SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS)

SALEM – 16

Reaccredited with 'B++' Grade by NAAC

Affiliated to Periyar University

PG & RESEARCH DEPARTMENT OF MATHEMATICS

(DST-FIST & DBT-STAR SPONSORED)

Outcome Based Syllabus

B.Sc. MATHEMATICS

(For the students admitted in 2025-26)

B.Sc. MATHEMATICS

PROGRAMME OUTCOMES

PO1 **Disciplinary Knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.

PO2 **Critical Thinking:** Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.

PO3 **Problem Solving:** Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's earning to real life situations.

PO4 **Analytical Reasoning:** Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples and addressing opposing viewpoints.

PO5 **Scientific Reasoning:** Ability to analyse, interpret and draw conclusions from quantitative / qualitative data and critically evaluate ideas, evidence, and experiences from an open minded and reasoned perspective.

PO6 **Self-directed & Lifelong Learning:** Ability to work independently, identify and manage a project. Ability to acquire knowledge and skills, including "learning how to learn", through self-placed and self-directed learning aimed at personal development, meeting economic, social and cultural objectives.

B.Sc. MATHEMATICS

PROGRAMME SPECIFIC OUTCOMES

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.

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B.Sc. MATHEMATICS
PROGRAMME STRUCTURE UNDER CBCS
(For the students admitted in 2025-26)
Total Credits: 140 + Extra Credits (Maximum 28)

I SEMESTER

Part	Course	Course Title	Code	No. of Hours	Credits
I	Language	Tamil-I / Hindi-I / Sanskrit-I	25ULTC1/ 25ULHC1/ 25ULSC1	6	3
II	English	General English – I	25ULEC1	6	3
III	Core Course -I	Algebra & Trigonometry	25UMACC1	4	4
	Core Course -II	Differential Calculus	25UMACC2	5	4
	Generic Elective -I	Physics – I	25UMAPGEC1	3	3
		Physics Practical – I	25UMAPGECQ1	2	2
IV	Skill Enhancement Course (NME-I)	Mathematics for Competitive Examinations	25UMASEC1	2	2
	Skill Enhancement (Foundation Course)	Bridge Mathematics	25UMASEFC	2	2
	Total			**30**	**23**
V	• Articulation and Idea Fixation Skills • Physical Fitness Practice - 35 Hours per Semester				
	• Advanced Diploma in Vedic Mathematics Level -1: Certificate Course 100 Hours per Year				

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SEMESTER-II

Part	Course	Course Title	Code	No. of Hours	Credits
I	Language	Tamil-II / Hindi-II / Sanskrit-II	25ULTC2/ 25ULHC2/ 25ULSC2	6	3
II	English	General English – II	25ULEC2	6	3
III	Core Course -III	Analytical Geometry (Two & Three Dimensions)	25UMACC3	5	4
	Core Course -IV	Integral Calculus	25UMACC4	4	4
	Elective-II (Generic)	Physics – II	25UMAPGEC2	3	3
		Physics Practical – II	25UMAPGECQ2	2	2
IV	Skill Enhancement Course -II(NME)	Quantitative Aptitude for Competitive Examinations	25UMASEC2	2	2
	Skill Enhancement Course- III (Indian Knowledge System)	History and Development of Indian Mathematics (From Vedic Period to Modern Era)	25UMASEC3	2	2
	Total			**30**	**23**
V	• Articulation and Idea Fixation Skills-1 Extra Credit • Physical Fitness Practice - 35 Hours per Semester-1 Extra Credit				
	• Advanced Diploma in Vedic Mathematics • Level -1: Certificate Course 100 Hours per Year-2 Extra Credits Extra credits are given for extra skills and courses qualified in MOOC/NPTEL				

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SEMESTER-III

Part	Course	Course Title	Code	No. of Hours	Credits
I	Language	Tamil-III / Hindi-III/ Sanskrit-III	25ULTC3 25ULHC3 25ULSC3	6	3
II	English	General English – III	25ULEC3	6	3
III	Core Course -V	Vector Calculus and its Applications	25UMACC5	4	4
	Core Course -VI	Differential Equations and its Applications	25UMACC6	5	4
	Elective-I (Discipline)	Mathematical Statistics-I	25UMADSEC1	5	5
IV	Skill enhancement course	Statistics with Excel Programming- Practical (Entrepreneurial Skill)	25UMASECQ4	1	1
	Skill Enhancement Course	Data Analytics with R-Practical	25UMASECQ5	2	2
		Environmental Studies	25UEVSC	1	
		Health and Wellness	25UHAW		1
	Total			**30**	**22+1**
V	• Articulation and Idea Fixation Skills • Physical Fitness Practice - 35 Hours per Semester				
	• Advanced Diploma in Vedic Mathematics Level -2: Certificate Course 100 Hours per Year Extra credits are given for extra skills and courses qualified in MOOC/NPTEL				

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PROGRAMME STRUCTURE UNDER CBCS
(For the Academic Year 2025-26)
Total Credits: 140 + Extra Credits (Maximum 28)
SEMESTER-IV

Part	Course	Course Title	Code	No. of Hours	Credits
I	Language	Tamil-IV / Hindi-IV/ Sanskrit-IV	25ULTC4 25ULHC4 25ULSC4	6	3
II	English	General English – IV	25ULEC4	6	3
III	Core Course - VII	Industrial Statistics	25UMACC7	4	4
	Core Course - VIII	Elements of Mathematical Analysis	25UMACC8	4	4
	Elective-II (Discipline)	Theory: Mathematical statistics-II (3 Credits)	25UMADSEC2	5	5
		Practical: Mathematical statistics using R Programming - Practical (2 Credits)	25UMADSECQ		
IV	Skill enhancement course	Computational Mathematics with MALAB- Practical	25UMASECQ6	2	2
	Skill Enhancement Course	LaTeX- Practical	25UMASECQ7	2	2
		Environmental Studies	25UEVSC	1	2
	Total			**30**	**25**
V	• Articulation and Idea Fixation Skills-1 Extra Credit • Physical Fitness Practice - 35 Hours per Semester-1 Extra Credit • Extra credits are given for extra skills and courses qualified in MOOC/NPTEL				
	• Advanced Diploma in Vedic Mathematics Level -2: Diploma Course 100 Hours per Year- 2 Credits				

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B.Sc. MATHEMATICS
PROGRAMME STRUCTURE UNDER CBCS
(For the Academic Year 2025-26)
Total Credits: 140 + Extra Credits (Maximum 28)

SEMESTER-V

Part	Course	Course Title	Code	No. of Hours	Credits
III	Core Course- IX	Abstract Algebra	25UMACC9	5	4
	Core Course- X	Real Analysis	25UMACC10	5	4
	Core Course- XI	Mathematical Modelling	25UMACC11	4	4
	Core Course- XII	Optimization Techniques	25UMACC12	4	3
	Elective-III (Discipline)	Project & Viva Voce	25UMAPVV	5	4
	Elective-IV (Discipline)	Theory: Biomathematics (2 Credits) Practical: Biomathematics-Practical (1 Credit) Discrete Mathematics (3 Credits)	25UMADSEC3A 25UMADSECQ2 25UMADSEC3B	5	3
IV		Value Education	25UVEN	2	2
		Internship / Industrial Training	25UMAI	-	2
	Total			**30**	**26**
V	• Articulation and Idea Fixation Skills • Physical Fitness Practice - 35 Hours per Semester • Extra credits are given for extra skills and courses qualified in MOOC/NPTEL				
	• Advanced Diploma in Vedic Mathematics - Level -3: Diploma Course 100 Hours per Year				

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="8">ALGEBRA & TRIGONOMETRY</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">CORE I</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">CORE</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">25UMACC1</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>3</td><td colspan="2">1</td><td colspan="2">-</td><td colspan="2">4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="8">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="8">1.Basic ideas on the Theory of Equations, Matrices and Number Theory.
2.Knowledge to find expansions of trigonometry functions, solve theoretical and applied problems.</td></tr>
<tr><td colspan="10">Course Outcomes:
Students will be able to
CO1: Classify and solve reciprocal equations
CO2: Find the sum of binomial, exponential and logarithmic series
CO3: Find Eigen values, eigen vectors, verify Cayley - Hamilton theorem and diagonalize a given matrix
CO4: Expand the powers and multiples of trigonometric functions in terms of sine and cosine
CO5: Determine relationship between circular and hyperbolic functions and the summation of trigonometric series</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="8">Unit – I (Hours: 12)

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 4 (Sections 32-34), Chapter 5 (Section 45) & Chapter 11 (Section 108)</td></tr>
<tr><td colspan="2"></td><td colspan="8">Unit –II (Hours: 12)
Summation of Series: Binomial - Exponential - Logarithmic series (Theorems without proof) – Approximations - related problems.
Chapter 1 (Page 84 - 88, 90 – 103) & Chapter 13 (Page 253)</td></tr>
<tr><td colspan="2"></td><td colspan="8">Unit–III (Hours: 12)
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 5(Sections5.1 -5.3) & Page 371</td></tr>
</table>

	Unit –IV (Hours: 12) Expansions of sin nθ, cos nθ in powers of sinθ, cosθ - Expansion of tan nθ in terms of tan θ, Expansions of $\cos^n\theta$, $\sin^n\theta$, $\cos^m\theta\sin^n\theta$ –Expansions of $\tan(\theta_1+\theta_2+,.,+\theta_n)$-Expansions of sinθ, cosθ and tanθ in terms of θ - related problems. **Chapters9 (Page 169 - 174) & Chapter 5 (Page 79 - 84)**
	Unit –V (Hours: 12) Hyperbolic functions – Relation between circular and hyperbolic functions Inverse hyperbolic functions, Logarithm of complex quantities, Summation of trigonometric series - related problems. **Chapter 4 (Page 52-57), Chapter 6 (Page 104 – 107& 110),** **Chapter 10 (Page 197-202),** **Chapter 13 (Page 241 - 245 & 256) &Chapter9 (Page 174 - 178)**
Extended Professional Component (is a part of Internal Component only, not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/ GATE/ TNPSC/ others to be solved. (To be discussed during the Tutorial hour)
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. W.S. Burnstine and A.W. Panton, Theory of equations (for Unit I) 2. David C. Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007 (for Unit III) 3. C.V.Durell and A. Robson, Advanced Trigonometry, Courier Corporation, 2003, (for Unit II, IV & V)
Reference Books	1. G.B. Thomas and R.L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005 2. J.Stewart, L. Redlin, and S. Watson, Algebra and Trigonometry, Cengage Learning, 2012. 3. Calculus and Analytical Geometry, G.B. Thomas and R. L. Finny, Pearson Publication, 9th Edition, 2010. 4. Dr.P.R.Vittal &V.Malini, Algebra, Analytical Geometry &Trigonometry, MarghamPublications,Chennai-17. 5. T.K.Manickavasagam Pillai & others, Algebra Volume-I , S.V. Publications,1985.
Web resources	https://nptel.ac.in/ https://yutsumura.com/linear-algebra/the-cayley-hamilton-theorem/ https://www.youtube.com/watch?v=V1AKAkGJlN8

Mapping of COs with POs and PSOs:

	Pos						**PSOs**		
	1	2	3	4	5	6	1	2	3
CO1	3	1	3	-	-	-	3	2	1
CO2	2	1	3	1	-	-	3	2	1
CO3	3	1	3	1	-	-	3	2	1
CO4	3	1	3	-	-	-	3	2	1
CO5	3	1	3	-	-	-	3	2	1

Strong-3; Medium-2; Low-1

Title of the Course		**DIFFERENTIAL CALCULUS**					
Paper Number		**CORE II**					
Category	**CORE**	**Year**	**I**	**Credits**	**4**	**Course Code**	**25UMACC2**
		Semester	**I**				

Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**	**Total**
	4	**1**	**-**	**5**

Pre-requisite	12th Standard Mathematics
Objectives of the Course	1.The basic skills of differentiation, successive differentiation, and their applications. 2.Basic knowledge on the notions of curvature, evolutes, involutes and polar co-ordinates and in solving related problems.

