IV	Surface Integral-Volume Integral–Applications. **Chapter 3 :3.5 to 3.6 & 3.8**	CO4	K1 K2 K3 K4,K5

UNIT-V	Gauss Divergence Theorem, Stoke's Theorem, Green's Theorem in two Dimensions. **Chapter 4 :4.1 to 4.6**	CO5	K1 K2 K3 K4 K5

Recommended Text Books

1.P.Duraipandiyan and Kayalal Pachaiyappan, Vector Analysis, S.Chand &Co.Ltd

Reference Books

1.P.R.Vittal. (2004) Vector Calculus, Fourier series and Fourier Transform. Margham Publications, Chennai.
2. Erwin Kreyszig (2011), Advanced Engineering Mathematics, John Wiley & Sons, Inc. (10thedition), Printed in the United States of America
3. B.S.Grewal (2012). Higher Engineering Mathematics, Khanna Publishers (42nd edition), Nai Sarak, New Delhi.

Website and e-learning source

https://nptel.ac.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Find the derivative of vector and sum of vectors, product of scalar and vector point function and to determine derivatives of scalar and vector products	K1,K2,K3,K4,K5
CO2	Applications of the operator 'del' and to Explain soleonidal and irrotational vectors	K1,K2,K3,K4,K5
CO3	Solve Simple Line Integrals	K1,K2,K3,K4,K5
CO4	Solve Surface Integrals and Volume Integrals	K1,K2,K3,K4,K5
CO5	Verify the theorems of Gauss, Stoke's and Green's (Two Dimension)	K1,K2,K3,K4,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	-	-	-	1	-	-	1	3	2	2
CO2	2	2	3	-	-	-	1	-	-	1	3	2	2
CO3	3	2	3	2	-	-	1	-	-	1	3	2	2
CO4	3	2	3	2	2	-	1	-	-	1	3	2	2
CO5	3	2	3	2	2	-	1	-	-	1	3	2	2

COURSE DESCRIPTORS

Title of the Course	DIFFERENTIAL EQUATIONS	Hours/Week	05
Course Code	AUCMA32	Credits	05
Category	Core - 6	Year & Semester	II & III
Prerequisites	12th Standard Mathematics	Regulation	2024

Objectives of the Course:

- Knowledge about the methods of solving Ordinary and Partial Differential Equations.
- The understanding of how Differential Equations can be used as Powerful tooling solving problems in science

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Ordinary Differential Equations: Variable separable – Homogeneous Equation-Non-Homogeneous Equations of first degree in two variables-Linear Equation-Bernoulli's Equation-Exact Differential equations. **Chapter 1 :2.1 to 2.5 & 3.1 to 3.3 ,4(Page No.6 to32)**	CO1	K1 K2 K3 K4,K5
UNIT-II	Equation of first order but not of higher degree: Equation solvable for dy/dx- Equation solvable for y-Equation solvable for x- Clairauts' form - Linear Equations with constant coefficients-Particular integrals of algebraic ,exponential, trigonometric functions and their products. **Chapter 1 :5.1 to 5.4 & 6.1(Page No.33 to38)** **Chapter 2 :1.1 ,1.2, 2, 3&4 (Page No.49 to74)**	CO2	K1 K2 K3 K4,K5
UNIT-III	Simultaneous linear differential equations-Linear Equations of the Second Order-Complete solution in terms of a known integrals-Method of Variation of Parameters. **Chapter 3 :3.6 (Page No.103 to107)** **Chapter 2 :10 (Page No.91 to 95)**	CO3	K1 K2 K3 K4,K5
UNIT-IV	Partial Differential Equation: Formation of PDE by Eliminating arbitrary constants and arbitrary functions – Complete Integral–Singular Integral-General Integral-Lagrange's Linear Equations–Simple Applications. **Chapter 4 :2.1,2.2& 3(Page No.115 to121)** **Chapter 4 : 5&6 (Page No.127 to144)**	CO4	K1 K2 K3 K4,K5
UNIT-V	Special Methods–Standard Forms-Charpit's Methods–Simple Applications. **Chapter 7 : (Page No.145 to153)**	CO5	K1 K2 K3 K4,K5

Recommended Text Books

1. T.K. Manicavachagom Pillay, T. Natarajan, K.S. Ganapathy, Calculus Volume-III, S. Viswanathan Printers and Publishers Pvt. Ltd, 2012.

Reference Books

1. D.A. Murray, Introductory course in Differential Equations, Orient and Longman
2. H.T. H.Piaggio, Elementary Treaties on Differential Equations and their applications, C.B.S Publisher & Distributors, Delhi,1985.
3. HorstR.Beyer, Calculus and Analysis,Wiley,2010.
4. Braun,M. Differential Equations and their Applications.(3rd Edn.), Springer- Verlag, New York. 1983.
5. TynMyint-U and Lognath Debnath. Linear Partial Differential Equations for Scientists and Engineers. (4thEdn.)Birhauser, Berlin. 2007.
6. Boyce, W.E. and R.C.DiPrima. Elementary Differential Equations and Boundary Value Problems. (7th Edn.) John Wileyand Sons, Inc., New York. 2001.
7. Sundra pandian,V. Ordinary and Partial Differential Equations, TataMcGraw Hill Education Pvt.Ltd. New Delhi,2013

Website and e-learning source

https://nptel.ac.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Determine solutions of homogeneous equations, non-homogeneous equations of degree one in two variables.	K1,K2,K3,K4,K5
CO2	Find the solutions of equations of first order but not of higher degree and to Determine particular integrals of algebraic, exponential, trigonometric functions and their products	K1,K2,K3,K4,K5
CO3	Find solutions of simultaneous linear differential equations, linear equations of second order.	K1,K2,K3,K4,K5
CO4	Form a PDE by eliminating arbitrary constants and arbitrary functions, find complete, singular and general integrals.	K1,K2,K3,K4,K5
CO5	Explain standard forms and Solve Differential equations using Charpit's method	K1,K2,K3,K4,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	-	-	-	1	-	-	1	3	2	2
CO2	2	2	3	-	-	-	1	-	-	1	3	2	2
CO3	3	2	3	2	-	-	1	-	-	1	3	2	2
CO4	3	2	3	2	2	-	1	-	-	1	3	2	2
CO5	3	2	3	2	2	-	1	-	-	1	3	2	2

COURSE DESCRIPTORS

Title of the Course	MATHEMATICAL STATISTICS-I	Hours/Week	04
Course Code	AUEMA33A1	Credits	04
Category	Elective Course -III	Year & Semester	II & III
Prerequisites	12th Standard Mathematics	Regulation	2024

Objectives of the Course:

- To make the students to gain wide knowledge in the fundamental concepts of Statistics.
- To understand the idea of random variables and its types.
- To derive certain values in corporate with random variables.
- To relate the statistical distributions with their a life situations
- To apply statistical techniques to get the solution store a life problems

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Random variables: Distribution function-Discrete random variable-Continuous random variable. **Chapter-5 (5.1 to 5.4)**	CO1	K1 K2 K3 K4,K5
UNIT-II	Mathematical expectation-Expected value of function of a random variable- Properties of expectation - Properties of variance – Covariance. **Chapter-6 (6.1 to 6.6)**	CO2	K1 K2 K3 K4,K5
UNIT-III	Moment generating function–Properties of cumulants- Chebychev's in equality-Binomial distribution. **Chapter-7 (7.1,7.2,7.5), Chapter-8 (8.4)**	CO3	K1 K2 K3 K4,K5
UNIT-IV	Poisson Distribution :Properties, Moments of Poisson Distribution– Geometric Distribution: Moment Generating Function of Geometric Distribution. **Chapter-8 (8.5,8.7 to 8.7.3)**	CO4	K1 K2 K3 K4,K5

UNIT-V	Normal Distribution: Moment Generating Function of Normal Distribution, Mean Deviation about Mean – Gamma Distribution - Exponential Distribution. **Chapter-9 (9.1,9.2.5,9.2.10,9.5& 9.8)**	CO5	K1 K2 K3 K4,K5

Recommended Text Book:
1.S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Co, New Delhi, Reprint 2019.

