



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

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
			AUEMA23B1	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	AUSMA35	Geogebra	2	2	25	75	100
	IV	Compulsory	AUES30	Environmental Science	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	Maxima	2	2	25	75	100
	IV	Skill Enhancement	AUSMA45	R Language 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	Transformation 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	12 th 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

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 $\sin n\theta$, $\cos n\theta$ in powers of $\sin\theta$, $\cos\theta$ - Expansion of $\tan n\theta$ in terms of $\tan \theta$ – Expansions of $\cos n\theta$, $\sin n\theta$, $\cos m\theta \sin n\theta$ – Expansions of $\tan(\theta_1 + \theta_2 + \dots + \theta_n)$ – Expansions of $\sin\theta$, $\cos\theta$ and $\tan\theta$ 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	12 th Standard 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 – Trigonometric 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 Involute – 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

<p>Recommended Text Books</p> <p>1. Calculus Volume I -S. Narayanan and T.K. Manickavachagom Pillay, S. Viswanathan Publishers Pvt. Ltd. 2015</p>
<p>Reference Books</p> <p>1. R. Courant and F. John, Introduction to Calculus and Analysis (Volumes I & II), Springer- Verlag, New York, Inc., 1989.</p> <p>2. T. Apostol, Calculus, Volumes I and II.</p> <p>S. Goldberg, Calculus and mathematical analysis</p>
<p>Website and e-learning source</p> <p>https://nptel.ac.in</p>

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	12 th Standard Mathematics	Regulation	2024

Objectives of the course:

- To know the methods of solving simultaneous linear equations.
- To acquire knowledge about forward differences and Backward differences and their relationship.
- Knowledge about central difference operators and problems based on various central differences formulae.
- To study Newton's divided difference formula and problems based 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 to 1.4	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 and Backward Interpolation formulae. Central Differences Formulae: Gauss-Forward and Backward Formulae. Chapter 4 :Section 4.1 to 4.3 (omit 4.1a) Chapter 5 :Section 5.1 to 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 and Engineering* 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 COMPETITIVE EXAMINATIONS-I	Hours/Week	02
Course Code	AUSMA14	Credits	02
Category	Skill Enhancement Course-I	Year & Semester	I & I
Prerequisites	12 th Standard 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	12 th Standard 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	12 th 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 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 Δ , ∇ 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 and Engineering* 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	12 th 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 Theory: 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	12 th 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 – 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 coefficient 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

<p>Recommended Text Books</p> <ol style="list-style-type: none"> 1. Fundamental of Mathematical Statistics-S.C.Gupta &V.K.Kapoor-Sultan Chand 2. Statistical Methods-Snedecor G.W.& Cochran W.G.oxford &+DII
<p>Reference Books</p> <ol style="list-style-type: none"> 1. Elements of Statistics -Mode. E.B.-Prentice Hall 2. Statistical Methods-Dr.S.P.Gupta-Sultan Chand &Sons
<p>Website and e-learning source</p> <p>https://www.simplilearn.com/what-is-statistical-analysis-article</p>

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	12 th 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 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 Δ , ∇ 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 and Engineering* 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	12 th Standard 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 coefficient 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

<p>Recommended Text Books</p> <p>1. Operations Research-S.D.Sharma-KedarNath Ramnath&Co-1997.Chapter1to6(all sections)</p>
<p>Reference Books</p> <p>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.</p>
<p>Website and e-learning source</p> <p>http://ebooks.iitd.ac.in/011erationsresearch/ http://ocw.mit.in/</p>

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	12 th 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 – 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	12 th 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 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 $y = ax + b$ parabolay = $ax^2 + bx + c$ 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 and Engineering* 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	12 th Standard 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 $\Delta, \nabla, E, E^{-1}$ 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 $\sin\theta$ and $\cos\theta$ - Expansions of $\sin(n\theta)$ and $\cos(n\theta)$ in a series sines and cosines of multiples of “ θ ”-Expansions of $\sin\theta, \cos\theta$ and $\tan\theta$ 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
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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

- Ancillary Mathematics by S .Narayanan and T.K.Manickavachagom Pillay,S.ViswanathanPinters,1986,Chennai
- Allied Mathematics by A.Singaravel
- 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