Course Outcomes:

Students will be able to

CO1: Find the nth derivative, form equations involving derivatives and apply Leibnitz formula

CO2: Find the partial derivative and total derivative coefficient

CO3: Determine maxima and minima of functions of two variables and to use the Lagrange's method of undetermined multipliers

CO4: Find the envelope of a given family of curves

CO5: Find the evolutes and involutes and to find the radius of curvature using polar co-ordinates

Course Outline	**Unit–I (Hours: 15)** **Successive Differentiation** Introduction (Review of basic concepts) – The n^{th} derivative – Standard results – Fractional expressions – Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz formula for the n^{th} derivative of a product – Feynman's method of differentiation. **Chapter 3 (Sections 3.1, 3.2 &3.3)**
	Unit–II (Hours: 15) **Partial Differentiation** Partial derivatives – Successive partial derivatives – Function of a function rule – Total differential coefficient – A special case – Implicit Functions. **Chapter 11 (Sections 11.3-11.5)**
	Unit–III (Hours: 15) **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 11 (Sections 11.3, 11.7, 11.8)**
	Unit –IV(Hours: 15)

	Curvature Definition of Curvature – Circle, Radius and Centre of Curvature – Evolutes and Involutes – Radius of Curvature in Polar Co-ordinates. **Chapter 13 (Sections13.1, 13.2, 13.4, 13.7,13.10)**
	Unit –V (Hours: 15) **Envelope** Method of finding the envelope – Another definition of envelope – Envelope of family of curves which are quadratic in the parameter. **Chapter 14 (Sections 14.1 to 14.4)**
Extended Professional Component (is a part of Internal Component only, not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/ GATE/ TNPSC/ others to be solved. (To be discussed during the Tutorial hour)
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. M.J. Strauss, G.L. Bradley and K. J. Smith, Calculus, 3rd Ed., Dorling Kindersley (India) P. Ltd. (Pearson Education), Delhi, 2007. (For Unit I, II & III) 2. N.P. Bali, Golden Differential Calculus, Laxmi Publications (P) Ltd. 2010. (For Unit IV &V)
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, 2010. 3. R. Courant and F. John, Introduction to Calculus and Analysis (Volumes I & II), Springer- Verlag, New York, Inc., 1989. 4. T. Apostol, Calculus, Volumes I and II. 5. S. Goldberg, Calculus and mathematical analysis.
Web resources	https://nptel.ac.in/ https://arcsecond.wordpress.com/2009/05/10/feynmans-differentiation-trick/

Mapping of COs with POs and PSOs:

	Pos						**PSOs**		
	1	2	3	4	5	6	1	2	3
CO1	3	1	3	-	-	-	3	2	1
CO2	2	1	3	-	-	-	3	2	1
CO3	3	2	3	2	-	-	3	2	1
CO4	3	2	3	2	1	-	3	2	1
CO5	3	2	3	2	1	-	3	2	1

Strong-3; Medium-2; Low-1

Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
25UMAPGEC1	**PHYSICS – I**	Generic Elective				3	3	70

COURSE	**GENERIC ELECTIVE-I**
COURSE TITLE	**PHYSICS - I**
CODE	**25UMAPGEC1**
CREDITS	**3**
HOURS	**3**
COURSE OBJECTIVES	To impart basic principles of Physics that which would be helpful for students who have taken programmes other than Physics.

UNITS	COURSE DETAILS
UNIT-I	**WAVES, OSCILLATIONS AND ULTRASONICS:** simple harmonic motion (SHM) – composition of two SHMs at right angles (periods in the ratio 1:1) – Lissajous figures – uses – laws of transverse vibrations of strings – determination of AC frequency using sonometer (steel and brass wires) – ultrasound – production – piezoelectric method – application of ultrasonics: medical field – lithotripsy, ultrasonography – ultrasono imaging- ultrasonics in dentistry – physiotheraphy, opthalmology – advantages of noninvasive surgery – ultrasonics in green chemistry.
UNIT-II	**PROPERTIES OF MATTER:** *Elasticity*: elastic constants – bending of beam – theory of non- uniform bending – determination of Young's modulus by non-uniform bending – energy stored in a stretched wire – torsion of a wire – determination of rigidity modulus by torsional pendulum *Viscosity*: streamline and turbulent motion – critical velocity – coefficient of viscosity – Poiseuille's formula – comparison of viscosities – burette method, *Surface tension*: definition – molecular theory – droplets formation–shape, size and lifetime – COVID transmission through droplets, saliva – drop weight method – interfacial surface tension.
UNIT-III	**HEAT AND THERMODYNAMICS:** Joule-Kelvin effect – Joule-Thomson porous plug experiment – theory – temperature of inversion – liquefaction of Oxygen– Linde's process of liquefaction of air– liquid Oxygen for medical purpose– importance of cryocoolers – thermodynamic system – thermodynamic equilibrium – laws of thermodynamics – heat engine – Carnot's cycle – efficiency – entropy – change of entropy in reversible and irreversible process.
UNIT-IV	**ELECTRICITY AND MAGNETISM:** potentiometer – principle – measurement of thermoemf using potentiometer –magnetic field due to a current carrying conductor – Biot-Savart's law – field along the axis of the coil carrying current – peak, average and RMS values of ac current and voltage – power factor

	and current values in an AC circuit – types of switches in household and factories– Smart wifi switches- fuses and circuit breakers in houses
UNIT-V	**DIGITAL ELECTRONICS AND DIGITAL INDIA:** logic gates, OR, AND, NOT, NAND, NOR , EXOR logic gates – universal building blocks – Boolean algebra – De Morgan's theorem – verification – overview of Government initiatives: software technological parks under MeitY, NIELIT- semiconductor laboratories under Dept. of Space – an introduction to Digital India
TEXT BOOKS	1. R.Murugesan (2001), Allied Physics, S. Chand & Co, New Delhi. 2. Brijlal and N.Subramanyam (1994), Waves and Oscillations, Vikas Publishing House, New Delhi. 3. Brijlal and N.Subramaniam (1994), Properties of Matter, S.Chand & Co., New Delhi. 4. J.B.Rajam and C.L.Arora (1976). Heat and Thermodynamics (8^{th} edition), S.Chand & Co., New Delhi. 5. R.Murugesan (2005), Optics and Spectroscopy, S.Chand & Co, New Delhi. 6. A.Subramaniyam, Applied Electronics 2^{nd} Edn., National Publishing Co., Chennai.
REFERENCE BOOKS	1. Resnick Halliday and Walker (2018). Fundamentals of Physics (11^{th}edition), 2. John Willey and Sons, Asia Pvt. Ltd., Singapore. 3. V.R.Khanna and R.S.Bedi (1998), Text book of Sound 1^{st} Edn. Kedharnaath Publish & Co, Meerut. 4. N.S.Khare and S.S.Srivastava (1983), Electricity and Magnetism 10^{th}Edn., Atma Ram & Sons, New Delhi. 5. D.R.Khannaand H.R. Gulati (1979). Optics, S. Chand & Co.Ltd., New Delhi. 6. V.K.Metha (2004). Principles of electronics 6^{th} Edn. S.Chand and company.
WEB LINKS	1. https://youtu.be/M_5KYncYNyc 2. https://youtu.be/ljJLJgIvaHY 3. https://youtu.be/7mGqd9HQ_AU 4. https://youtu.be/h5jOAw57OXM 5. https://learningtechnologyofficial.com/category/fluid-mechanics-lab/ 6. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.htmlhttps://www.youtube.com/watch?v=gT8Nth9NWPMhttps://www.youtube.com/watch?v=9mXOMzUruMQ&t=1s https://www.youtube.com/watch?v=m4u-SuaSu1s&t=3shttps://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work

COURSE OUTCOMES:
At the end of the course, the student will be able to:

COURSE OUTCOMES	**CO1**	Explain types of motion and extend their knowledge in the study of various dynamic motions analyze and demonstrate mathematically. Relate theory with practical applications in medical field.
	CO2	Explain their knowledge of understanding about materials and their behaviors and apply it to various situations in laboratory and real life. Connect droplet theory with Corona transmission.
	CO3	Comprehend basic concept of thermodynamics concept of entropy and associated theorems able to interpret the process of flow temperature physics in the background of growth of this technology.
	CO4	Articulate the knowledge about electric current resistance, capacitance in terms of potential electric field and electric correlate the connection between electric field and magnetic field and analyze the mathematically verify circuits and apply the concepts to construct circuits and study them.
	CO5	Interpret the real life solutions using AND, OR, NOT basic logic gates and intend their ideas to universal building blocks. Infer operations using Boolean algebra and acquire elementary ideas of IC circuits. Acquire information about various Govt. programs/ institutions in this field.

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the 3-point scale of STRONG (**S**), MEDIUM (**M**) and LOW (**L**).

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	S	S	S	S	S	S
CO2	M	S	S	S	M	S	S	S	S	M
CO3	M	S	S	S	S	M	S	S	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	M	S	S	S	S	S	S	S	S	S

METHOD OF EVALUATION:

Continuous Internal Assessment	**End Semester Examination**	**Total**	**Grade**
25	**75**	**100**	

COURSE OUTCOMES:
At the end of the course, the student will be able to:

COURSE OUTCOMES	**CO1**	Explain types of motion and extend their knowledge in the study of various dynamic motions analyze and demonstrate mathematically. Relate theory with practical applications in medical field.
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MAPPING WITH PROGRAM OUT COMES:

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	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	S	S	S	S	S	S
CO2	M	S	S	S	M	S	S	S	S	M
CO3	M	S	S	S	S	M	S	S	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	M	S	S	S	S	S	S	S	S	S

COURSE	**GENERIC ELECTIVE –I**
COURSE TITLE	**PHYSICS PRACTICAL - I**
CODE	**25UMAPGECQ1**
CREDITS	**2**
HOURS	**2**
COURSE OBJECTIVES	Apply various physics concepts to understand Properties of Matter and waves, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results

ANY Seven only

1. Young's modulus by non-uniform bending using pin and microscope
2. Young's modulus by non-uniform bending using optic lever, scale and telescope
3. Rigidity modulus by static torsion method.
4. Rigidity modulus by torsional oscillations without mass
5. Surface tension and interfacial Surface tension – drop weight method
6. Comparison of viscosities of two liquids – burette method
7. Specific heat capacity of a liquid – half time correction
8. Verification of laws of transverse vibrations using sonometer
9. Calibration of low range voltmeter using potentiometer
10. Determination of the rmosemf using potentiometer
11. Verification of truth tables of basic logic gates using ICs
12. Verification of De Morgan's theorems using logic gate ICs.
13. Use of NAND as universal building block.

Note : Use of digital balance permitted

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">MATHEMATICS FOR COMPETITIVE EXAMINATIONS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">NME I</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Skill Enhancement</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">25UMASEC1</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>2</td><td colspan="2">-</td><td colspan="2">-</td><td>2</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">1. To introduce the basic concepts of Mathematics.
2. To make them to find simple and compound interest.
3. To promote the problem solving ability to write the competitive examinations.</td></tr>
<tr><td colspan="9">Course Outcomes:
Students will be able to
CO1: Recognize the notions on numbers and averages
CO2: Understand the concepts of profit and loss, ratio and proportion, partnership, simple interest and compound interest problems
CO3: Apply the concepts obtained in the course to solve real life problems
CO4: Infer solutions about the partnership and rate of proportionality appropriately.
CO5: Analyze the problems on profit and loss and inspect the odd man out series.</td></tr>
<tr><td colspan="2">Course outline</td><td colspan="7">Unit – I (Hours: 6)

Averages, Problems on Numbers.
Section-I – Chapter 6 – Solved examples 1-15 only (Page No. 139-141), Chapter 7 - Solved examples 1-15 only (Page No.161-163).</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit – II (Hours: 6)
Profit and Loss
Section-I – Chapter 11 – Solved examples 1-29 only (Page No.251-256).</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit – III (Hours: 6)
Ratio and Proportion, Partnership
Section-I – Chapter 12 – Solved examples 1-7 only (Page No.294-296), Chapter 13 (Page No.311-325).</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit – IV (Hours: 6)
Simple Interest, Compound Interest
Section-I – Chapter 21 – Solved examples 1-12 only (445-447), Chapter 22 – Solved examples 1-15 only (466-470).</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit – V (Hours: 6)
Odd Man Out and Series
Section-I – Chapter 35 (Page No.649-657).</td></tr>
</table>

Extended Professional Component (is a part of Internal Component only, not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/ GATE/ TNPSC/ others to be solved.
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	Dr. R. S. Aggarwal- Quantitative Aptitude for Competitive Examinations (Fully Solved) (Seventh Revised Edition), S. Chand & Company Pvt. Ltd
Reference Books	Abhijit Guha - Quantitative Aptitude for All Competitive Examinations, McGraw Hill Education, Sixth edition.
Web resources	1. https://ncert.nic.in/ncerts/l/gemh108.pdf 2. https://ncert.nic.in/textbook/pdf/femh112.pdf?html 3. https://ncert.nic.in/ncerts/l/hemh108.pdf

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">BRIDGE MATHEMATICS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">FOUNDATION COURSE</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Skill Enhancement</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">25UMASEFC</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>2</td><td colspan="2">-</td><td colspan="2">-</td><td>2</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">1.To bridge the gap and facilitate the transition from higher secondary to tertiary education;

2.To instill confidence among students and inculcate interest for Mathematics.</td></tr>
<tr><td colspan="9">Course Outcomes:

Students will be able to
CO1: Prove the binomial theorem and apply it to find the expansions of any $(x + y)^n$ and also, solve the related problems
CO2: Find the various sequences and series and solve the problems related to them. Explain the principle of counting.
CO3: Find the number of permutations and combinations in different cases. Apply the principle of counting to solve the problems on permutations and combinations
CO4: Explain various trigonometric ratios and find them for different angles, including sum of the angles, multiple and submultiple angles, etc. Also, they can solve the problems using the transformations.
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.</td></tr>
<tr><td colspan="2" rowspan="3">Course Outline</td><td colspan="7">UNIT-I: (Hours: 6)