Reference Books:

1. Vittal,P.R.(2004).*Mathematical statistics*. Margham Publications

Website and e-learning source

https://nptel.ac.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Acquire the knowledge of basic concepts in statistics	K1,K2,K3,K4,K5
CO2	Be able to understand various types of random variables and the distributions	K1,K2,K3,K4,K5
CO3	Calculate moments, cumulants, moment generating function and various constants of probability distributions	K1,K2,K3,K4,K5
CO4	Illustrate the theory of random variables, distribution functions and probability distributions with suitable	K1,K2,K3,K4,K5
CO5	Be able to evaluate solution of real-life problems under the concept of probability and probability distributions.	K1,K2,K3,K4,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	2	2	1	1	-	-	1	3	2	1
CO2	2	1	3	1	2	-	1	-	-	1	3	2	1
CO3	3	1	3	1	2	1	1	-	-	1	3	2	1
CO4	3	1	3	2	2	-	1	-	-	1	3	2	1
CO5	3	1	3	2	2	1	1	-	-	1	3	2	1

COURSE DESCRIPTORS

Title of the Course	**GEOGEBRA** (Practical)	**Hours/Week**	02
Course Code	**AUSPMA34**	**Credits**	02
Category	Skill Enhancement Course	**Year & Semester**	II & III
Prerequisites	---	**Regulation**	2024

Objectives of the Course:

- To introduce the students to Geogebra.
- To enhance understanding of mathematical concepts.
- To make the students to progressively build skills and knowledge.
- To leverage geometry for advanced applications.
- To ensure prerequisite knowledge and skills.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Introduction to Geogebra and Matrices** Introduction to Geogebra and its Applications- Exploring the Geogebra interface- Creating and manipulating matrices - Matrix operations (addition, multiplication) - Rank and Transpose of a matrix- Inverse of a matrix.	CO1	K1 K2 K3 K4
UNIT-II	**Trigonometry and Geogebra** Trigonometric functions and identities- Graphing trigonometric functions - Using Geogebra to solve trigonometric equations- Trigonometric applications and Geogebra tools.	CO2	K1 K2 K3 K4
UNIT-III	**Roots of Polynomials** Solving polynomial equations- Graphical representation of polynomial functions- Finding roots and factors of polynomials - Maxima and Minima of polynomial equations.	CO3	K1 K2 K3 K4
UNIT-IV	**Limits and Continuity** Introduction to limits and their graphical representation-Calculating limits-Exploring the concept of continuity - Continuity and limits in real-world scenarios	CO4	K1 K2 K3K4

UNIT-V	**Advanced Topics and Practical Applications** Further exploration of mathematical concepts- Real-world applications and case studies of the topics covered- Interactive problem-solving.	CO5	K1 K2 K3 K4,K6

Recommended Text Book:

1. **Online Geogebra Documentation:**Geogebra provides extensive online documentationand tutorials to support learning and exploration.
2. **Additional Reading:** Students are encouraged to explore additional resources related to specific topics covered in the course, such as calculus textbooks for more in-depth coverage of differentiation and integration.
3. **Course Materials:** Lecture notes, slides, and assignments provided by the instructor throughout the course will be essential references.
4. **Geogebra Software:** Ensureyou have access to the latest version of GeoGebra,whichcan be downloaded for free from the Geogebra website

Website and e-learning source

1. SearchTutorials|spoken-tutorial.org
2. ApplicationsofGeoGebra-Course(swayam2.ac.in)
3. GeoGebra5.04-Course(swayam2.ac.in)

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Understand Matrix operations using Geogebra	K1,K2,K3,K4
CO2	Solve trigonometric equations and graph trigonometric functions using Geogebra.	K1,K2,K3,K4
CO3	Understand Graphical representation of polynomial functions	K1,K2,K3,K4
CO4	Understand limits and their graphical representation-Calculating limits	K1,K2,K3,K4
CO5	Apply Mathematics in various academic and practical contexts.	K1,K2,K3,K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	1	-	-	1	-	-	1	3	2	1
CO2	3	1	3	1	-	-	1	-	-	1	3	2	1
CO3	3	1	3	1	-	-	1	-	-	1	3	2	1
CO4	3	1	3	1	-	-	1	-	-	1	3	2	1
CO5	3	1	3	1	-	-	1	-	-	1	3	2	1

COURSE DESCRIPTORS

Title of the Course	**STATISTICAL METHODS AND THEIR APPLICATIONS-I** (For B.Sc., Computer Science)	**Hours/Week**	03
Course Code	**AUEMA33B**	**Credits**	03
Category	Elective Course -III	**Year & Semester**	II & III
Prerequisites	12th Standard Mathematics	**Regulation**	2024

Objectives of the Course:

- Understand basic concepts of Statistical Methods
- Have a basic understanding of Measures of Location
- Have a basic understanding of Measures of Dispersion
- Understand about Measures of Skewness
- Understand about Correlation

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction - scope and limitations of statistical methods - classification of data -Tabulation of data- Diagrammatic and Graphical representation of data. **PART-II Chapter-1 (1.1 to1.3), Chapter-2 (2.1 to 2.5) Chapter-3 (3.1 to 3.2), Chapter-4 (4.1 to4.4)**	CO1	K1 K2 K3 K4
UNIT-II	Measures of location: Arithmetic mean, median, mode, geometric mean and Harmonic mean and their properties. **PART-II Chapter-5 (5.1 to 5. 31)**	CO2	K1 K2 K3 K4
UNIT-III	Measures of dispersion: Range, Quartile deviation, mean deviation, Standard deviation, combined Standard deviation, and their relative measures. **PART-II Chapter-6 (6.1 to 6. 38)**	CO3	K1 K2 K3 K4
UNIT-IV	Measures of Skewness: Karl Pearson's, Bowley's, and kelly's and co-efficient of Skewness and kurtosis based on moments. **PART-II Chapter-7 (7.1 to 7. 36)**	CO4	K1 K2 K3 K4
UNIT-V	Correlation - Karl Pearson - Spearman's Rank correlation - concurrent deviation methods. Regression Analysis: Simple Regression Equations. **PART-I Chapter-8 (8.16 to 8.52) , Chapter-9 (9.1 to 9.3)**	CO5	K1 K2 K3 K4,K5

Recommended Text Book:

1. P.R Vittal,.(2004).*Mathematical statistics*. Margham Publications.

Reference Books:

1.S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Co, New Delhi, Reprint 2019.

Website and e-learning source

https://www.simplilearn.com/what-is-statistical-analysis-article

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Learn the basics of statistical methods	K1,K2,K3,K4
CO2	Understanding of measures of location	K1,K2,K3,K4
CO3	understanding of measures of dispersion	K1,K2,K3,K4
CO4	Understand about Measures of skewness	K1,K2,K3,K4
CO5	Understand about correlation	K1,K2,K3,K4,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	1	1	-	-	1	1	1	1
CO2	2	2	3	3	2	-	1	-	-	1	1	1	1
CO3	3	3	3	3	2	1	1	-	-	1	1	2	1
CO4	3	2	3	3	2	-	1	-	-	1	1	2	1
CO5	3	2	3	3	2	1	1	-	-	1	1	2	1

COURSE DESCRIPTORS

Title of the Course	DISCRETE MATHEMATICS-I (For B.Sc.,Data Science)	Hours/Week	03
Course Code	AUEMA33A	Credits	03
Category	Elective Course-III	Year &Semester	II & III
Prerequisites	12th Standard Mathematics	Regulation	2024

Objectives of the course:

- To make the students understand the Mathematical Logic and truth table.
- To know about how and when to use set theory.
- To understand the discrete structure, storage structure.
- To understand the methods of Relations and ordering.
- To understand the functions, classifications, and types.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Mathematical logic-:** Connectives, well formed formulas, Tautology, Equivalence of formulas, Tautological implications, Duality law, Normal forms.	CO1	K1 K2 K3
UNIT-II	**Set Theor**y: Basic Concept of Set Theory–Operations on Sets– Venn Diagram	CO2	K1 K2 K3
UNIT-III	**Representation of Discrete Structure** : Data Structure – Storage Structure -Sequential Allocation – Pointers and Linked Allocation – An Application of Bit Represented Sets	CO3	K1 K2 K3
UNIT-IV	**Relations and Ordering:** Relations–Properties of Binary Relations in a set – Relation Matrix and the Graph of a Relation – Partition and Covering of a set – Equivalence Relations – Compatibility Relations – Composition of Binary Relations –Partial Ordering – Partially Ordered set.	CO4	K1 K2 K3
UNIT-V	**Functions** Definitions of functions and its Classification – Types – Examples–Composition of functions–Inverse functions–Binary and nary operations–Characteristic function of a set–Hashing functions – Recursive functions	CO5	K1 K2 K3

Recommended Text Books

1.Discrete Mathematical Structures with applications to computer Science J.P Tremblay and R.P Manohar (Mc.Graw Hill, 1997.)

Reference Books

1. P.R.Vittal, Mathematical Foundations–Margham Publication, Chennai.
2. Discrete Mathematics-Oscar Levin(3rdEdition)

Website and e-learning source

https://nptel.ac.in/courses/106106094
https://nptel.ac.in/courses/111107058

Course Learning Outcomes (for Mapping with Pos and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Solve problems in Mathematical logic and truth table	K1,K2,K3
CO2	Know and understand about set theory.	K1,K2,K3
CO3	Know and understand about discrete structure, storage structure.	K1,K2,K3
CO4	Know and understand about Relations and Ordering	K1,K2,K3
CO5	Understand the functions, classification and types.	K1,K2,K3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	1	-	-	1	1	1	1
CO2	2	2	3	3	2	3	1	-	-	1	1	1	1
CO3	3	3	3	3	3	3	1	-	-	1	1	2	2
CO4	3	2	2	3	3	3	1	-	-	1	1	2	2
CO5	3	2	3	3	3	2	1	-	-	1	1	2	2

COURSE DESCRIPTORS

Title of the Course	OPTIMIZATION TECHNIQUES	Hours/Week	05
Course Code	AUCMA41	Credits	05
Category	Core - 7	Year & Semester	II & IV
Prerequisites	12th Standard Mathematics	Regulation	2024

Objectives of the Course:

- To develop the skill of formulation of LPP and different techniques to solve it.
- To know the applications of Transportation and Assignment problems.
- To study the optimizing problems in Sequencing Networking and Inventory control.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Linear Programming Problem** Introduction – Formulation of the Linear Programming Problem-General Formulation of Linear Programming Problem-Matrix Form of Linear Programming Problem Graphical Method –Procedure for Solving LPP by Graphical Method- Simplex Method-Simplex Algorithm-Problems.	CO1	K1 K2 K3 K4
UNIT-II	**Transportation Problem** Introduction-Mathematical Formulation-Optimal Solution-North-West Corner Rule-Least Cost Method-Vogel's Approximation Method-Optimality Test-MODI Method – Assignment Problem – Mathematical Formulation of an Assignment Problem-Hungarian Method Procedure-Unbalanced Assignment Problem.	CO2	K1 K2 K3
UNIT-III	**Sequencing Problem** Introduction –Definition-Terminology and Notation-Principal Assumption-Problems with n jobs through Two machines - Problems with n jobs through Three machines A,B,C- Problems with n jobs through k machines.	CO3	K1 K2 K3 K4
UNIT-IV	**Inventory Control** Introduction-Reasons for Marinating Inventories models-Types Inventory – Inventory Costs –Variables in the Inventory Problems – Others Factors involved in Inventory Analysis -Deterministic Inventory model- EOQ Models with and without shortages.	CO4	K1 K2 K3 K4
UNIT-V	**Network Scheduling by PERT/CPM** Introduction –Basic Terms – Rules of Network Construction – Numbering the Events - Time Analysis –Forward Pass Computations-Backward Pass Computations-Determination of Floats and Slack Times Critical Path Method (CPM) –Programme Evaluation and Review Technique (PERT).	CO5	K1 K2 K3 K4

Recommended Text Book

1. S. Kalavathy, Operations Research – Vikas Publishing House Pvt. Ltd.,4th Edition, Second Reprint 2018.
   UNIT-I : Chapters -2, 3, 4
   UNIT-II : Chapter-8: (8.1 to 8.5) Chapter-9:(9.3, 9.4, 9.5)
   UNIT-III : Chapter-14: (14.1 to 14.4)
   UNIT-IV : Chapter 16:(16.1 to 16.7)
   UNIT-V : Chapter-15:(15.1 to 15.8)

Reference Books

1. Hamdy A. Taha, Operations Research – An Introduction, Pearson, Seventh edition, 2014.
2. P. K Gupta, Problems in Operations Research, S. Chand & Sons, New Delhi, 1983.
3. R. Pannerselvam, Operations Research, Prentice Hall of India Pvt. Ltd., New Delhi, 2005.
4. S. D. Sharma, Operations Research, KedarNath Ram Nath and Co, Meerut, 1998.
5. J. K. Sharma, Operations Research Theory & Applications –Trinity Press, India, Sixth edition, 2016.
6. Kanti Swarup, P. K. Gupta, Man Mohan, Operations Research –Sultan Chand & Sons, Reprint 2013.

Website and e-learning source

http://cs.bme.hu/fcs/operations research.pdf

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Describe the concepts involved in solving linear programming problems which are widely used in business operations	K1, K2, K3, K4
CO2	Apply mathematical techniques used in optimizing transportation and assignment problems	K1, K2, K3
CO3	Analyze the job sequencing problems	K1, K2, K3, K4
CO4	Analyze different inventory models	K1, K2, K3, K4
CO5	Analyze Critical Path Method, Programme Evaluation and Review Technique Method	K1, K2, K3, K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	2	2	1	1	-	-	1	3	2	2
CO2	2	1	3	1	2	-	1	-	-	1	3	2	2
CO3	3	1	3	1	2	1	1	-	-	1	3	2	2
CO4	3	1	3	2	2	-	1	-	-	1	3	2	2
CO5	3	1	3	2	2	1	1	-	-	1	3	2	2

COURSE DESCRIPTORS

Title of the Course	**ELEMENTS OF MATHEMATICAL ANALYSIS**	**Hours/Week**	05
Course Code	**AUCMA42**	**Credits**	05
Category	Core - 8	**Year & Semester**	II & IV
Prerequisites	12^{th} Standard Mathematics	**Regulation**	2024

Objectives of the Course:

- To identify and characterize sets and functions and Understand, test and analyze the convergence and Divergence of Sequences, Series.
- To understand Metric Spaces with suitable Examples.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Sets and Functions** Sets and elements- Operations on sets functions-Real valued functions- equivalence-Countability- real numbers- least upper bounds.	CO1	K1 K2 K3
UNIT-II	**Sequences of Real Numbers** Definition of a sequence and subsequence-limit of a sequence – convergent sequences–divergent sequences- bounded sequences-monotone sequences	CO2	K1 K2 K3 K4 K5
UNIT-III	**Operations on Sequences** Operations on convergent sequences – operations on divergent sequences – limit superior and limit inferior-Cauchy sequences.	CO3	K1 K2 K3
UNIT-IV	**Series of Real Numbers** Convergence and divergence –series with non –negative terms-alternating series-conditional convergence and absolute convergence	CO4	K1 K2 K3 K4
UNIT-V	**Limits and Metric Spaces** Limit of a function on a real line -Metric spaces - Limits in metric spaces – Continuous Functions on Metric Spaces - Function continuous at a point on there a line-Function Continuous on a metric space (Except Reformulation).	CO5	K1 K2 K3

Recommended Text Book

1. Richard R. Goldberg, Methods of Real Analysis: Oxford and IBH Publishing, (1 January 2020).

Reference Books

1. T. M. Apostol, Calculus (Vol. I), John Wiley and Sons (Asia) P. Ltd., 2002.
2. R.G. Bartle and D. R Sherbert, Introduction to Real Analysis, John Wiley and Sons (Asia) P. Ltd., 2000.
3. E. Fischer, Intermediate Real Analysis, Springer Verlag, 1983.
4. K.A. Ross, Elementary Analysis- The Theory of Calculus Series-Undergraduate Texts in Mathematics, Springer Verlag, 2003.

Website and e-learning source

https://nptel.ac.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Apply the concepts functions, equivalence and countability	K1, K2, K3
CO2	Calculate the limit of sequence for convergent, divergent, bounded and monotone sequences	K1, K2, K3, K4, K5
CO3	Utilize the operations on convergent and divergent sequences	K1, K2, K3
CO4	Analyze the series of real numbers with convergence and divergence	K1, K2, K3, K4
CO5	Utilize the concepts of Metric Spaces	K1, K2, K3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	2	2	1	1	-	-	1	3	2	2
CO2	2	1	3	1	2	-	1	-	-	1	3	2	2
CO3	3	1	3	1	2	1	1	-	-	1	3	2	2
CO4	3	1	3	2	2	-	1	-	-	1	3	2	2
CO5	3	1	3	2	2	1	1	-	-	1	3	2	2

COURSE DESCRIPTORS

Title of the Course	MATHEMATICAL STATISTICS-II	Hours/Week	04
Course Code	AUEMA43A1	Credits	03
Category	Elective Course -IV	Year & Semester	II & IV
Prerequisites	12th Standard Mathematics	Regulation	2024

Objectives of the Course:

- To test the significance of sampling
- To finding the Goodness of Fit
- To derive the various measures of t and F distributions
- To Analyze the correlation coefficient and Regression lines