Algebra: Binomial theorem, General term, middle term, problems based on these concepts</td></tr>
<tr><td colspan="7">Unit II: (Hours: 6)

Sequences and series (Progressions). Fundamental principle of counting. Factorial n.</td></tr>
<tr><td colspan="7">Unit III:(Hours: 6)

Permutations and combinations, Derivation of formulae and their connections, simple applications, combinations with repetitions, arrangements within groups, formation of groups.</td></tr>
</table>

	Unit IV: (Hours: 6) 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.
	Unit V: (Hours: 6) 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.
Recommended Text	1. NCERT class XI and XII text books. 2. Any State Board Mathematics text books of class XI and XII
Web resources	https://nptel.ac.in/

Mapping of COs with POs and PSOs:

	Pos						**PSOs**	
	1	2	3	4	5	6	1	2
CO1	1	1	1	1	1	1	1	1
CO2	2	1	1	2	2	1	2	1
CO3	2	1	1	2	2	1	2	1
CO4	1	1	1	1	1	1	2	1
CO5	1	1	1	1	1	1	2	1

Strong-3; Medium-2; Low-1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">ANALYTICAL GEOMETRY (TWO & THREE DIMENSIONS)</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">CORE III</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">CORE</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">25UMACC3</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>4</td><td colspan="2">1</td><td colspan="2">-</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">1. Necessary skills to analyze characteristics and properties of two- and three-dimensional geometric shapes.
2. To present mathematical arguments about geometric relationships.
3. To solve real world problems on geometry and its applications.</td></tr>
<tr><td colspan="8">Course Outcomes:
Students will be able to
CO1: assimilate the basic concepts of Polar Equations of Straight Line and Circle
CO2: understand the concepts of the Ellipse, the Hyperbola and Conic
CO3: learn about angle between two planes, Symmetrical form of Equations and solve related problems.
CO4: analyse the concepts of straight lines, coplanarity of straight lines and shortest distance between two given lines
CO5: explain in detail the system of Spheres.</td></tr>
<tr><td colspan="2" rowspan="3">Course Outline</td><td colspan="6">Unit – I (Hours: 15)

Coordinates, Length of Straight Lines and Areas of Triangles: Polar coordinates
The Straight Line: Polar Equations and Oblique Coordinates
The Circle: Equation to a Tangent

Chapter 2 (Sections 30-35)
Chapter 5 (Sections 88-96)
Chapter 8(Sections138-147)</td></tr>
<tr><td colspan="6">Unit –II (Hours: 15)

The Ellipse: Pole and Polar - Conjugate Diameters.
The Hyperbola: Asymptotes
Polar Equation to a Conic: Polar Equation to a Tangent, Polar and Normal.

Chapter 12 (Sections 274-292)
Chapter 13 (Sections 312 -327)
Chapter 14(Sections 335-347)</td></tr>
<tr><td colspan="6">Unit–III (Hours: 15)
The Plane, The Straight line, Volume of the Tetrahedron: Forms of the Equation to a Plane - The General Equation to a Plane - The Distance of a Point from a Plane - The Planes Bisecting the angles between two</td></tr>
</table>

	given Planes - The Equation to a Straight Line - Symmetrical form of Equation. **Chapter - 3 (Sections 33 - 35, 37 - 40)**
	Unit –IV (Hours: 15) **The Plane, The Straight line, Volume of the Tetrahedron:** The Line through two given Points - The Direction Ratios found from the Equations - Constants in the Equation to a Line - The Plane and the Straight Line - The intersection of Three Planes - The Condition that two given Lines should be Coplanar - The Shortest Distance between two given Lines. **Chapter - 3 (Sections41 - 45,48 & 49)**
	Unit -V (Hours: 15) **The Sphere:** The Equation to a sphere - Tangents and Tangent Plane to a Sphere - The Radical Plane of two Spheres. **Chapter - 5 (Sections 56 -58)**
Extended Professional Component (is a part of Internal Component only, not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/ GATE/ TNPSC/ others to be solved. (To be discussed during the Tutorial hour)
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill.
Recommended Text	1. S. L. Loney, Co-ordinate Geometry (For Units I & II). 2. Robert J. T. Bell, Co-ordinate Geometry of Three Dimensions. (For Units III, IV & V)
Reference Books	1. Thomas G.B and Finney R. L, Calculus and Analytical Geometry, Pearson Publication, 9th Edition, 2010. 2. Manicavachagom Pillay T. K and Natarajan T, A Text book of Analytical Geometry Part I- Two Dimensions, Divya Subramanian for Ananda Book Depot, 1996 3. Shanti Narayanan and Mittal P.K, Analytical Solid Geometry, S. Chand Publishing, 2021. 4. Vittal P.R and Malini V, Algebra, Analytical Geometry & Trigonometry, Margam Publications, India, 2018 5. William F. Osgood and William C. Graustein, Plane and Solid Analytic Geometry, Macmillan Company, New York, 2016.
Web resources	https://nptel.ac.in

Mapping of COs with POs and PSOs:

	Pos						**PSOs**		
	1	2	3	4	5	6	1	2	3
CO1	2	2	2	1	-	-	3	2	1
CO2	2	2	2	1	-	-	3	2	1
CO3	3	2	2	1	-	-	3	2	1
CO4	3	2	3	1	-	-	3	2	1
CO5	3	2	3	1	-	-	3	2	1

Strong-3; Medium-2; Low-1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">INTEGRAL CALCULUS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">CORE IV</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">CORE</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">25UMACC4</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>4</td><td colspan="2">-</td><td colspan="2">-</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">1.Knowledge on integration and its geometrical applications, double, triple integrals and improper integrals.
2. Knowledge about beta and gamma functions and the applications.
3. Skills to determine Fourier series expansions.</td></tr>
<tr><td colspan="8">Course Outcomes:
Students will be able to
CO1: determine the integrals of algebraic, trigonometric and logarithmic functions and to find the reduction formulae.
CO2: evaluate double and triple integrals and problems using change of order of integration
CO3: solve multiple integrals and to find the areas of curved surfaces and volumes of solids of revolution
CO4: explain beta and gamma functions and to use them in solving problems of integration
CO5: explain geometric and physical applications of integral calculus</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="6">Unit – I (Hours: 12)

Reduction formulae - Types, integration of product of powers of algebraic and trigonometric functions, integration of product of powers of algebraic and logarithmic function - Bernoulli’s formula, Feyman’s technique of integration.
Chapter 6 & 7 (Sections 6.6 &6.7, 7.2-7.4)</td></tr>
<tr><td colspan="2"></td><td colspan="6">Unit – II (Hours: 12)
Multiple Integrals - definition of double integrals -evaluation of double integrals - double integrals in polar coordinates - Change of order of integration.

Chapter 14 (Sections 14.1&14.3)</td></tr>
<tr><td colspan="2"></td><td colspan="6">Unit–III (Hours: 12)
Triple integrals - applications of multiple integrals - volumes of solids of revolution - areas of curved surfaces - change of variables - Jacobian.

Chapter 14 (Sections 14.5-14.7)</td></tr>
</table>

	Unit –IV (Hours: 12) Beta and Gamma functions - infinite integrals - definitions - recurrence formula of Gamma functions - properties of Beta and Gamma functions - relation between Beta and Gamma functions - Applications. **Chapter 3(Sections 3.1-3.3)**
	Unit –V (Hours: 12) Geometric and Physical Applications of Integral calculus. **Chapter 5(Sections 5.1 - 5.8)**
Extended Professional Component (is a part of Internal Component only, not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/ GATE/ TNPSC/ others to be solved.
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1.H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc.,2002. (For Units I,II,III & V) 2.D. Chatterjee, Integral Calculus and Differential Equations, Tata-McGraw Hill Publishing Company Ltd. (For Unit IV)
Reference Books	1. G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2010. 2. P. Dyke, An Introduction to Laplace Transforms and Fourier Series, Springer Undergraduate Mathematics Series, 2001(second edition).
Web resources	https://nptel.ac.in/

Mapping of COs with POs and PSOs:

	Pos						**PSOs**		
	1	2	3	4	5	6	1	2	3
CO1	3	1	3	-	-	-	3	2	1
CO2	3	1	3	-	-	-	3	2	1
CO3	3	1	3	-	-	-	3	2	1
CO4	3	1	3	-	-	-	3	2	1
CO5	3	1	3	-	2	1	3	2	1

Strong-3; Medium-2; Low-1

Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
25UMAPGEC2	PHYSICS –II	Elective	2	1	-	3	3	70

COURSE	ELECTIVE-II (GE)
COURSE TITLE	PHYSICS –II
CREDITS	3
COURSE OBJECTIVES	To understand the basic concepts of optics, modern Physics, Relativity, quantum physics, semiconductor physics and electronics

UNITS	COURSE DETAILS
UNIT-I	**OPTICS:** Interference – interference in thin films –colors of thin films – air wedge – determination of diameter of a thin wire by air wedge – diffraction – diffraction of light– normal incidence – experimental determination of wavelength using diffraction grating (no theory) – polarization – polarization by double reflection – Brewster's law – optical activity – application in sugar industries
UNIT-II	**ATOMIC PHYSICS:** Atom models – Bohr atom model – mass number – atomic number – nucleons – vector atom model – various quantum numbers – Pauli's exclusion principle – electronic configuration – periodic classification of elements – Bohr magneton – Stark effect – Zeeman effect (elementary ideas only).
UNIT-III	**NUCLEAR PHYSICS:** Nuclear models – magic numbers – shell model – nuclear energy – mass defect – binding energy – radioactivity – uses – half life - radio isotopes and uses – nuclear fission – energy released in fission – chain reaction - atom bomb - nuclear fusion – thermonuclear reactions – differences between fission and fusion (elementary ideas only).
UNIT-IV	**INTRODUCTION TO RELATIVITY AND GRAVITATIONAL WAVES**: Frame of reference – postulates of special theory of relativity – Galilean transformation equations – Lorentz transformation equations – derivation – length contraction – time dilation – twin paradox – mass-energy equivalence.
UNIT-V	**SEMICONDUCTOR PHYSICS:** p-n junction diode – forward and reverse biasing – characteristic of diode – zener diode – characteristic of zener diode – voltage regulator – full wave bridge rectifier.

TEXT BOOKS	1. R.Murugesan (2005), Allied Physics, S.Chand & Co, New Delhi. 2. K.Thangaraj and D.Jayaraman (2004), Allied Physics, Popular Book Depot, Chennai. 3. Brijlal and N.Subramanyam (2002), Text book of Optics, S.Chand & Co, New Delhi. 4. R.Murugesan (2005), Modern Physics, S.Chand & Co, New Delhi. 5. A.Subramaniyam Applied Electronics, 2nd Edn., National Publishing Co., Chennai.
REFERENCE BOOKS	1. Resnick Halliday and Walker (2018), Fundamentals of Physics, 11th Edn., John Willey and Sons, Asia Pvt. Ltd., Singapore. 2. D.R.Khanna and H.R. Gulati (1979). Optics, S.Chand & Co.Ltd., New Delhi. 3. A.Beiser (1997), Concepts of Modern Physics, Tata Mc Graw Hill Publication, New Delhi. 4. Thomas L. Floyd (2017), Digital Fundamentals, 11th Edn., Universal Book Stall, New Delhi. 5. V.K.Metha (2004), Principles of electronics, 6th Edn. , S.Chand and Company, New Delhi.
WEBLINKS	*1.* https://www.berkshire.com/learning-center/delta-p-facemask/https://www.youtube.com/watch?v=QrhxU47gtj4https://www.youtube.com/watch?time_continue=318&v=D38BjgUdL5U&feature=emb_logo 2. https://www.youtube.com/watch?v=JrRrp5F-Qu4 3. https://www.validyne.com/blog/leak-test-using-pressure-transducers/ 4. https://www.atoptics.co.uk/atoptics/blsky.htm - 5. https://www.metoffice.gov.uk/weather/learn-about/weather/optical-effects
Board of Studies Date : 02.11.2023	

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
30	**70**	**100**	

COURSE OUTCOMES:
At the end of the course, the student will be able to:

COURSE OUTCOMES	**CO1**	Explain the concepts of interference diffraction using principles of super position of waves and rephrase the concept of polarization based on wave patterns
	CO2	Outline the basic foundation of different atom models and various experiments establishing quantum concepts. Relate the importance of interpreting improving theoretical models based on observation..
	CO3	Summarize the properties of nuclei, nuclear forces structure of atomic nucleus and nuclear models. Solve problems on delay rate half-life and mean-life. Interpret nuclear processes like fission and fusion. Understand the importance of nuclear energy in nuclear field.
	CO4	To describe the basic concepts of relativity like equivalence principle, inertial frames and Lorentz transformation. Extend their knowledge on concepts of relativity and vice versa.
	CO5	Summarize the working of semiconductor devices like junction diode, Zener diode, transistors and full wave bridge rectifer.

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the 3-point scale of STRONG (**S**), MEDIUM (**M**) and LOW (**L**).

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	S	S	S	S	S	S
CO2	M	S	S	S	M	S	S	S	S	M
CO3	M	S	S	S	S	M	S	S	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	M	S	S	S	S	S	S	S	S	S

Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
25UMAPGECQ2	PHYSICS PRACTICALS - II	Elective	-	-	2	2	2	60

COURSE	**Elective Course (GE)**
COURSE TITLE	**PHYSICS PRACTICAL – II**
CREDITS	2
COURSE OBJECTIVES	1.Apply the concepts of Light, electricity and magnetism and waves, 2.Set up experiments to verify theories, quantify and analyse the observations. 3.To do error analysis and correlate results

Any Eight

1. Radius of curvature of lens by forming Newton's rings
2. Thickness of a wire using air wedge
3. Wavelength of mercury lines using spectrometer and grating
4. Refractive index of material of the lens by minimum deviation
5. Refractive index of liquid using liquid prism
6. Determination of AC frequency using sonometer
7. Specific resistance of a wire using PO box
8. Thermal conductivity of poor conductor using Lee's disc
9. Determination of figure of merit table galvanometer
10. Determination of Earth's magnetic field using field along the axis of a coil
11. Characterisation of Zener diode
12. Construction of Zener/IC regulated power supply
13. Construction of AND, OR, NOT gates using diodes and transistor
14. NOR gate as a universal building block

Board of Studies Date: 02.11.2023

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
30	**70**	**100**	

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">QUANTITATIVE APTITUDE FOR COMPETITIVE EXAMINATIONS (FOR I B.A / I B.Sc. / I B.Com)</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">NME II</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Skill Enhancement</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">25UMASEC2</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="3">Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td>2</td><td colspan="3">-</td><td>-</td><td>2</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">1. To introduce the basic concepts of Mathematics.
2.To make the students to acquire knowledge on Geometry and solid and plane figures.
3.To initiate the students to find the volume and surface area of solids.</td></tr>
<tr><td colspan="9">Course Outcomes:
Students will be able to
CO1: recognize the notions of numbers, H.C.F and L.C.M percentage
CO2: understand the concepts of area, volume and surface area.
CO3: use the acquire knowledge to solve the problems in numbers, H.C.F and L.C.M and percentage.
CO4: calculate the area, volume and surface area for geometrical shapes and solid shapes.
CO5: apply the concepts acquired to write the competitive examinations.</td></tr>
<tr><td colspan="2">Course outline</td><td colspan="7">Unit - I (Hours: 6)

Operations on Numbers.

Section-I - Chapter 1 - Solved examples 1-32 only.(Page No. 1-9 only)</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit – II (Hours: 6)

H.C.F. and L.C.M of Numbers.

Section-I - Chapter 2 (Page No. 30-45 only)</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit - III (Hours: 6)

Percentage

Section-I - Chapter 10 - Solved examples 1-33 only. (Page No.208-214 only)</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit - IV (Hours: 6)

Area
Section-I - Chapter 24 - Solved examples 1-32 only. (Page No. 499-505 only)</td></tr>
</table>

	Unit - V (Hours: 6) Volume and Surface Area **Section-I - Chapter 25 - Solved examples 1-34 only. (Page No. 549-555 only)**
Extended Professional Component (is a part of Internal Component only, not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/ GATE/ TNPSC/ others to be solved.
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	Dr. R. S. Aggarwal- Quantitative Aptitude for Competitive Examinations (Fully Solved) (Seventh Revised Edition), S. Chand & Company Pvt. Ltd
Reference Books	Rajesh Verma, Fast Track Objective Arithmetic, Arihant Publications India Limited, New Delhi, Completely Revised Edition.
Web resources	1. http://ncert.nic.in/ncerts/l/iemh113.pdf 2. https://yoursmahboob.files.wordpress.com/2016/12/quantramandeepbook-1.pdf

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">HISTORY AND DEVELOPMENT OF INDIAN MATHEMATICS (FROM VEDIC PERIOD TO MODERN ERA)</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">SEC III</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Skill Enhancement</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">25UMASEC3</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>2</td><td colspan="2">-</td><td colspan="2">-</td><td>2</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">1. Understand the Ancient Beginnings
2. Grasp the Classical Period Contributions
3. Realize the Colonial Period and Modern Developments</td></tr>
<tr><td colspan="9">Course Outcomes:
Students will be able to
CO1: understand the foundational contributions of ancient India during the Vedic period, including the concept of zero, arithmetic operations, and basic geometry.
CO2: explore the classical period advancements, such as the Brahmas phutasiddhanta, the Aryabhata, and their influence on algebra, trigonometry, and astronomy.
CO3: analyze the medieval era's contributions, including the works of Mathematicians like Bhaskar Acharya and his pioneering concept in calculus and continuous functions.
CO4: recognize the interactions between Indian and global mathematics during the colonial period, leading to integrated and expanded mathematical knowledge.
CO5: realize the modern era's contributions, where Indian mathematics like Ramanujan made profound discoveries and India's ongoing role in the global mathematical community.</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="7">Unit – I (Hours:6)

Introduction of Mathematics -Evolution of Vedic Mathematics - Features of Vedic Mathematics - Importance of Vedic Mathematics - Sutras - Sub sutras.</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit –II(Hours:6)

Baudhayana-Apastamba-yajnavalkya-panini-Aryabhata-varahamihira- Brahmagupta- Bhaskara- Mahavira-Sridharacharya- Bhaskara-II-Madhava of Sangamagrama-Nilakantha somayaji-Jyeshtadeva-Parameshvara-Ramanujan.</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit–III (Hours:6)

Birth of Zero - Mathematics in Vedas- A</td></tr>
</table>

	Generalized Approach for finding the Nth order roots of Numbers.
	Unit-IV (Hours:6) A Greedy Algorithm Hidden in Sulbasutra- Sankaras Geometrical Approach to Citrabhanus Ekavimsati Prasnottara**.**
	Unit –V(Hours:6) Vedic Mathematics in Modern Era - Vedic Mathematics in Computer: A survey -Vedic Mathematics- The cosmic software for implementation of fast Algorithms - Analysis of digital signal processing Algorithms based on Vedic Mathematics - Role of Vedic Mathematics in driving optimal solutions for Real Life Problems**.**
Recommended Text	Proceedings of the National Workshop on Ancient Indian Mathematics with special reference to Vedic Mathematics and Astronomy. Rashtriya Sanskrit Vidyapeetha 2011.
Web resources	https://nptel.ac.in/

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">VECTOR CALCULUS AND ITS APPLICATIONS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">CORE V</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">CORE</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">25UMACC5</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="3">Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td>3</td><td colspan="3">1</td><td>-</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">• 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.</td></tr>
<tr><td colspan="9">Course Outcomes:
Students will be able to
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
CO2: Applications of the operator ‘del’ and to Explain soleonidal and ir-rotational vectors
CO3: Solve simple line integrals
CO4: Solve surface integrals and volume integrals
CO5: Verify the theorems of Gauss, Stoke’s and Green’s(Two Dimension)</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="7">Unit – I (Hours: 12)
Vector point function - Scalar point function - 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(Sections1.1 -1.5)</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit –II (Hours: 12)
The vector operator ‘del’, The gradient of a scalar point function - Divergence of a vector - Curl of a vector - solenoidal and irrotational vectors – simple applications.
Chapter 2(Sections2.1 -2.7)</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit–III (Hours: 12)
Laplacian operator, Vector identities - Line integral - simple problems.
Chapter 2(Sections2.8) & Chapter 3(Sections 3.1 -3.4)</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit –IV (Hours: 12)
Surface integral - Volume integral – Applications
Chapter 3(Sections 3.5,3.6)</td></tr>
</table>

	Unit –V (Hours: 12) Gauss divergence Theorem, Stoke's Theorem, Green's Theorem in two dimensions – Applications to real life situations. **Chapter 4(Sections 4.1 -4.5)**
Extended Professional Component (is a part of Internal Component only, not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/ GATE/ TNPSC/ others to be solved. (To be discussed during the Tutorial hour)
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1.P. Duraipandian and Laxmi Duraipandian, Vector Analysis Revised Edition, Emerald publishers, Chennai 2. J.C. Susan ,Vector Calculus, , (4th Edn.) Pearson Education, Boston, 2012.
Reference Books	1.A. Gorguis, Vector Calculus for College Students, Xilbius Corporation, 2014. 2.J.E. Marsden and A. Tromba ,Vector Calculus, , (5^{th}edn.) W.H. Freeman, New York, 1988.
Web resources	https://nptel.ac.in/

Mapping of COs with POs and PSOs:

	Pos						**PSOs**		
	1	2	3	4	5	6	1	2	3
CO1	3	2	3	1	-	-	3	2	1
CO2	3	2	3	1	2	-	3	2	1
CO3	3	3	3	3	-	-	3	3	1
CO4	3	3	3	3	-	-	3	3	1
CO5	3	3	3	3	2	-	3	3	1

Strong-3; Medium-2; Low-1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">CORE VI</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">CORE</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">25UMACC6</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>4</td><td colspan="2">1</td><td colspan="2">--</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">1. Knowledge about the methods of solving Ordinary and Partial Differential Equations.
2. The understanding of how Differential Equations can be used as a powerful tool in solving problems in science.</td></tr>
<tr><td colspan="9">Course Outcomes :
Students will be able to
CO1: Determine solutions of homogeneous equations, non- homogeneous equations of degree one in two variables, solve Bernoulli‘s equations and exact differential equations.
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.
CO3: Find solutions of simultaneous linear differential equations, linear equations of second order and to find solutions using the method of variations of parameters.
CO 4: Form a PDE by eliminating arbitrary constants and arbitrary functions, find complete, singular and general integrals, to solve Lagrange‘s equations
CO 5: Explain standard forms and Solve Differential equations using Charpit‘s method.</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="7">UNIT-I: (Hours: 15)
Ordinary Differential Equations: Variable separable - Homogeneous Equation-Non-Homogeneous Equations of first degreein two variables - Linear Equation - Bernoulli‘s Equation-Exactdifferential equations.
(Chapter2: Sections 1 to 6)</td></tr>
<tr><td colspan="2"></td><td colspan="7">UNIT-II: (Hours: 15)
Equation of first order but 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.
(Chapter4: Sections 1,2 ,3 and Chapter5: 1 to 4)</td></tr>
</table>

	UNIT-III: (Hours: 15) Simultaneous linear differential equations- Linear Equations of the Second Order -Complete solution in terms of a knownintegrals-Reduction to the Normal form-Change of the Independent Variable-Method of Variation of Parameters. **(Chapter 6 and Chapter 8: Sections 1 to 4)**
	UNIT-IV: (Hours: 15) 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. **(Chapter12: 1,2,3, and 4)**
	UNIT-V: (Hours: 15) Special methods – Standard forms- Charpit's Method- Simple Applications. **(Chapter12: 5, and 6)**
Extended Professional Component (is a part of internal component only, not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Narayanan S and Manicavachagam Pillay T.K. Differential equations and its application, 2006, S. Viswananthan Printers Pvt. Ltd. 2. G.F. Simmons, Differential equations with applications and historical notes, 2nd Ed, Tata Mcgraw Hill Publications, 1991.

Reference Books	1. Shepley L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984. 2. I.Sneddon, Elements of Partial Differential Equations, McGraw-Hill, International Edition, 1967. 3. D.A. Murray, Introductory course in Differential Equations, Orient and Longman 4. H.T. H.Piaggio, Elementary Treaties on Differential Equations and their applications, C.B.S Publisher & Distributors, Delhi,1985. 5. Horst R. Beyer, Calculus and Analysis, Wiley, 2010. 6. Braun, M. Differential Equations and their Applications. (3rd Edn.), Springer- Verlag, New York. 1983. 7. TynMyint-U and Lognath Debnath. Linear Partial Differential Equations for Scientists and Engineers. (4th Edn.) Birhauser, Berlin. 2007. 8. Boyce, W.E. and R.C.DiPrima. Elementary Differential Equations and Boundary Value Problems. (7th Edn.) John Wiley and Sons, Inc., New York. 2001. 9. Sundrapandian, V. Ordinary and Partial Differential Equations, Tata McGraw Hill Education Pvt.Ltd. New Delhi, 2013
Website and e-Learning Source	https://nptel.ac.in

Mapping of COs with POs and PSOs:

	Pos						**PSOs**		
	1	2	3	4	5	6	1	2	3
CO1	3	1	3	2	1	-	3	2	1
CO2	3	1	3	2	1	-	3	2	1
CO3	3	1	3	2	1	-	3	3	1
CO4	3	1	3	2	2	1	3	3	1
CO5	3	1	3	2	2	1	3	3	1

Strong-3; Medium-2; Low-1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">MATHEMATICAL STATISTICS - I</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">ELECTIVE – I (DISCIPLINE SPECIFIC)</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">ELECTIVE</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2">25UMADSEC1</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">5</td><td>-</td><td colspan="2">-</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">Basics of Statistics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">1. To introduce the basic concepts of random variables, probability distribution and measures.
2. To introduce the statistical concepts and develop analytical skills.</td></tr>
<tr><td colspan="8">Course Outcomes:
Students will be able to
CO1: learn the concepts of characteristic functions, cumulants, conditional expectation, correlation, regression, curve fitting, measures of averages, dispersion and skewness.
CO2: examine the properties of characteristic function, correlation, regression and solve the related problems.
CO3: Applying the principle of Least squares for fitting of a curve.
CO4: evaluate the reliability and validity of statistical findings based on distributions and measures used.
CO5: solve society connect problems using mathematical statistics concepts.</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="6">Unit – I (Hours: 12)
Characteristic Functions: Definition, Properties of characteristic function, Moments from the characteristic function, Inversion theorem, Probability generating function – Definition, Probability generating function of Binomial distribution and Poisson distribution, Additive Property, Relation between PGF and MGF and examples.
Cumulants: Definition, examples, Additive Property of Cumulants.
Conditional Expectation: Definition, Theorems on conditional expectation and examples
Part I: Chapter 6 (Page No.: 6.1 – 6.46)
Part I: Chapter 3 (Page No.: 7.1 – 7.11)</td></tr>
<tr><td colspan="2"></td><td colspan="6">Unit – II (Hours: 12)
Correlation: Definition, Rank correlation, Properties of correlation coefficient, Limitations, Examples.
Regression – Derivation of Regression lines, Properties of regression coefficients, Examples.