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Large Sample Theory** Introduction-Types of Sampling-Parameter and Statistic-Tests of significance-Procedure for testing of Hypothesis - Test of significance for large samples - Sampling of attributes-Sampling of variables.	CO1	K1, K2 K3, K4
UNIT-II	**Exact Sampling Distributions-II** Introduction - Student's 't'-distribution – Derivation of Student's 't'-distribution-Fishers 't'-Distribution of Fishers 't' - Critical values of 't'- Applications of 't' Distribution-t-test for Single Mean-t-test for difference of Means-Paired t-test for difference of Means.	CO2	K1, K2 K3, K4
UNIT-III	**Exact Sampling Distributions-II (Continued)** Introduction-F-Distribution–Derivation of Snedecor's F Distribution – Constants of F- Distribution-Mode and Points of Inflexion of F-Distribution –Applications of F-Distribution-F test for Equality of two Population Variances- F test for Equality of Several Means.	CO3	K1 K2 K3
UNIT-IV	**Correlation** Meaning of Correlation – Scatter Diagram – Karl Pearsons's Coefficient of Correlation – Limits for Correlation Coefficient - Rank Correlation- Spearman's Rank Correlation Coefficient -Tied or Repeated Ranks.	CO4	K1, K2 K3, K4, K5
UNIT-V	**Linear regression** Introduction - Linear regression-Regression Coefficients-Properties of Regression Coefficients-Angle between two lines of Regression-Standard Error of Estimate - Correlation Coefficient between Observed and Estimated Values.	CO5	K1 K2 K3 K4

Recommended Text Book:
1.S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Co, New Delhi, Reprint 2019.
UNIT-I : Chapter-14 (Full)
UNIT-II : Chapter-16 (16.1 to16.3.3)
UNIT-III :Chapter-16 (16.5 to16.6.5)
UNIT-IV :Chapter-10(10.1 to 10.4, 10.7.1)
UNIT-V : Chapter-11 (11.1to 11.2.5)

Reference Books:

1. Vittal,P.R.(2004).*Mathematical statistics*. Margham Publications.
2. Kapur, J. N & Saxena, H. C. (2010). Mathematical statistics (20thed.). S.Chand & Company Ltd.

Website and e-learning source

https://nptel.ac.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Analyse the parameters and statistics to test the significance of sampling	K1, K2, K3, K4
CO2	Analyse Student's 't'-distribution	K1, K2, K3, K4
CO3	Apply F distributions for the given data	K1, K2, K3
CO4	Calculate the Correlation coefficients between Observed and Estimated values	K1, K2, K3, K4, K5
CO5	Analyse the Regression lines	K1, K2, K3, K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	2	2	1	1	-	-	1	3	2	1
CO2	2	1	3	1	2	-	1	-	-	1	3	2	1
CO3	3	1	3	1	2	1	1	-	-	1	3	2	1
CO4	3	1	3	2	2	-	1	-	-	1	3	2	1
CO5	3	1	3	2	2	1	1	-	-	1	3	2	1

COURSE DESCRIPTORS

Title of the Course	**STATISTICAL METHODS AND THEIR APPLICATIONS-II** (For B.Sc., Computer Science)	**Hours/Week**	04
Course Code	**AUEMA43B**	**Credits**	03
Category	Elective Course -IV	**Year & Semester**	II & IV
Prerequisites	12th Standard Mathematics	**Regulation**	2024

Objectives of the Course:

- Understand basic concepts of curve fitting.
- Have a basic understanding of Sample Space
- Have a basic understanding of standard distribution
- Understand about Test of Significance
- Understand about Analysis of variance

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Curve Fitting** Introduction, Principle of Least Squares, Curve fitting by the methods of least squares-Fitting a Straight Line Y= a+ bx, Fitting a Second Degree Polynomial $Y= ax^2+ bx+ c$, Fitting a Curve of the Form $Y =ae^{bx}$, Fitting a Curve of the Form $Y=ab^x$ and Fitting a Curve of the Form $Y= ax^{b.}$	CO1	K1 K2 K3
UNIT-II	**Probability and Chebychev's Inequality** Introduction, Sample Space- Events-Probability-Additional Theorem and Multiplication Theorem-Axioms of Probability-Conditional Probability- Multiplicative Law of Probability-Probability of an event in terms of Conditional Probability - Baye's Theorem – Examples - Chebychev's Inequality.	CO2	K1 K2 K3 K4
UNIT-III	**Standard Distributions** Definition of Binomial Distribution, Properties of Binomial Distribution, Definition of Poisson Distribution, Properties of Poisson Distribution, Definition of Normal distribution , Properties of Normal distribution and fitting of these distributions – Examples.	CO3	K1 K2 K3
UNIT-IV	**Test of Significance** Large sample test –- Test for a specified Mean-Test for equality of two Means- Test for a specified Proportion -Test for equality of two Proportions- Test for a specified Standard Deviation-Test for equality of two Standard Deviations- Confidence Interval and Simple Problems.	CO4	K1 K2 K3 K4

UNIT-V	**Analysis of Variance and Design of Experiments** One and Two way classifications- ANOVO Table-Basic principle in the Design of Experiments- Randomization, Replication and Local Control-Completely Randomized Design(C.R.D) , Randomized Block Design(R.B.D) and Latin Square Design(L.S.D).	CO5	K1 K2 K3 K4

Recommended Text Book:

1. Dr. P.R Vittal,.(2004).*Mathematical statistics*. Margham Publications.

UNIT-I : Chapter-10(10.1 to 10.10)
UNIT-II : Chapter-1(1.1 to 1.56), Chapter-4 (4.21 to 4.26)
UNIT-III :Chapter-12(12.1 to 12.16,12.24&12.25),Chapter-13(13.1 to 13.12),Chapter-16(16.12 to 16.27)
UNIT-IV : Chapter-24 (24.1 to 24.50)
UNIT-V : Chapter-26 (26.14 to 26.29),Chapter-28 (28.1 to 28.17)

Reference Book:

1.S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Co, New Delhi, Reprint 2019.

Website and e-learning source

https://www.simplilearn.com/what-is-statistical-analysis-article

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Apply the basics of curve fitting methods.	K1, K2, K3
CO2	Analysis of Sample Space	K1, K2, K3, K4
CO3	Apply of standard distribution	K1, K2, K3
CO4	Analysis the Significance tests	K1, K2, K3, K4
CO5	Analysis of Variance and Design of Experiments	K1, K2, K3, K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	1	1	-	-	1	1	1	1
CO2	2	2	3	3	2	-	1	-	-	1	1	1	1
CO3	3	3	3	3	2	1	1	-	-	1	1	2	1
CO4	3	2	3	3	2	-	1	-	-	1	1	2	1
CO5	3	2	3	3	2	1	1	-	-	1	1	2	1

COURSE DESCRIPTORS

Title of the Course	**DISCRETE MATHEMATICS-II** (For B.Sc., Data Science)	**Hours/Week**	04
Course Code	**AUEMA43A**	**Credits**	03
Category	Elective Course -IV	**Year & Semester**	II & IV
Prerequisites	12th Standard Mathematics	**Regulation**	2024

Objectives of the Course:

- This course aims to develop mathematical ability to deal with abstraction.
- To develop construction and verification of Formal logical manipulation.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Recurrence Relations and GeneratingFunctions** Recurrence - Polynomials and their Evaluations - Recurrence Relations - Solution of Finite Order Homogeneous [linear] Relations - Solutions of Non-homogeneous Relations.	CO1	K1 K2 K3
UNIT-II	**Mathematical Logic** TF Statements - Connectives - Atomic and Compound Statements - Well-formed [Statement Formulae] - Truth Table of a Formula-Tautology-Tautological Implications and Equivalence of Formulae.	CO2	K1 K2 K3 K4
UNIT-III	**Mathematical Logic (Continued)** Replacement Process - Functionally complete sets of connectives and Duality law – Normal Forms- Extended Distributive Law-Principal Normal Forms.	CO3	K1 K2 K3 K4
UNIT-IV	**Lattices** Lattices – Hasse Diagrams- Some properties of Lattices – Duality Principle-Lattices through Algebraic Operations-New Lattices – Lattices Homomorphism- Product Lattices of Two Lattices-Modular and Distributive Lattices.	CO4	K1 K2 K3 K4
UNIT-V	**Boolean Algebra** Boolean Algebra - Boolean Polynomials - Karnaugh Maps for 1, 2, 3 & 4 Variables -Simple Problems.	CO5	K1 K2 K3

Recommended Text Book:

1. M.K.Venkataraman, N.Sridharan and N.Chandrasekaran, [2003] Discrete Mathematics, The National Publishing Company,Chennai.