Part I: Chapter 8 (Page No.:8.20 - 8.47)
Part I: Chapter 9 (Page No.: 9.1 - 9.24)</td></tr>
</table>

	Unit - III (Hours: 12) **Curve Fitting**: Method of least square - Fitting of a straight line and second-degree Parabola, Fitting of Power Curve and Exponential Curves - Simple Problems. **Part I: Chapter 10 (Page No.: 10.1 – 10.14)**
	Unit - IV (Hours: 12) **Binomial Distribution**: Definition, Binomial frequency distribution and Examples. **Poisson Distribution**: Definition and Examples of Poisson Distribution. **Normal distribution**: Definition, standard normal probability distribution and Examples. **Part I: Chapter 12 (Page No.: 12.1 – 12.16)** **Part I: Chapter 13 (Page No.: 13.1 – 13.12)** **Part I: Chapter 16 (Page No.: 16.1, 16.13 - 16.27)**
	Unit –V (Hours: 12) **Measures of Averages:** Definitions - Mean, Median, Mode, Geometric mean, Harmonic mean - Merits and demerits. **Measures of Dispersion:** Range, Quartile deviation, Mean deviation and their coefficients - Standard deviation - Co-efficient of Variation - Merits and demerits. **Measure of Skewness**: Karl Pearson's and Bowley's Coefficient of Skewness. **Part II: Chapter 5 (Page No.: 5.1 – 5.22)** **Part II: Chapter 6 (Page No.: 6.1 – 6.37)** **Part II: Chapter 7 (Page No.: 7.1 – 7.18)**
Extended Professional Component (is a part of Internal Component only, not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/ GATE/ TNPSC/ others to be solved.
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Vittal P. R, Mathematical Statistics, Margham Publications, Chennai. (For Units I - V)

Reference Books	1. Gupta S. C and Kapoor V. K, Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi(11th edition)2004. 2. Gupta. S. P. (2001), Statistical Methods, Sultan Chand & Sons, New Delhi. 3. Sancheti D. C and Kapoor V. K, Statistics (7th Edition), Sultan Chand & Sons, New Delhi, 2005. 4. Robert V. Hogg, Allen T. Craig, Joseph W. Mc Kean, Introduction to mathematical statistics, Pearson Education. 5. Agarwal B. L, Basic Statistics, Wiley Eastern Ltd., Publishers, New Delhi. 6. Marek Fisz, Probability theory and Mathematical Statistics, John Wiley and Sons. 7. Rohatgi V. K, An Introduction to Probability theory and Mathematical Statistics, Wiley Eastern Ltd., Publishers, New Delhi. 8. Arora P. N, Comprehensive Statistical Methods, Sultan Chand & Sons, New Delhi. 9. Hoel P. G, Introduction to Mathematical Statistics, Asia Publishing House, New Delhi.
Web resources	https://nptel.ac.in/

Mapping of COs with POs and PSOs:

	Pos						**PSOs**		
	1	2	3	4	5	6	1	2	3
CO1	3	3	2	2	2	3	3	2	1
CO2	3	3	3	3	2	3	3	2	1
CO3	3	3	3	2	3	3	3	2	1
CO4	3	3	3	2	3	3	2	2	1
CO5	3	3	2	2	2	3	2	2	1

Strong-3; Medium-2; Low-1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">STATISTICS WITH EXCEL PROGRAMMING (PRACTICAL)</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">SEC – IV</td></tr>
<tr><td>Category</td><td>Skill enhancement (Enterpreneurial based)</td><td>Year</td><td>II</td><td>Credit</td><td>1</td><td>Course Code</td><td>25UMASECQ4</td></tr>
<tr><td colspan="2"></td><td>Semester</td><td>III</td><td colspan="4"></td></tr>
<tr><td colspan="2" rowspan="2">InstructionalHours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>-</td><td colspan="2">--</td><td colspan="2">1</td><td>1</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">To Acquire the knowledge of Statistics with Excel Programming</td></tr>
<tr><td colspan="9">Course Outcomes:
Students will be able to
CO1 : handle distribution of data and analyses the characteristics of data using Excel.
CO2 : find Normal distribution, common distribution shapes, Correlation Coefficient and plot graphs using Excel.
CO3 : create Time-Series Graphs, Dot plots, Stem plots, Bar Charts, Pie Charts using Excel.
CO4 : compute Mean and Median using Excel.
CO5 : compute Mode, Midrange, Weighted Mean using Excel.</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="7">UNIT – I (Hours : 3)
Distribution of data- Characteristics of data- Frequency distribution-Procedure for Constructing a Frequency Distribution- Using Excel to Construct a Frequency Distribution-Relative Frequency Distribution-Cumulative Frequency Distribution.
Chapter 2 (Page No. 58 - 70)</td></tr>
<tr><td colspan="2"></td><td colspan="7">UNIT-II (Hours : 3)
Histograms-Relative Frequency Histogram-Normal Distribution-Common Distribution Shapes-Skewness-Using XLSTAT for Histograms-Graphs-Using Excel to Construct a Scatterplot-Correlation Coefficient.
Chapter 2 (Page No. 70 - 81)</td></tr>
<tr><td colspan="2"></td><td colspan="7">UNIT-III (Hours : 3)
Time-Series Graph-Dot plots-Using XLSTAT for Stem plots-Bar Graphs-Using Excel to Create Bar Graphs-Pareto Charts-Pie Charts-Using Excel to Create Pie Charts-Frequency Polygon-Using Excel to Create Frequency Polygons.
Chapter 2 (Page No. 81 - 98)</td></tr>
</table>

	UNIT-IV (Hours : 3) Descriptive statistics – Measures of Center – Mean -Using Excel to Calculate the Mean-Median-Using Excel to Find the Median. **Chapter 3 (Page No. 110 - 114)**
	UNIT-V (Hours : 3) Mode-Using Excel to Find the Mode-Midrange-Using Excel to Calculate the Midrange-Weighted Mean-Using Excel for DescriptiveStatistics. **Chapter 3 (Page No. 114 - 125)**
Recommended Text	Mario F. Triola, "Elementary Statistics Using Excel", Fifth Edition, Pearson New International Edition, 2014.
Reference Books	1. E. Balagurusamy, "Computer Oriented Statistical and Numerical Methods", Macmillan Publishers India Limited, 2000. 2. V. K. Rohatgi, A. M. E. Saleh, "An introduction to probability and statistics", John Wiley & Sons, 2015. 3. B. Held, B. Moriarty&T. Rchardson, "Microsoft ExcelFunctions andFormulas", Stylus Publishing, LLC, 2019. 4. N. J. Salkind, "Excel statistics: A quick guide", SagePublications, 2015. 5. J. Schmuller, "Statistical analysis with Excel for dummies", John wiley & sons, 2013.
Website and e-Learning Source	https://nptel.ac.in

Mapping of Cos with POs and PSOs

	Pos						**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**
CO1	3	1	3	-	-	-	3	2	1
CO2	2	1	3	1	-	-	3	2	1
CO3	3	1	3	1	-	-	3	2	1
CO4	3	1	3	-	-	-	3	2	1
CO5	3	1	3	-	-	-	3	2	1

Strong-3; Medium-2; Low-1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">DATA ANALYTICS WITH R – PRACTICAL</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">SEC V</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Skill Enhancement</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">25UMASECQ5</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>2</td><td colspan="2">-</td><td colspan="2">-</td><td>2</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">-</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">1. To familiarize the operations on vectors and matrices using R studio
2. To understand computations on Big Data analytics and correlation using R studio</td></tr>
<tr><td colspan="9">Course Outcomes:
Students will be able to
CO1: understand the operations on vectors using R
CO2: interpret basic operations on matrices using R
CO3: apply commands on data frames to understand various operations on it using R
CO4: solve Correlation problems with R
CO5: analyse the operations on Big Data tables using R</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="7">Unit- I (Hours:6)

Getting started with R: Installation – Getting started with the R interface

R Nuts and Bolts – Entering Input – Evaluation – R objects – Numbers – creating vectors – Matrices – Lists – Factors – Missing values – Data frames –Names – Summary

Pages 11 to 22</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit –II (Hours:6)
Getting Data In and Out of R

Reading and Writing Data – Reading Data Files with read.table() – Reading in Larger Datasets with read.table – Calculating Memory Requirements for R Objects

Pages 23 to 26</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit–III (Hours:6)
Vectorized Operations: Vectorized Matrix Operations

Dates and Times : Dates in R - Times in R - Operations on Dates and Times

Pages 43 to 48</td></tr>
</table>

	Unit-IV (Hours:6) **Coding Standards for R Loop Functions** Looping on the Command Line - lapply() - sapply() - split() - Splitting a Data Frame - tapply - apply() - Col/Row Sums and Means - Other Ways to Apply - mapply() - Vectorizing a function **Pages 88 to 106**
	Unit –V(Hours:6) **Data Analysis Case Study: Changes in Fine Particle** Synopsis - Loading and Processing the Raw Data - Results **Pages 131 to 133**
Recommended Text	Roger D. Peng, R Programming for Data Science.
Web resources	https://www.google.com/url?sa=t&source=web&rct=j&url=https://sites.calvin.edu/scofield/courses/m143/materials/RcmdsFromClass.pdf&ved=2ahUKEwjD9butqeTyAhU-7XMBHf7nDvcQFnoECAMQBg&usg=AOvVaw2cqS0mj02xNYei1l59OIq6

Mapping of COs with POs and PSOs:

	Pos						**PSOs**		
	1	2	3	4	5	6	1	2	3
CO1	3	1	1	1	1	3	3	2	3
CO2	3	1	1	1	1	3	3	2	3
CO3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3

Strong-3; Medium-2; Low-1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">INDUSTRIAL STATISTICS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">CORE VII</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">CORE</td><td>Year</td><td>II</td><td>Credits</td><td>4</td><td>Course Code</td><td>25UMACC7</td></tr>
<tr><td>Semester</td><td>IV</td><td colspan="4"></td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td colspan="2">--</td><td>--</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">1. Enable students to understand and apply statistical techniques and data.
2. Knowledge about the methods of solving Industrial problems using statistics.</td></tr>
<tr><td colspan="8">Course Outcomes :
Students will be able to
CO 1: Understand the concepts of Combinatorial and basic probability methods with few examples .
CO 2: Define Sample spaces, probability distributions, Continuous Random variables and The Probability of event .
CO 3: Describe Independent Events and problems.
CO 4: Solve problems on Probability Distributions and Random variables.
CO 5: Describe Conditional Distributions and Mathematical Expectations with moments.
.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT-I: Introduction- Combinatorial Methods- Binomial coefficients.
(Chapter1: Section-1.1, 1.2, 1.3.)</td></tr>
<tr><td colspan="6">UNIT-II: Probability - Introduction-Sample spaces- Events –The Probability of event- Some Rules of Probability.
(Chapter2: Section-2.1, 2.2, 2.3, 2.4, 2.5.)</td></tr>
<tr><td colspan="6">UNIT-III: Conditional Probability- Independent Events-Baye‘s Theorem(Only problems).
(Chapter2: Section-2.6, 2.7, 2.8.)</td></tr>
<tr><td colspan="6">UNIT-IV: Probability Distributions and Probability Densities- Introduction - Probability Distributions-Continuous Random variables- Probability Density functions-Multivariate Distributions.
(Chapter3: Section-3.1, 3.2, 3.3, 3.4, 3.5.)</td></tr>
<tr><td colspan="6">UNIT-V: Marginal Distributions- Conditional Distributions- Mathematical Expectations- Introduction- The Expected value of a Random variable- Moments.
(Chapter3: Section-3.6, 3.7 and Chapter4: Section- 4.1, 4.2, 4.3.)</td></tr>
</table>

Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication, Transferrable Skill and designing mathematical models towards solving mathematical Applications
Recommended Text	1. Fruend John E, Mathematical Statistics, Prentice Hall of India, New Delhi.
Reference Books	1. Papoulis A. Probability, Random Variables and Stochastic process, Tata McGraw Hill Education Pvt. Ltd., New Delhi 2. Baisnab A., Jas M., Elements of Probability and Statistics, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 1993.
Website and e-Learning Source	https://nptel.ac.in

Mapping of COs with POs and PSOs:

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CO1	3	2	2	3	3	2	2	3	1
CO2	2	3	3	3	3	2	2	3	1
CO3	3	3	3	3	3	2	2	3	1
CO4	2	3	3	2	3	2	2	3	1
CO5	2	3	3	3	3	2	2	3	1

Strong-3; Medium-2; Low-1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">ELEMENTS OF MATHEMATICAL ANALYSIS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">CORE VIII</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">CORE</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">25UMACC8</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="3">Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td>3</td><td colspan="3">1</td><td>-</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">• Identify and characterize sets and functions and Understand, test and analyze the convergence and divergence of sequences, series.
• Understand metric spaces with suitable examples</td></tr>
<tr><td colspan="9">Course Outcomes:
Students will be able to
CO1: Explain in detail about sets and functions, equivalence and countability and the LUB axiom
CO2: Explain Sequence and Subsequence of real numbers and to find the limit of sequence to test for convergent, divergent, bounded and monotone sequences
CO3: Explain the operations on convergent and divergent sequences and to Explain the concepts of limit superior and limit inferior and the notion of Cauchy sequences
CO4: Classify the series of real numbers and the alternating series and their convergence and divergence, the conditional convergence and absolute convergence and solve problems on convergence of the sequences
CO5: Explain about the metric spaces and functions continuous on a Metric space</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="7">Unit – I (Hours: 12)
Sets and Functions: Sets and elements- Operations on sets- functions- real valued functions- equivalence-countability- real numbers- least upper bounds.
Chapter 1(Sections1.1 -1.7)</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit –II (Hours: 12)
Sequences of Real Numbers: Definition of a sequence and subsequence-limit of a sequence – convergent sequences–divergent sequences- bounded sequences-monotone sequences
Chapter 2(Sections2.1 -2.6)</td></tr>
</table>

	Unit–III (Hours: 12) Operations on convergent sequences – operations on divergent sequences – limit superior and limit inferior-Cauchy sequences. **Chapter 2(Sections2.7-2.10)**
	Unit –IV (Hours: 12) Series of Real Numbers: Convergence and divergence – series with non –negative terms-alternating series-conditional convergence and absolute convergence- tests for absolute convergence. **Chapter 3(Sections 3.1-3.4 &3.6)**
	Unit –V (Hours: 12) 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. **Chapter 4(Sections 4.1 -4.3) Chapter 5(Sections:5.1,5.3)**
Extended Professional Component (is a part of Internal Component only, not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/ GATE/ TNPSC/ others to be solved. (To be discussed during the Tutorial hour)
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Richard R.Gold Berg, Methods of Real Analysis, Oxford & IBH. Publications ,New Delhi,2017.
Reference Books	1. Ethan D. Bloch, The Real Numbers and Real Analysis, Springer, 2011. 2.G.M. The fundamentals of Mathematical Analysis, vol I. Pergamon Press, New York, 1965. 3. T. M. Apostol, Calculus (Vol. I), John Wiley and Sons (Asia) P. Ltd., 2002. 4. R.G. Bartle and D. R Sherbert, Introduction to Real Analysis, John Wiley and Sons (Asia) P. Ltd., 2000. 5. E. Fischer, Intermediate Real Analysis, Springer Verlag, 1983. 6. K.A. Ross, Elementary Analysis- The Theory of Calculus Series- Undergraduate Texts in Mathematics, Springer Verlag, 2003.
Web resources	https://nptel.ac.in/

Mapping of COs with POs and PSOs:

	POs						**PSOs**		
	1	2	3	4	5	6	1	2	3
CO1	3	2	3	1	1	1	3	2	1
CO2	3	2	3	1	1	1	3	2	1
CO3	3	2	3	2	1	2	3	2	1
CO4	3	2	3	2	1	2	3	2	1
CO5	3	2	3	2	1	2	3	2	1

Strong-3; Medium-2; Low-1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">MATHEMATICAL STATISTICS - II</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">ELECTIVE – II (DISCIPLINE SPECIFIC)</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">ELECTIVE</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">25UMADSEC2</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">3</td><td>-</td><td colspan="2">-</td><td>3</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">Basics of Statistics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">1. To understand the concepts of sampling distribution and moments of t-distribution.
2. To acquire knowledge about statistical hypothesis and error values
3. To gain knowledge about the testing of significance for Large samples and Small samples</td></tr>
<tr><td colspan="8">Course Outcomes:
Students will be able to
CO1: learn the concepts of sampling distribution, Estimation and testing of hypothesis.
CO2: understand the notions of Student t distribution, moments of chi-square, t-test and F-distribution.
CO3: estimate the error value and standard error for mean and test the hypothesis for them and validate the claims
CO4: analyse the properties of Maximum Likelihood estimators, chi-square, t and F distributions and solve the related problems.
CO5: derive the distribution of chi-square, t and F distribution and defend its applications for small samples.</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="6">Unit – I (Hours: 12)
Sampling Distribution: Sampling distribution, Sampling distribution of $\bar{X}$, chi-square distribution, MGF of χ^2 - distribution, characteristic function of χ^2, Additive property, Relation between moments. Student t distribution, Moments of t distribution, limiting form of t-distribution and properties F – distribution, Moments of F-distribution.
Chapter 22 (Page No.: 22.1 - 22.40)</td></tr>
<tr><td colspan="2"></td><td colspan="6">Unit – II (Hours: 12)
Estimation: Point Estimation: Estimator and estimate, unbiased estimator, Examples, Efficiency, Cramer – Rao inequality, and Rao – Blackwell theorem, Method of maximum likelihood, Properties of ML estimators and Examples.
Chapter 23 (Page No.: 23.1 - 23.25, 23.46 - 23.56)</td></tr>
</table>

	Unit - III (Hours: 12) **Large Samples:** Population, Parameter and statistic, sampling distribution, Characteristic of sampling distribution, standard error of the mean, test of hypothesis – Procedure, One tail test, two tail test, test for a specified mean, test for equality of two means, test for a specified proportion, test for equality of two proportions. **Chapter 24 (Page No.: 24.1 – 24.41)**
	Unit - IV (Hours: 12) **Small samples:** t Test, uses of t – test, Properties of sampling distribution of t, Test for a specified Mean, Test of significance for the difference between two population means, confidence interval for small samples. F – test, Procedure for equality of two population variances. **Chapter 25 (Page No. :25.1 –25.30)** **Chapter 26 (Page No. :26.1 –26.12))**
	Unit –V (Hours: 12) **Small samples:** chi-square test, Additive property, Pearsons' statistic, uses of χ^2- test, Test for independence of Attributes, Test for a specified Population Variance, Test of Independence of attributes. **Chapter 27 (Page No.:27.1 – 27.46)**
Extended Professional Component (is a part of Internal Component only, not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/ GATE/ TNPSC/ others to be solved.
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	Vittal P. R, Mathematical Statistics, Margham Publications, Chennai. (For Units I - V)
Reference Books	1 Gupta S. C and Kapoor V. K, Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi(11th edition)2004. 2 J. N. Kapur & H. C. Saxena, Mathematical Statistics, S Chand & Company 3 Richard W. Hamming (2004) Methods of Mathematics Applied to Calculus, Probability, and Statistics, Dover Publications, New York
Web resources	https://ocw.mit.edu/courses/18-655-mathematical-statistics-spring-2016/ https://archive.nptel.ac.in/courses/111/105/111105043/

Mapping of COs with POs and PSOs:

	Pos						**PSOs**		
	1	2	3	4	5	6	1	2	3
CO1	3	3	2	2	2	3	3	2	1
CO2	3	3	3	3	2	3	3	2	1
CO3	3	3	3	2	3	3	3	2	1
CO4	3	3	3	2	3	3	2	2	1
CO5	3	3	2	2	2	3	2	2	1

Strong-3; Medium-2; Low-1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">MATHEMATICAL STATISTICS USING R PROGRAMMING - PRACTICAL</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">ELECTIVE – II (DISCIPLINE SPECIFIC)</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">ELECTIVE</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">25UMADSECQ</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">-</td><td>-</td><td colspan="2">2</td><td>2</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">Basics of Statistics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">1. To provide a strong foundation on the practical applications of R-studio
2. To critically evaluate data and determine the most appropriate statistical models for specific scenarios
3. To apply the knowledge of regression analysis in solving real-world problems</td></tr>
<tr><td colspan="9">Course Outcomes:
Students will be able to
CO1: recall and understand the basics of R, including data entry, vectors and other computations
CO2: apply the knowledge of R Studio to real-world problems with the use of chi-squared tests, correlation coefficients and regression analysis.
CO3: analyze data and perform advanced statistical tests, such as hypothesis testing, chi-squared tests and regression analysis, to draw meaningful conclusions.
CO4: evaluate the appropriateness of various statistical data, including hypothesis testing and chi-squared tests.
CO5: create and execute complex statistical computations, including correlation and regression models, and report the findings.</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="7">Unit – I
Data: Starting R-Entering data with c- Data is a vector – Problems.
(Page No: 1-7)</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit – II
Bivariate Data: Handling bivariate categorical data, Handling bivariate data: categorical vs. numerical, Bivariate data: numerical vs. numerical, Linear regression, Problems.
(Page No:19-22)</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit - III
Hypothesis Testing: Testing a population parameter, Testing a mean, Tests for the median, Problems.
(Page No: 66-68)</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit - IV (Hours: 12)
Chi Square Tests: The Chi-Squared Distribution, Chi-Squared Goodness of Fit Tests, Chi-Squared Tests for Independence, Chi-</td></tr>
</table>

	Squared Tests for Homogeneity, Problems. **(Page No: 72-76)**
	Unit –V **Regression Analysis:** Simple Linear Regression Model-Testing the Assumption of the Model-Statistical Inference, Problems**.** **(Page No: 77-83)**
Extended Professional Component (is a part of Internal Component only, not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/ GATE/ TNPSC/ others to be solved.
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	Simple R - Using R for Introductory Statistics by John Verzani.
Reference Books	Statistics – An Introduction using R by Michael J. Crawley, Wiley Publications
Web resources	https://www.geeksforgeeks.org/r-statistics/

Mapping of COs with POs and PSOs:

	Pos						**PSOs**		
	1	2	3	4	5	6	1	2	3
CO1	3	3	3	3	3	1	3	2	2
CO2	3	3	3	3	3	1	3	2	2
CO3	3	3	3	3	3	1	3	2	2
CO4	3	3	3	3	3	1	3	2	2
CO5	3	3	3	3	3	1	3	2	2

Strong-3; Medium-2; Low-1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">Computational Mathematics with MATLAB- PRACTICAL</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">SEC VI</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">SKILL ENHANCEMENT COURSE</td><td>Year</td><td>II</td><td>Credits</td><td>2</td><td>Course Code</td><td>25UMASECQ6</td></tr>
<tr><td>Semester</td><td>IV</td><td colspan="4"></td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>-</td><td colspan="2">-</td><td colspan="2">2</td><td>2</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">Fundamentals of Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">To impart knowledge on solving mathematical problems using Matlab</td></tr>
<tr><td colspan="9">Course Outcomes:
Students will be able to
CO1: apply Matlab to compute determinants, eigenvalues, and eigenvectors, and evaluate the properties of hyperbolic and inverse hyperbolic functions
CO2: execute Matlab commands to compute partial derivatives and determine critical points, maxima, minima, and envelopes of curves
CO3: apply Matlab to calculate distances between points, angles between two plans and volume of the Tetrahedron
CO4: implement numerical integration methods in MATLAB for single, double, and triple integrals
CO5: apply Matlab to solve differential equations with initial conditions</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="7">Unit - I(Hours: 6)
Algebra
Creating and working with Arrays and Matrices- Determinants - Eigen Values and Eigen Vectors
Trigonometry
Hyperbolic Functions-Inverse Hyperbolic functions</td></tr>
<tr><td colspan="7">Unit - II(Hours: 6)
Differential Calculus
Partial Derivatives-Successive partial derivative- Maxima and Minima of functions of two variables - Envelope of family of curves</td></tr>
<tr><td colspan="7">Unit - III(Hours: 6)
Analytical Geometry
Distance between two points - Asymptotes - Tangent to a curve - Angle between two given Planes - Volume of the Tetrahedron</td></tr>
<tr><td colspan="7">Unit - IV(Hours: 6)
Numerical Integration
Single integrals - Double integrals - Triple integrals - Applications of multiple integrals</td></tr>
<tr><td colspan="7">Unit - V (Hours: 6)
Differential Equations
Solve linear and nonlinear differential equations with initial conditions</td></tr>
<tr><td colspan="2">Skills acquired from the course</td><td colspan="7">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
</table>

Recommended Text	Rudra Pratap, Getting started with MATLAB
Reference Books	Dingyu Xue and Yangquan Chen, Solutions Manual for Solving Applied Mathematical Problems with Matlab, Taylor and Francis Group, LLC, 2009.
Web resources	https://in.mathworks.com/matlabcentral/answers/270283-get-envelope-of-multiples-curve https://in.mathworks.com/matlabcentral/answers/728153-finding-an-equation-of-the-tangent-line-to-a-curve-at-the-given-point-in-matlab https://in.mathworks.com/matlabcentral/answers/496531-how-to-calculate-the-partial-derivatives-for-a-given-function-of-two-variable

Mapping of COs with POs and PSOs:

	Pos						**PSOs**		
	1	2	3	4	5	6	1	2	3
CO1	3	3	3	3	3	1	3	2	2
CO2	3	3	3	3	3	1	3	2	2
CO3	3	3	3	3	3	1	3	2	2
CO4	3	3	3	3	3	1	3	2	2
CO5	3	3	3	3	3	1	3	2	2

Strong-3; Medium-2; Low-1

Title of the Course		**LaTeX - PRACTICAL**					
Paper Number		**SEC – VII**					
Category	**SKILL ENHANCEMENT COURSE**	**Year**	**II**	**Credit**	2	**Course Code**	**25UMASECQ7**
		Semester	**IV**				

Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**	**Total**
	-	--	2	2

Pre-requisite	12th Standard Mathematics
Objectives of the Course	To enable the Students to prepare research articles in LaTeX format.