UNIT-I : Chapter -V(Sections:1 to 5)
UNIT-II : Chapter - IX (Sections:1 to 8)
UNIT-III : Chapter - IX (Sections:9 to 12)
UNIT-IV : Chapter - X (Sections:1 to 4) [omit example 15 Page No:10.6, remark Page No: 10.14, theorem 10 and 17,Example 4- Page No :10.23, Example 11- Page No :10.24)
UNIT-V : Chapter - X (Sections:5 to 7) (omit theorem 25, K- map for 5 and 6 variables)

Reference Books:

1. Oscar Levin, Discrete Mathematics, 3rd Edition, 2016.
2. B. A. Davey & H. A. Priestley (2002). *Introduction to Lattices and Order* (2nd edition). Cambridge University Press.
3. Edgar G. Goodaire& Michael M. Parmenter (2018). *Discrete Mathematics with Graph Theory* (3rd edition). Pearson Education.
4. Rudolf Lidl& Günter Pilz (1998). *Applied Abstract Algebra* (2nd edition). Springer.
5. Kenneth H. Rosen (2012). *Discrete Mathematics and its Applications*: *With Combinatorics and Graph Theory* (7th edition). McGraw-Hill.
6. C. L. Liu (1985). *Elements of Discrete Mathematics* (2nd edition).McGraw-Hill.

Website and e-learning source

https://nptel.ac.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Apply Recurrence Relations and Generating Functions.	K1, K2, K3
CO2	Analyze the Mathematical Logic	K1, K2, K3, K4
CO3	Analyze the Normal Forms and Principal Normal Forms	K1, K2, K3, K4
CO4	Analyze the Lattices	K1, K2, K3, K4
CO5	Apply Karnaugh map for simplifying the Boolean expression	K1, K2, K3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	1	1	-	-	1	1	1	1
CO2	2	2	3	3	2	-	1	-	-	1	1	1	1
CO3	3	3	3	3	2	1	1	-	-	1	1	2	1
CO4	3	2	3	3	2	-	1	-	-	1	1	2	1
CO5	3	2	3	3	2	1	1	-	-	1	1	2	1

COURSE DESCRIPTORS

Title of the Course	PYTHON PROGRAMMING	Hours/Week	02
Course Code	AUSMA44	Credits	02
Category	Skill Enhancement Course	Year & Semester	II & IV
Prerequisites	HSC Computer Science	Regulation	2024

Objectives of the Course:

- To train student in programming techniques and provide hands on experience in using Programmes to solve basic mathematical problems.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Introduction**: Features of Python -How to run Python– variables–comments Indentation-Multi-Line Statements–Quotes–Input, Output and Import Functions-Operators-Data types: Numbers –Strings – List – Tuple–Set–Dictionary-Data type conversion, Booleans.	CO1	K1 K2
UNIT-II	**Control Flow Statements**: The if Decision Control Flow Statement, The if…else Decision Control Flow Statement, The if…else Decision Control Statement, Nested if Statement, The while Loop, The for Loop, The continue and break Statements. Functions: Definition- calling- Function Arguments- Anonymous functions-Recursive With more than one return value ,Python Arrays ,Introduction to Tensors	CO2	K1 K2 K3
UNIT-III	**Modules and Packages**: Built-in modules- creating modules- import statement- package in Python-Date and Time modules- Case study: Numpy, Pandas, matplotlib- math, Python File handling.	CO3	K1 K2
UNIT-IV	Addition and subtraction of matrices-Multiplication of Matrices-Trace and Transpose of Matrix-Rank of matrix-Inverse of a Matrix-Finding the Eigen values and Eigen vectors.	CO4	K1 K2 K3
UNIT-V	Finding the Derivative of e^{ax}, trigonometric and hyperbolic functions-Finding the Derivative of algebraic and logarithmic functions-evaluate the line integrals with constant and Variable limits.	CO5	K1 K2 K3 K4

Recommended Text Books:

1. Jeeva Jose ,"Taming Python by Programming", Revised Edition,KhannaPublishing,2019. ISBN:978-93-86173-34-8.
2. S.Narayanan andT.K.Manicavachagom Pillay, Calculus, Volume-I, S.Viswanathan (Printers and Publishers), PVT Ltd, Chennai, 2011.
3. P.R.Vital and V.Malini, Algebra and Trigonometry–I,Margham Publications –Reprint 2015.

Reference Books:

1. GowrishankarS,VeenaA,"IntroductiontoPythonProgramming",1stEdition,CRCPress/Taylor & Francis,2018.ISBN-13: 978-0815394372
2. Ch Satyanarayana,"Python Programming",Orient Black Swan Pvt. Ltd,2022.ISBN:978-93-86235-63-3.
3. A.K.Sharma, Differential Calculus, Discovery Publishing House, New Delhi, 2004.
4. G.B.Thomas and R.L. Finney, Calculus, Pearson Education, 2007.
5. S.Arumugam and A.Thangapandi Issac, Algebra and Trigonometry, New Gamma Publishing House, July 2011

Website and e-learning source

1.https://www.python.org/

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Understand Operators using Python	K1, K2
CO2	Use Control Flow Statements	K1, K2, K3
CO3	Understand Modules, Packages and Python File handling	K1, K2
CO4	Utilize the Python in Matrices	K1, K2, K3
CO5	Apply Python trigonometric and hyperbolic functions	K1, K2, K3, K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	1	-	-	1	-	-	1	3	2	1
CO2	3	1	3	1	-	-	1	-	-	1	3	2	1
CO3	3	1	3	1	-	-	1	-	-	1	3	2	1
CO4	3	1	3	1	-	-	1	-	-	1	3	2	1
CO5	3	1	3	1	-	-	1	-	-	1	3	2	1

COURSE DESCRIPTORS

Title of the Course	R PROGRAMMING FOR STATISTICS (Practical)	Hours/Week	02
Course Code	AUSPMA45	Credits	02
Category	Skill Enhancement Course	Year & Semester	II & IV
Prerequisites	HSC Computer Science	Regulation	2024

Objectives of the Course:

- To introduce to the students the applications of R language and to give them hands On experience of working with data.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Basic Concepts in R** Assignmentofvalues,Character,Vectorarithmetic,UnderstandingDatatypes,importing/exporting data - Computation of tables and graphical representation in R:plot ,pie chart ,box plot ,generating graphs from imported data.	CO1	K1 K2
UNIT-II	**Probability Distributions** Fitting and plotting of binomial, Poisson and Normal distributions.	CO2	K1 K2
UNIT-III	**Correlation and Regression** Correlation and linear regression: Representation of bivariate data through Scatter diagram, Karl Pearson's, Spearman's and Kendall's coefficients of correlation, Coefficient of determination, linear regression model, Multiple Linear Regression.	CO3	K1 K2
UNIT-IV	**Tests of Hypothesis** Student's t-test, One sample Z–test, Paired data t–test.	CO4	K1 K2 K3 K4
UNIT-V	**Chi-square test and Design of Experiments** Chi-square test: Independence of attributes and goodness off it– Design of Experiments: Completely randomized design (CRD), Randomized block design(RBD)and Latin square design(LSD).	CO5	K1 K2 K3 K4

Reference Books:

1. Mark Gardener, Beginning R the Statistical Programming Language, JohnWiley & Sons ,Inc.2012.
2. Joseph Adler, RinaNut shell A Desktop Quick Reference, O'reilly,2010.
3. Cornillon Pierre Andre Et Al, R For Statistics, T and F India,2015.
4. R for Everyone: Advanced Analytics and Graphics, Jared P. Lander, Addison-WesleyData &Analytics Series, 2018.
5. R for Data Science: Import, Tidy, Transform, Visualize, and Model Data, Hadley Wickham, Garrett Grolemund, Shroff publishers, 2017.
6. Learn R For Applied Statistics: With Data Visualizations Regressions And Statistics by Hui, Apress, 2019

Website and e-learning source

https://www.coursera.org/courses?query=r%20statistics

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Understanding data types, and performing vector arithmetic	K1, K2
CO2	Understanding Fit and plot standard probability distributions	K1, K2
CO3	Understand the Measure and model the relationship between variables using scatter diagrams	K1, K2
CO4	Apply appropriate statistical tests (t-test, Z-test, Chi-square) to draw conclusions from data.	K1, K2, K3, K4
CO5	Analyze experimental designs	K1, K2, K3, K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	1	-	-	1	-	-	1	3	2	1
CO2	3	1	3	1	-	-	1	-	-	1	3	2	1
CO3	3	1	3	1	-	-	1	-	-	1	3	2	1
CO4	3	1	3	1	-	-	1	-	-	1	3	2	1
CO5	3	1	3	1	-	-	1	-	-	1	3	2	1

COURSE DESCRIPTORS

Title of the Course	ABSTRACT ALGEBRA	Hours/Week	05
Course Code	AUCMA51	Credits	04
Category	Core - 9	Year & Semester	III & V
Prerequisites	12th Standard Mathematics	Regulation	2024

Objectives of the Course:

The Course Aims to

- Concepts of Sets, Groups and Rings.
- Construction, Characteristics and Applications of the Abstract Algebraic Structures.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction to Groups- Examples of Groups-Cancellation Laws-Subgroups- Euler's Theorem-Fermat's Theorem-Cyclic Groups and Properties of Cyclic Groups-Lagrange's Theorem-A Counting Principle – Theorems and Examples.	CO1	K1, K2 K3, K4
UNIT-II	Normal Subgroups and Quotient Group-Homomorphism-Isomorphism – Isomorphic G groups - Automorphism, Kernel of a Group Homomorphism -Examples. First Isomorphism Theorem, Second Isomorphism Theorem, Third isomorphism.	CO2	K1, K2 K3, K4
UNIT-III	Cayley's Theorem and its Applications- Permutation Groups, Cyclic Permutation, Transpositions -Odd Permutation and Even Permutation– Theorems and Examples-Alternative Group-Normal Subgroup.	CO3	K1, K2 K3, K4
UNIT-IV	Definition and Examples of Rings- Integral Domain -Some Special classes of Rings-Homomorphism of Rings-Ideals and Quotient Rings-More Ideals and Quotient Rings. First Isomorphism theorem, Second isomorphism theorem, Third isomorphism- Prime Ideals – Maximal Ideals.	CO4	K1, K2 K3, K4

UNIT-V	Theorems on Prime Ideals and Maximal Ideals. The Field of Quotients of an Integral Domain-Euclidean Rings -The particular Euclidean Ring – Theorems and Examples- Fermat's Theorem for Ring.	CO5	K1, K2 K3, K4

Recommended Text Book

1. Topics in Algebra –I. N. Herstein, Wiley Eastern Ltd. Second Edition (1stJanuary2006).
   UNIT-I: Chapter-2(2.1 to 2.5)
   UNIT-II: Chapter-2(2.6, 2.7(without applications) 2.8)
   UNIT-III: Chapter-2(2.9 ,2.10)
   UNIT-IV: Chapter-3 (3.1 to 3.5)
   UNIT-V: Chapter-3(3.6 to 3.8)

Reference Books

1. John B.Fraleigh, A First Course in Abstract Algebra, 7th Ed., Pearson, 2002.
2. M.Artin, Abstract Algebra, 2nd Ed., Pearson, 2011.
3. Joseph A Gallian, Contemporary Abstract Algebra, 4th Ed., Narosa, 1999.

Website and e-learning source

https://nptel.ac.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Analyze groups, subgroups and cyclic groups.	K1, K2, K3, K4
CO2	Discuss about Normal subgroup, Quotient groups, Homomorphisms and Automorphisms.	K1, K2, K3, K4
CO3	Analyze Permutation groups and apply Cayley's theorem to solve problems.	K1, K2, K3, K4
CO4	Analyze Rings, Ideals and Quotient Rings and examine their structure.	K1, K2, K3, K4
CO5	Analyze about the field of quotient of an integral domain.	K1, K2, K3, K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	2	2	1	1	-	-	1	3	2	2
CO2	2	1	3	1	2	-	1	-	-	1	3	2	2
CO3	3	1	3	1	2	1	1	-	-	1	3	2	2
CO4	3	1	3	2	2	-	1	-	-	1	3	2	2
CO5	3	1	3	2	2	1	1	-	-	1	3	2	2

COURSE DESCRIPTORS

Title of the Course	**REAL ANALYSIS**	**Hours/Week**	05
Course Code	**AUCMA52**	**Credits**	04
Category	Core - 10	**Year & Semester**	III & V
Prerequisites	12th Standard Mathematics	**Regulation**	2024

Objectives of the Course:

The Course aims to

- Real Numbers and properties of Real–valued functions.
- Connectedness, Compactness, Completeness of Metric spaces.
- Convergence of sequences of functions, Examples and counter examples.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Continuous Functions on Metric Spaces- Open Sets– Closed Sets– Connectedness-Completeness and Compactness- More about Open Sets-Connected Sets- Theorems and Examples.	CO1	K1, K2 K3, K4
UNIT-II	Bounded Sets and Totally Bounded Sets- Complete Metric Spaces-Compact Metric Spaces-Continuous Functions on a Compact Metric Space-Continuity of Inverse Functions-Uniform Continuity.	CO2	K1, K2 K3, K4
UNIT-III	Calculus-Sets of Measure Zero-Definition of the Riemann Integral, Existence of the Riemann Integral Theorems and Proofs-Properties of Riemann Integral Theorems and Proofs.	CO3	K1, K2 K3, K4
UNIT-IV	Derivatives- Chain Rule-Rolle's Theorem- The Law of Mean, The Generalized law of Mean-Fundamental Theorems of Calculus-Second Fundamental Theorem of Calculus.	CO4	K1, K2
UNIT-V	Taylor's Theorem-Taylor's Formula for the Integral form of the Remainder-Taylor's Formula with the Cauchy form of the Remainder, Taylor's Formula with the Lagrange form of the Remainder-Point wise Convergence of Sequences of Functions-Uniform Convergence of Sequences of Functions- Dini's Theorem.	CO5	K1, K2 K3, K4

Recommended Text Books

1. Richard R. Goldberg, Methods of Real Analysis: Oxford and IBH Publishing, (1 January 2020).
   UNIT-I: Chapter-5(5.4,5.5), Chapter-6(6.1,6.2)
   UNIT-II: Chapter-6(6.3to6.8)
   UNIT-III: Chapter-7(7.1to7.4)
   UNIT-IV: Chapter-7 (7.5to7.8)
   UNIT-V: Chapter-8(8.5),Chapter-9(9.1,9.2)

Reference Books

1. Principles of Mathematical Analysis by Walter Rudin, Tata McGraw Hill Education, Third edition (1 July 2017).
2. Mathematical Analysis Tom M Apostal, Narosa Publishing House,2nd Edition (1974), Addison-Wesley publishing company, New Delhi.

Website and e-learning source

https://nptel.ac.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Analyze the concepts of Continuous and Discontinuous functions.	K1, K2, K3, K4
CO2	Analyze the concepts of bounded and totally bounded sets, continuity of inverse functions and Uniform continuity	K1, K2, K3, K4
CO3	Analyze about the existence and properties of Riemann integral	K1, K2, K3, K4
CO4	Understand the concept of differentiability.	K1, K2
CO5	Analyze the point wise and uniform convergence of sequence of function and to derive the Taylor's theorem	K1, K2, K3, K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	2	2	1	1	-	-	1	3	2	2
CO2	2	1	3	1	2	-	1	-	-	1	3	2	2
CO3	3	1	3	1	2	1	1	-	-	1	3	2	2
CO4	3	1	3	2	2	-	1	-	-	1	3	2	2
CO5	3	1	3	2	2	1	1	-	-	1	3	2	2

COURSE DESCRIPTORS

Title of the Course	MATHEMATICAL MODELLING	Hours/Week	05
Course Code	AUCMA53	Credits	04
Category	Core– 11	Year & Semester	III & V
Prerequisites	12th Standard Mathematics	Regulation	2024

Objectives of the Course:

The Course aims to

- Construction and Analysis of Mathematical models found in real life problems.
- Modelling through differential and difference equations.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Mathematical Modelling- Simple Situations requiring Mathematical Modelling- The Technique of Mathematical Modeling-Classification of Mathematical Models -Some Characteristics of Mathematical Models.	CO1	K1, K2 K3, K4
UNIT-II	Mathematical Modelling through Differential Equations- Linear Growth and Decay Models-Non-Linear growth and Decay Models-Compartment Models.	CO2	K1, K2 K3, K4
UNIT-III	Mathematical Modelling, through System of Ordinary Differential Equations of First Order- Prey-Predator Models-Competition Models-Model with Removal and Model with Immigrations- Epidemics-Simple Epidemic Model-Susceptible-Infected- Susceptible (SIS) Model-SIS Model with Constant Number of Carriers-Medicine-Model for Diabetes Mellitus.	CO3	K1, K2 K3, K4
UNIT-IV	Introduction to Difference Equations-The Need of Mathematical Model through Difference Equations-Some Simple Models- Basic Theory of Linear Difference Equations with Constant Coefficients.	CO4	K1, K2
UNIT-V	Mathematical Modelling through Difference Equations in Economics and Finance- Harrod Model-Cob Web Model Application to Actuarial Science.	CO5	K1, K2 K3, K4