Course Outcomes:

Students will be able to

CO1: make different alignments in a document and an application for a job

CO2: generate bio-data and table structures.

CO3: create Mathematical statements using LaTeX.

CO4: prepare articles and inserting pictures.

CO5: prepare question paper and power point presentation in LaTeX format

Course Outline	**UNIT – I (Hours : 6)** Creation of a document with different alignments (Left, Right, Centre, Justify) – typing a letter for appling a job.
	UNIT-II (Hours : 6) Creation of own bio-data – Creating a Table Structure.
	UNIT-III (Hours : 6) Typing a Mathematical Expression involving Differentiation, Integration and Trigonometry –Typing a Mathematical Expression using all expressions and Inequalities.
	UNIT-IV (Hours : 6) Creation of an Article using LaTeX - Inserting Picture in a LaTeX.
	UNIT-V (Hours : 6) Preparing a question paper in LaTeX format - Creation of Power Point Presentation in LaTeX.
Recommended Text	1. David F Griffiths and Desmond J. Higham, Learning LaTex, SIAM (Society for Industrial and Applied Mathematics)Publishers, Phidelphia, 1996.

ReferenceBooks	1. Nambudiripad, K.B.M., 2014. LaTeX for beginners. Narosa Publishing House private limited, New Delhi. 2. Martin J. Erickson and Donald Bindner, A student's Guide to the Study, Practice and Tools of Modern Mathematics, CRC Press, Boca Raton, FL, 2011. 3. L. Lamport, LATEX: A Document Preparation System, User's Guide and Reference Manual,Addison-Wesley, Newyork, Second edition, 1994.
Website and e-Learning Source	https://nptel.ac.in

Mapping of COs with POs and PSOs:

	Pos						**PSOs**		
	1	2	3	4	5	6	1	2	3
CO1	3	3	3	3	3	1	3	2	2
CO2	3	3	3	3	3	1	3	2	2
CO3	3	3	3	3	3	1	3	2	2
CO4	3	3	3	3	3	1	3	2	2
CO5	3	3	3	3	3	1	3	2	2

Strong-3; Medium-2; Low-1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">ABSTRACT ALGEBRA</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">CORE IX</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">25UMACC9</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td>1</td><td>--</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">Concepts of Sets, Groups and Rings.
Construction, characteristics and applications of the abstract algebraic structures</td></tr>
<tr><td colspan="8">Course Outcomes:
Students will be able to
CO1: Learn the notions of groups, subgroups and cyclic groups and interpret their properties
CO2: Understand the notions of normal subgroups, quotient groups, homomorphisms and automorphisms and inspect the functions for homomorphism and automorphism properties
CO3: Analyze the attributes of permutation groups and apply Cayley ‘s theorem to problems
CO4: Learn the concept of rings, ideals and quotient rings and examine their structure
CO5: Discuss about the field of quotient of an integral domain and to explain in detail about Euclidean rings</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="6">UNIT - I (Hours: 15)
Definition of a group - Some examples of groups - Some preliminary lemmas - Subgroups - A counting principle.
Chapter 2 (Section 2.1 to 2.5)</td></tr>
<tr><td colspan="2"></td><td colspan="6">UNIT - II (Hours: 15)
Normal subgroups and Quotient groups – Homomorphisms – Automorphisms.
Chapter 2 (Section 2.6 to 2.8)</td></tr>
<tr><td colspan="2"></td><td colspan="6">UNIT-III (Hours: 15)
Cayley’s theorem-Permutation groups.
Chapter 2 (Section 2.9 and 2.10)</td></tr>
<tr><td colspan="2"></td><td colspan="6">UNIT-IV (Hours: 15)
Definition and examples of rings - Some special classes of rings – homomorphisms - Ideals and quotient rings- More ideals and quotient rings.
Chapter 3: (Section 3.1 to 3.5)</td></tr>
<tr><td colspan="2"></td><td colspan="6">UNIT-V (Hours: 15)
The field of quotients of an integral domain - Euclidean rings - A particular Euclidean ring.
Chapter 3 (Section 3.6 to 3.8)</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, not to be included in the External Examination question paper)</td><td colspan="6">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
</table>

Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	I.N. Herstein, Topics in Algebra Wiley Eastern Ltd. Second Edition (1st January 2006)
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

Mapping of COs with POs and PSOs:

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CO1	3	3	2	3	1	-	3	3	1
CO2	3	3	2	3	1	-	3	3	1
CO3	3	3	2	3	2	-	3	3	1
CO4	3	3	2	3	1	-	3	3	1
CO5	3	3	2	3	2	-	3	3	1

Strong-3; Medium-2; Low-1

Title of the Course		**REAL ANALYSIS**					
Paper Number		**CORE X**					
Category	**Core**	**Year**	**III**	**Credits**	4	**Course Code**	**25UMACC10**
		Semester	**V**				
Instructional Hours per week		**Lecture**		**Tutorial**	**Lab Practice**		**Total**
		4		1	-		5
Pre-requisite		12^{th} Standard Mathematics					
Objectives of the Course		• Real Numbers and properties of Real–valued functions. • Connectedness, Compactness, Completeness of Metric spaces. • Convergence of sequences of functions, Examples and counter examples					

Course Outcomes:

Students will be able to

CO1: explain the concepts of continuous and discontinuous functions, open and closed sets, Connectedness, completeness and compactness

CO2: explain the concepts of bounded and totally bounded sets, continuity of inverse functions and uniform continuity

CO3: define the sets of measure zero, to explain about the existence and properties of Riemann integral

CO4: explain the concept of differentiability and to explain Rolle 's theorem, Law of mean, and Fundamental theorem of calculus

CO5: explain the point wise and uniform convergence of sequence of function and to derive the Taylor 's theorem

Course Outline	
	Unit-I (Hours:15) Continuous Functions on Metric Spaces: Open sets– closed sets– Discontinuous function on R^1 . Connectedness, Completeness and Compactness: More about open sets-Connected sets. **(Chapter 5: Section-5.4 to 5.6 and Chapter6: Sections-6.1,6.2)**
	Unit-II (Hours:15) Bounded sets and totally bounded sets: Complete metric spaces- compact metric spaces, continuous functions on compact metric space, continuity of inverse functions, uniform continuity**.** **(Chapter6: Sections-6.3 to 6.8)**
	Unit-III (Hours:15) Calculus: Sets of measure zero, definition of the Riemann integral, existence of the Riemann integral, properties of Riemann integral. **(Chapter7: Sections-7.1 to 7.4)**
	Unit-IV (Hours:15) Derivatives- Rolle 's theorem, The Law of mean, Fundamental theorems of calculus. **(Chapter7: Sections-7.5 to 7.8)**
	Unit-V (Hours:15) Taylor 's theorem-Point wise convergence of sequences of functions, uniform convergence of sequences of functions **(Chapter8: Sections-8.5 and Chapter9: Sections-9.1,9.2)**

Extended Professional Component (is a part of internal component only, not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	Methods of Real Analysis-Richard Goldberg (John Wiley & sons, 2 nd edition) (Indian edition –Oxford and IBH Publishing Co, New Delhi, 1 st January 2020)
Reference Books	1. Principles of Mathematical Analysis by Walter Rudin, Tata McGraw Hill Education, Third edition (1 July 2017). 2. Mathematical Analysis Tom M A postal, Narosa Publishing House, 2 nd edition (1974), Addison-Wesley publishing company, New Delhi.
Web resources	https://nptel.ac.in

Mapping of Cos with Pos and PSOs:

	Pos						**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**
CO1	3	3	1	3	1	-	3	1	1
CO2	3	3	1	3	1	-	3	1	1
CO3	3	3	1	3	1	-	3	1	1
CO4	3	3	1	3	1	-	3	1	1
CO5	3	3	1	3	1	-	3	1	1

Strong-3; Medium -2; Low;1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">MATHEMATICAL MODELLING</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">CORE XI</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">CORE</td><td>Year</td><td>III</td><td>Credits</td><td>4</td><td>Course Code</td><td>25UMACC11</td></tr>
<tr><td>Semester</td><td>V</td><td colspan="4"></td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>4</td><td colspan="2">-</td><td colspan="2">-</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">• Construction and Analysis of Mathematical models found in real life problems.
• Modelling through differential and difference equations</td></tr>
<tr><td colspan="9">Course Outcomes:
Students will be able to
CO1: explain simple situations requiring Mathematical Modelling and to determine the characteristics of such models
CO2: model using differential equations in-terms of linear growth and Decay models
CO3: model using systems of ordinary differential equations of first order, to discuss about various models under the categories Epidemics and Medicine
CO4: explain in detail about difference equations
CO5: model using difference equations</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="7">Unit –I (Hours: 12)
Mathematical Modelling: Simple situations requiring Mathematical Modelling, Some characteristics of Mathematical models.
(Chapter1: Sections - 1.1, 1.4)</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit - II (Hours: 12)
Mathematical Modelling through Ordinary differential equations of first order: Mathematical Modelling through differential equations, Linear Growth and Decay Models, Non-Linear growth and decay models, Compartment models.
(Chapter2: Sections - 2.1 to 2.4)</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit - III (Hours: 12)
Mathematical Modelling through systems of Ordinary differential equations of first order: Prey-predator models, Competition models, A simple epidemic model, A Susceptible-infected- susceptible (SIS) model, SIS model with constant number of carriers, simple epidence model with carriers, model with removal and immigration, Medicine: A Model for Diabetes Mellitus.
(Chapter 3: Sections - 3.1 : 3.1.1, 3.1.2; 3.2: 3.2.1 to 3.2.4, 3.2.6, 3.5 : 3.5.1)</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit - IV(Hours:12)
The need for Mathematical modelling through difference equations: some simple models, the linear difference equation, the complementary function, the particular solution.
(Chapter 5: Sections - 5.1, 5.2 : 5.2.1, 5.2.2, 5.2.3)</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit - V(Hours:12)
Mathematical Modelling through difference equations in Economics and finance: The Harrod Model, The Cobweb model, application to Actuarial Science
(Chapter 5: Sections - 5.3 : 5.3.1, 5.3.2, 5.3.4)</td></tr>
</table>

Extended Professional Component (is a part of Internal Component only, not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC - CSIR/ GATE/ TNPSC/ others to be solved. (To be discussed during the Tutorial hour)
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	J N Kapur, Mathematical Modelling, Third Edition, New Age International Publishers (2023).
Reference Books	1. Mathematical Modeling by Bimalk. Mishra and Dipak K. Satpathi. Ane Books Pvt. Ltd(1 Januuary 2009) 2. Mathematical Modelling Models, Analysis and Applications, by Sandip Banerjee, CRC Press, Taylor & Francis group, 2014 3. Mathematical Modelling applications with Geogebra by Jonas Hall & Thomas Ligefjard, 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
Web resources	**https://nptel.ac.in**

Mapping of Cos with Pos and PSOs:

	Pos						**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**
CO1	2	3	3	3	2	2	2	3	2
CO2	2	3	3	3	2	2	2	3	2
CO3	2	3	3	3	2	2	2	3	2
CO4	3	2	2	2	-	1	2	3	2
CO5	2	3	3	3	2	2	2	3	2