Recommended Text Book:

1. J N Kapur, Mathematical Modeling, New Age International Publishers (2009).

UNIT-I: Chapter-1(1.1to1.4)
UNIT-II: Chapter-2(2.1to2.4)
UNIT-III: Chapter-3(3.1.1, 3.1.2, 3.2, 3.5.1)
UNIT-IV: Chapter-5 (5.1to5.2)
UNIT-V: Chapter-5(5.3(5.3.3 not included))

Reference Books:

1. Mathematical Modeling by Bimalk. Mishra and Dipak K. Satpathi. Ane Books Pvt. Ltd (1st January 2009).
2. Mathematical Modeling Models, Analysis and Applications, by Sandip Banerjee, CRC Press, Taylor & Francis group, 2014.
3. Mathematical Modeling applications with Geogebra by Jonas Hall & Thomas Lige fjard, John Wiley & Sons, 2017.
4. Mark M. Meerschaert: Mathematical Modeling, Elsevier Publ., 2007.
5. Edward A. Bender: An introduction to mathematical Modeling, CRC Press,2002.
6. Walter J. Meyer, Concepts of Mathematical Modeling, Dover Publ.,2000.

Website and e-learning source

https://nptel.ac.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Analyze simple situations requiring Mathematical Modelling and to Determine the characteristics of such models.	K1, K2, K3, K4
CO2	Analyze differential equations in-terms of linear growth and Decay models.	K1, K2, K3, K4
CO3	Apply systems of ordinary differential equations of first order.	K1, K2, K3, K4
CO4	Understand the detail about difference equations.	K1, K2
CO5	Apply Model using difference equations.	K1, K2, K3, K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	2	2	1	1	-	-	1	3	2	1
CO2	2	1	3	1	2	-	1	-	-	1	3	2	1
CO3	3	1	3	1	2	1	1	-	-	1	3	2	1
CO4	3	1	3	2	2	-	1	-	-	1	3	2	1
CO5	3	1	3	2	2	1	1	-	-	1	3	2	1

COURSE DESCRIPTORS

Title of the Course	**PROJECT WITH VIVA VOCE**	**Hours/Week**	05
Course Code	**AUPMA54**	**Credits**	04
Category	Core– 12	**Year & Semester**	III & V
Prerequisites	---	**Regulation**	2024

COURSE DESCRIPTORS

Title of the Course	TRANSFORM TECHNIQUES	Hours/Week	04
Course Code	AUEMA55A	Credits	03
Category	Elective Course-V	Year & Semester	III & V
Prerequisites	12thStandardMathematics	Regulation	2024

Objectives of the Course:

The Course aims to

- The Basic Knowledge about Laplace Transforms and its inverse.
- Apply Laplace Transform in solving Ordinary Differential Equations.
- To solve problems in Fourier Series and Fourier Transforms.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Laplace Transforms: Definition–Sufficient Condition for the Existence of Laplace Transforms (Without Proof) – Laplace Transform of Periodic Functions–Some General Theorems– Evaluation of Integrals Using Laplace Transform– Problems.	CO1	K1, K2 K3, K4, K5
UNIT-II	The Inverse Laplace Transforms: Properties of Inverse Laplace Transform- Partial Fraction Method – First and Second order linear differential Equations -The Inverse Laplace Transforms–Problems.	CO2	K1, K2
UNIT-III	Fourier Series: Fourier Series–Expansion of Periodic Functions of Period2π–Expansion of Odd and Even Functions - Properties of Odd and Even Functions–Problems.	CO3	K1, K2 K3, K4, K5
UNIT-IV	Fourier Transforms: Fourier Transform Complex form of Fourier Integral– Infinite Fourier Transform (Complex Form) Formula-Fourier Integral Theorem–Properties of Fourier Transforms.	CO4	K1, K2 K3, K4, K5
UNIT-V	Fourier Transforms (Continued): Fourier Cosine and Sine Transform–Formula- Fourier Cosine and Sine Transform – Properties - Fourier Cosine and Sine Transform Problems.	CO5	K1, K2 K3, K4, K5

Recommended Text Book:

1.Calculus Volume-III by S. Narayanan and T.K. Manickavachagom Pillay, S. Viswanathan Publishers Pvt. Ltd. 2006.

UNIT-I: Chapter-5 (Sections 1-5)
UNIT-II: Chapter-5 (Sections 6 & 7)
UNIT-III: Chapter-6 (Sections 1-3)
UNIT-IV: Chapter-6 (Sections 9 & 10)
UNIT-V: Chapter-6 (Sections 11 & 12)

Reference Books:

1. Differential Equations, Fourier and Laplace Transforms, Probability – P.R. Vittal, Margham Publications.
2. Engineering Mathematics Volume -III, P. Kandasamy and Others, (S. Chand and Co)
3. Advanced Engineering Mathematics– Stanley Gross man and William R. Devit
4. Engineering Mathematics -III, A. Singaravelu, Meenakshi Agency, Chennai2008.

Website and e-learning source

https://nptel.ac.in
https:www.mathhelp.com/

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Evaluation of integrals using Laplace Transform	K1, K2, K3, K4, K5
CO2	Understanding the Inverse Laplace Transforms	K1, K2
CO3	Evaluate the Expansion of Periodic Functions of Period 2π, Expansion of Odd and Even Functions.	K1, K2, K3, K4, K5
CO4	Evaluating the Fourier Transforms, Infinite Fourier Transforms and their properties	K1, K2, K3, K4, K5
CO5	Evaluate Fourier sine and cosine transform.	K1, K2, K3, K4, K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	1	-	-	1	-	-	1	3	2	1
CO2	3	1	3	1	-	-	1	-	-	1	3	2	1
CO3	3	1	3	1	-	-	1	-	-	1	3	2	1
CO4	3	1	3	1	-	-	1	-	-	1	3	2	1
CO5	3	1	3	1	-	-	1	-	-	1	3	2	1

COURSE DESCRIPTORS

Title of the Course	**SPECIAL FUNCTIONS**	**Hours/Week**	04
Course Code	**AUEMA55B**	**Credits**	03
Category	Elective Course -V	**Year & Semester**	III & V
Prerequisites	12th Standard Mathematics	**Regulation**	2024

Objectives of the Course:

The Course aims to

- Learn the concepts of simultaneous linear differential equations and some solvable types of non-linear equations.
- Basic knowledge about numerical solutions using the Taylor series.
- To understand the concepts of Bessel functions, Legendre functions, and their properties.
- To give an insight about Fourier integral, term by term differentiation of Fourier series and Legendre Series.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Properties of Linear Operators- Additive-Homogeneity, Superposition Principle-Commutative-Operator Notation - Simultaneous Linear Differential Equations Elimination Method, Operator Method (Matrix/Cramer's Rule) - Method of Laplace Transform–Special Solvable Types of Nonlinear Equations.	CO1	K1, K2
UNIT-II	Numerical Solutions Using Taylor Series-Identify the Initial Value Problem- Calculate Higher Derivatives-Evaluate at Initial Point:- Adams and Modified Adams Method-Extrapolation with Differences.	CO2	K1, K2 K3, K4
UNIT-III	Properties of Power Series- Radius of Convergence (R), Term-by-Term Differentiation-Integration, Algebraic Operations and Uniform Convergence -Examples -Singular Points of Linear Second Order Differential Equations - Method of Frobenius.	CO3	K1, K2 K3, K4
UNIT-IV	Bessel Functions, Definition - Differential Equation- Recurrence Relations Orthogonality-Generating Function-Behavior at Zero - Modified Bessel Functions-Properties - Legendre Functions - Legendre Polynomials-Legendre Functions of the Second Kind.	CO4	K1, K2 K3

UNIT-V	Term by Term Differentiation of Fourier Series- Continuity- Periodicity- Piecewise Smoothness and Convergence - Legendre Series- Conditions and Formula Fourier Integral- Fourier Integral Theorem-Fourier Cosine Integral, Fourier Sine Integral and Complex Form.	CO5	K1, K2 K3

Recommended Text Book:

1. F.B. Hildebrand. (1977) Advanced Calculus for Applications. Prentice Hall. New Jersey.

UNIT-I: Chapter-1 (1.7to1.12), Chapter-2(2.1,2.2)
UNIT-II: Chapter-3 (3.1to3.4,3.7)
UNIT-III: Chapter-4 (4.1to4.4)
UNIT-IV: Chapter-4 (4.8to4.12)
UNIT-V: Chapter-5 (5.10to5.14)

Reference Books:

1. J.N. Sharma and R.K. Gupta (1998) Special Functions, Krishna Prakashan Mandir, Meerut.
2. Satya Prakash. (2004) Mathematical Physics. Sultan &Sons. New Delhi.
3. B.D. Gupta (1978) Mathematical Physics, Vikas Publishing House.

Website and e-learning source

https://nptel.ac.in

https:www.mathhelp.com/

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Understanding of simultaneous linear differential equations.	K1, K2
CO2	Apply Adams and Modified Adams Method to solve problems	K1, K2, K3, K4
CO3	Discuss about the Properties of Power Series	K1, K2, K3, K4
CO4	Explain about Bessel Functions	K1, K2, K3
CO5	Explain about Differentiation of Fourier Series	K1, K2, K3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	1	1	-	-	1	1	1	1
CO2	2	2	3	3	2	-	1	-	-	1	1	1	1
CO3	3	3	3	3	2	1	1	-	-	1	1	2	1
CO4	3	2	3	3	2	-	1	-	-	1	1	2	1
CO5	3	2	3	3	2	1	1	-	-	1	1	2	1

COURSE DESCRIPTORS

Title of the Course	GRAPH THEORY	Hours/Week	04
Course Code	AUEMA56A	Credits	03
Category	Elective Course -VI	Year & Semester	III & V
Prerequisites	12th Standard Mathematics	Regulation	2024

Objectives of the course:

- To study and develop the concepts of Graphs, sub graphs, Trees, Connectivity, Eulerian, Hamiltonian graphs, and planar graphs.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Graphs, Subgraphs- Definition and Examples- Degree of Vertex – Subgraphs-Isomorphism of graphs, Ramsey Numbers, Independent Sets and Coverings - Theorems and simple problems.	CO1	K1, K2, K3
UNIT-II	Intersection Graphs and Line Graphs- Matrices-Adjacency and Incidence Matrices- Operations on Graphs, Degree Sequence and Graphic Sequence - Theorems and simple problems.	CO2	K1, K2, K3, K4
UNIT-III	Connectedness-Walks Trails and Paths -Connectedness and Components-Connected-Disconnected-Cut point and Bridge-Blocks-Theorems and Simple Problems.	CO3	K1, K2, K3
UNIT-IV	Connectivity-Line Connectivity Theorems and Simple Problems--Eulerian Graphs and Hamiltonian Graphs-Necessary and Sufficient conditions- Theorems and Simple Problems.	CO4	K1, K2, K3, K4
UNIT-V	Trees- Characterization of Trees-Centre of a Tree- Theorems and Simple Problems-Planarity-Definition and Properties-Euler Theorem-Maximal Planar- Theorems and Simple problems.	CO5	K1, K2, K3

Recommended Text Book

1. S. Arumugam and S. Ramachandran, "Invitation to Graph Theory", SCITECH Publications India Pvt. Ltd., 7/3C, Madley Road, T. Nagar, Chennai – 17.

UNIT-I: Chapter-2 (2.1 to 2.6)
UNIT-II: Chapter-2 (2.7 to 2.9) Chapter-3 (3.1, 3.2)
UNIT-III: Chapter-4 (4.1 to 4.3)
UNIT-IV: Chapter-4 (4.4), Chapter-5 (5.1 to 5.2)
UNIT-V: Chapter-6 (6.1 to 6.2) Chapter-8 (8.1)

Reference Books

1. Douglas B. West 'Introduction to Graph Theory', Pearson Education, Inc. Pearson Prentice Hall, London.
2. S.A. Choudham, First Course in Graph Theory, Macmillan India Ltd.
3. Robin J. Wilson, Introduction to Graph Theory, Longman Group Ltd.
4. J.A. Bondy and U.S.R. Murthy, Graph Theory with Applications, Macmill on, London.

Website and e-learning source

https://nptel.ac.in

https:www.mathhelp.com/

Course Learning Outcomes (for Mapping with Pos and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Explain Graphs, Degrees, Subgraphs and Isomorphism of graphs.	K1, K2, K3
CO2	Demonstrate Operations on graphs and Degree Sequence.	K1, K2, K3, K4
CO3	Discuss Walks, Trails, Paths, Connectedness and Components.	K1, K2, K3
CO4	Apply Eulerian graphs and Hamiltonian graphs for solving problems	K1, K2, K3, K4
CO5	Explain the Characterization of Trees and Centre of a Tree.	K1, K2, K3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	1	1	-	-	1	1	1	1
CO2	2	2	3	3	2	-	1	-	-	1	1	1	1
CO3	3	3	3	3	2	1	1	-	-	1	1	2	1
CO4	3	2	3	3	2	-	1	-	-	1	1	2	1
CO5	3	2	3	3	2	1	1	-	-	1	1	2	1

COURSE DESCRIPTORS

Title of the Course	**NUMBER THEORY**	**Hours/Week**	04
Course Code	**AUEMA56B**	**Credits**	03
Category	Elective Course -VI	**Year & Semester**	III & V
Prerequisites	12th Standard Mathematics	**Regulation**	2024

Objectives of the Course:

The course aims to

- Apply the various techniques of solving puzzles in applications.
- Know the connections of number theory with other branches.
- Gain competence in solving problems.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction– Basic binary Operations on the set of Integers– Ordering of Integers –Well Ordering Principle–Mathematical Induction-Simple problems only- Theorems and Examples.	CO1	K1, K2
UNIT-II	Divisibility Theory: Greatest common Divisor- Relatively Prime integers– Algorithm to find G.C.D: Investigation of the set of integers{bx+cy}- Least Common Multiple - problems - Theorems and Examples.	CO2	K1, K2 K3, K4, K5
UNIT-III	Linear Diophantine Equations: Linear Diophantine Equations – The Equation ax+by=c – Diophantine Equations in Three or More Unknowns-Statements and problems only.	CO3	K1, K2 K3, K4, K5
UNIT-IV	Quadratic Residues: Introduction, Quadratic Residues, Elementary Properties- Non-Quadratic Residues-Eulers Criterion-Legendre Symbol- Theorems -Simple problems only.	CO4	K1, K2 K3, K4
UNIT-V	Perfect Numbers: Introduction, Perfect Numbers, Necessary and Sufficient Conditions for a positive Integer to be an even Perfect number, Mersenne Numbers, Fermat Numbers- Theorems and Examples.	CO5	K1, K2 K3, K4, K5

Recommended Text Book:

1. Theory of Numbers, Dr. Sudhir, K. Pundir, Pragati Prakashan Publications, third revised edition 2012.

UNIT-I: Chapter - 1 (1.1 to 1.6)
UNIT-II: Chapter – 2 (2.1 to 2.5)
UNIT-III: Chapter – 3 (3.1 to 3.4)
UNIT-IV: Chapter - 9 (9.1 to 9.4)
UNIT-V: Chapter - 10 (10.1 to 10.5)

Reference Books:

1. An introduction to the Theory of Numbers (V edition) by Ivan Niven, Herbert S. Zuckarman and Hugh L. Montgometry John Wiley& Sons, Inc.2001.
2. Elementary theory of numbers,cy.Hsiung, Allied publishers,1995.
3. Elementary Number Theory, Allyn and BaconInc., Boston,1980.

Website and e-learning source

https://nptel.ac.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Understand the fundamental concepts of Mathematical Induction.	K1, K2
CO2	Evaluate the Greatest common Divisor and Least common multiple using the algorithms.	K1, K2, K3, K4, K5
CO3	Determine the Diophantine equations for three or more unknowns.	K1, K2, K3, K4, K5
CO4	Demonstrate the quadratic residues, elementary Properties	K1, K2, K3, K4
CO5	Evaluate the perfect numbers using the Mersenne and Fermat Numbers.	K1, K2, K3, K4, K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	1	1	-	-	1	1	1	1
CO2	2	2	3	3	2	-	1	-	-	1	1	1	1
CO3	3	3	3	3	2	1	1	-	-	1	1	2	1
CO4	3	2	3	3	2	-	1	-	-	1	1	2	1
CO5	3	2	3	3	2	1	1	-	-	1	1	2	1

COURSE DESCRIPTORS

Title of the Course	**Internship / Industrial Training (Summer vacation at the end of IV semester activity)**	**Hours/Week**	-
Course Code	**AUIMA57**	**Credits**	02
Category	Compulsory	**Year & Semester**	III & V
Prerequisites	-	**Regulation**	2024