Strong-3; Medium-2; Low-1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">OPTIMIZATION TECHNIQUES</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">CORE XII</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">CORE</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">25UMACC12</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours Per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>4</td><td colspan="2">-</td><td colspan="2">-</td><td>4</td></tr>
<tr><td colspan="2">Pre- requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objective of the Course</td><td colspan="7">• To provide knowledge on Formulating real life problems into L P. P
• To teach the techniques for converting the industrial problems as mathematical problems and solving them.</td></tr>
<tr><td colspan="9">Course Outcomes :
Students will be able to
CO 1: Define linear programming problem and to solve the problems using graphical method, Simplex method and Big-M method.
CO 2 : Solve Transportation problems and Assignment problems.
CO 3 : Find solutions for sequencing problems.
CO 4 : Discuss game, strategies on dominance property.
CO 5 : Construct network and do PERT calculations.</td></tr>
<tr><td colspan="2" rowspan="2">Course Outline</td><td colspan="7">UNIT I : (Hours: 12)
Operations Research - An Overview: Introduction (Operations Research) - Modelling in Operations Research - Advantages and limitations of models.
Linear Programming Problem - Mathematical Formulation: Introduction - Linear Programming Problem (LPP) - Mathematical Formulation of the Problem – Illustration on Mathematical formulation of LPPs.
Linear Programming Problem - Graphical Solutions and Extension: Introduction - Graphical Solution Method - Some Exceptional Cases.
Linear Programming Problem - Simplex method: Introduction - The Computational Procedure - Use of Artificial Variables.
(Chapter1: Sections 1.1 ,1.5 & 1.6; Chapter2: Sections 2.1 to 2.4; Chapter3: Sections 3.1 to 3.3; Chapter4: Sections 4.1, 4.3, 4.4)</td></tr>
<tr><td colspan="7">UNIT II : (Hours: 12)
Transportation Problem: Introduction – LP Formulation of the Transportation Problem – Finding an Initial Basic Feasible Solution - Degeneracy in Transportation Problem - Transportation algorithm (MODI Method) - Some Exceptional Cases.
Assignment Problem: Introduction - Mathematical Formulation of the Problem – Solution Methods of Assignment Problem - Special cases in Assignment Problem – The Travelling Salesman Problem.
(Chapter10:Sections 10.1, 10.2, 10.9, 10.12,10.13, 10.15
Chapter11: Sections 11.1 to 11.3 &11.4, 11.7)</td></tr>
</table>

	UNIT III : (Hours: 12) **Sequencing problem:** Introduction - Problem of Sequencing- Basic Terms Used in Sequencing - Processing n jobs through Two Machines - Processing n jobs through k Machines - Processing 2 jobs through k Machines. **(Chapter12: Sections 12.1 to 12.6)**
	UNIT IV : (Hours: 12) **Games and Strategies:** Introduction - Two-Person Zero-Sum Games Some basic terms - The Maximin-minimax Principle - Games without Saddle points - Mixed Strategies – Graphic Solution of 2 x n and m x 2 Games - Dominance Property. **(Chapter17:Sections 17.1 to 17.7)**
	UNIT V : (Hours: 12) **Network Scheduling by PERT/CPM:** Introduction – Network: Basic Components - Logical Sequencing - Rules of Network Construction - Concurrent Activities - Critical Path Analysis - Probability Consideration in PERT - Distinction between PERT and CPM. **(Chapter25: Sections 25.1 to 25.8)**
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill.
Recommended Text	1. Kantiswarup., Gupta, P.K. and Man Mohan. Operations Research.[Seventeenth Edition]. Sultan Chand and Sons, New Delhi.2020.
Reference Books	1. Gupta, P.K. and Hira, D.S. Operations Research. [Eighth Edition]. Sulthan .Chand and Co., NewDelhi.2020. 2. Gupta, P.K. and Man Mohan. Problems in Operations Research.[Ninth Edition]. Sultan Chand and Sons, New Delhi.2014. 3. Kalavathy.S. Operations Research [Fourth Edition],Vikas Publishing House,Chennai.2012.

Course Learning Outcome (for Mapping with POs and PSOs)

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CO1	3	2	2	3	3	2	2	3	1
CO2	2	3	3	3	3	2	2	3	1
CO3	3	3	3	3	3	2	2	3	1
CO4	2	3	3	2	3	2	2	3	1
CO5	2	3	3	3	3	2	2	3	1

Strong-3; Medium-2; Low-1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">PROJECT & VIVA VOCE</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">ELECTIVE – III (DISCIPLINE SPECIFIC)</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">ELECTIVE</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">25UMAPVV</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours Per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>5</td><td colspan="2">-</td><td colspan="2">-</td><td>5</td></tr>
<tr><td colspan="2">Pre- requisite</td><td colspan="7">12^{th} Standard Mathematics</td></tr>
</table>

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">BIOMATHEMATICS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">ELECTIVE – IV (DISCIPLINE SPECIFIC)</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">ELECTIVE</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">25UMADSEC3A</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">3</td><td colspan="2">--</td><td>--</td><td>3</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• To understand the concept of modeling using MATLAB/Scilab.
• To develop the ability of solving the homogenous and non-homogenous system of difference</td></tr>
<tr><td colspan="8">Course Outcomes:
Students will be able to
CO1: Learn the modeling process of first order homogenous and non- homogenous difference equations with equilibrium values and understand the basics of MATLAB
CO2: Apply the process of Modeling using difference equations and diffusion equations
CO3: Examine the role of Gauss-Jordan Elimination method and Einstein’s relation in solving difference equations
CO4: Explain the recursions occurring in a difference equation through matrices, and compute the Eigenvalues and Eigenvectors through MATLAB.
CO5: Formulate Model for real situations using the system of linear equations in matrices and utilize MATLAB for finding solutions for the same.</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="6">UNIT - I (Hours: 10)
Overview of Discrete Dynamical Modeling and MATLAB /Scilab: Introduction to Modeling and Difference Equations - The Modeling Process - Getting Started with MATLAB/Scilab.
Chapter 1
Nernst equation
Chapter 9</td></tr>
<tr><td colspan="2"></td><td colspan="6">UNIT - II (Hours: 9)
Modeling with first – order Difference Equations: Modeling with First - Order Linear Homogenous Difference with Constant Coefficients - Modeling with Non-homogenous First - Order Linear Difference Equations
Chapter 2
Diffusion – I : Diffusion equation
Chapter 9</td></tr>
</table>

	UNIT-III (Hours: 07) **Modeling with Matrices**: Systems of Linear Equations Having Unique Solutions - The Gauss-Jordan Elimination Method With Models - Introduction to Matrices **Chapter 3: 3.3.10 – 3.3.17** Diffusion – II: Mean – square displacement **Chapter 9**
	UNIT-IV (Hours: 09) **Modeling with Matrices:** Determinants and System of Linear Equations **Chapter 3: 3.4.1 & 3.4.2** Computing Eigenvalues and Eigenvectors with MATLAB/Scilab **Chapter 3: 3.5.3 – 3.5.6** Diffusion – III: Einstein's relation **Chapter 9**
	UNIT-V (Hours: 12) **Modeling with Nonlinear Systems of Difference Equations** Modeling of Interacting Species **Chapter 5: 5.1.1 & 5.1.2**
Extended Professional Component (is a part of internal component only, not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1 Mazen Shahin, Explorations of Mathematical Models in Biology with MATLAB, Wiley Publishers. (for Unit I to Unit V) 2 Introduction to Mathematics for Life Scientists, E. Batschelet, Springer Verlag, 3rd edition (2003). (for Unit I to IV)
Reference Books	1 R Phillips, J Kondev, J. Theriot, Physical Biology of the Cell, Garland Science, 2009 2 H. C.Berg, Random Walks in Biology, Princeton university press, 1993
Website and e-Learning Source	http://nptel.ac.in

Mapping of COs with POs and PSOs:

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CO1	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3
CO3	3	1	2	3	3	3	3	3	3
CO4	3	2	2	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3

Strong-3; Medium-2; Low-1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">BIOMATHEMATICS – PRACTICAL</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">ELECTIVE – IV (DISCIPLINE SPECIFIC)</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">ELECTIVE</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">1</td><td rowspan="2">Course Code</td><td rowspan="2">25UMADSECQ2</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">-</td><td colspan="2">--</td><td>2</td><td>2</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• To use MATLAB/Scilab for solving problems on difference equations
• To compute and solve problems on matrices using MATLAB/Scilab</td></tr>
<tr><td colspan="8">Course Outcomes:
Students will be able to
CO1: recall the basics of MATLAB/Scilab
CO2: express the difference equations as matrices and solve them using MATLAB/Scilab
CO3: apply MATLAB/Scilab to analyse the society connected problems
CO4: perceive the idea of recurrences in difference equations and compute the Eigen values and Eigenvectors using MATLAB/Scilab
CO5: estimate the solution for problems occurring in real life by using MATLAB/Scilab</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="6">UNIT - I (Hours: 6)
Getting Started with MATLAB/Scilab - Operations on Vectors and Matrices</td></tr>
<tr><td colspan="2"></td><td colspan="6">UNIT - II (Hours: 6)
Problems on Modeling with First - Order Linear Homogenous and Non- Homogenous Difference equations with Constant Coefficients for computing amount of drug present in blood after a few hours, Owl’s population, in the process of Radioactive Decay and Carbon Dating and Forensic Application.</td></tr>
<tr><td colspan="2"></td><td colspan="6">UNIT-III (Hours: 6)
Problems solving using Gauss-Jordan Elimination Method for Biologists mixer problem, Nutrition Problems, Existence of bacteria, Balancing Chemical Equations</td></tr>
<tr><td colspan="2"></td><td colspan="6">UNIT-IV (Hours: 6)
Computing Eigenvalues and Eigenvectors with MATLAB/Scilab for Population movement problems</td></tr>
<tr><td colspan="2"></td><td colspan="6">UNIT-V (Hours: 6)
Problems on non-linear systems viz Predator-Prey Model using MATLAB/Scilab tools.</td></tr>
</table>

Extended Professional Component (is a part of internal component only, not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	Mazen Shahin, Explorations of Mathematical Models in Biology with MATLAB, Wiley Publishers.
Reference Books	1 R Phillips, J Kondev, J. Theriot, Physical Biology of the Cell, Garland Science, 2009 2 H. C.Berg, Random Walks in Biology, Princeton university press, 1993
Website and e-Learning Source	https://www.mathworks.com/solutions/mathematical-modeling.html

Mapping of COs with POs and PSOs:

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CO1	3	1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3
CO4	3	2	2	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3

Strong-3; Medium-2; Low-1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="8">DISCRETE MATHEMATICS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">ELECTIVE – IV (DISCIPLINE SPECIFIC)</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">ELECTIVE</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">25UMADSEC3B</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td>Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td colspan="2">5</td><td>--</td><td>--</td><td colspan="2">5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="8">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="8">• To gain knowledge about the concept of Mathematical logic and algebraic structures.
• To know about Boolean algebra and its application to Sequential Machines.
• To make them to use in practical applications related to computer science.</td></tr>
<tr><td colspan="10">Course Outcomes:
Students will be able to
CO1: Understand the concept of connectives and inference theory of predicate calculus.
CO2: Classify the various type of functions and make them to use in practical applications related to computer science.
CO3: Gain knowledge about the Algebraic system and group codes.
CO4: Understand the concept of Boolean Algebra and its application to sequential Machines.
CO5: Examine about the grammar and language and apply to finite state machine</td></tr>
<tr><td colspan="2" rowspan="2">Course Outline</td><td colspan="8">UNIT - I (Hours: 15)
Connectives: Negation, Conjunctions, Disjunctions, Conditional and Biconditional, WFF, Tautologies equivalence and duality.
Normal forms: DNF, CNF, PDNF, PCNF.
Theory of inference for the statement calculus: validity using truth table.
Predicate calculus: Predicates, Statement function, Variables and Quantifiers.
Inference theory of predicate calculus: Valid formulae and Equivalences.
Chapter 1 (sections 1.2,1 -1.2.3, 1.2.6-1.2.10, 1.3.1 - 1.3.4, 1.4.1, 1.5.1, 1.5.2, 1.6.1)</td></tr>
<tr><td colspan="8">UNIT - II (Hours: 15)
Relations and ordering: Relations, Properties of binary relation in a set.
Functions: Definitions and introduction, composition of functions, Inverse function, Binary and n-array operations, Hashing functions.
Natural numbers: Peano axioms and Mathematical introduction, cardinality.
Chapter 2 (Sections 2.3.1, 2.3.2, 2.4.1 – 2.4.4, 2.4.6, 2.5.1, 2.5.2)</td></tr>
</table>

	UNIT-III (Hours: 15) **Algebraic systems**: Definition and examples **Semigroups and monoids**: Definition and examples - Homomorphism of semi group and monoids, Sub semigroups and sub monoids **Polish expression and their compilation**: Polish notation, Conversion of infix expressions to polish notation. **Group codes**: The communication model and basic notations of error correction, Generation of codes by using parity checks, Error recovery in group codes. **Chapter 3 (Sections 3.1.1, 3.2.1 - 3.2.3, 3.4.1, 3.4.2, 3.7.1 – 3.7.3)**
	UNIT-IV (Hours: 15) **Lattices as partially ordered set**: Definition and examples, Some properties of lattices, Sub lattices, Direct product and homomorphism. **Boolean algebra**: Definition and examples, Sub algebra, Direct product and homomorphism. **Chapter 4 (Sections 4.1.1, 4.1.2, 4.1.4, 4.2.1, 4.2.2)**
	UNIT-V (Hours: 15) **Grammar and Language**: Discussion of grammar, Formal definition of a language **Finite state machines**: Introductory sequential circuit, Equivalence of finite state machines. **Chapter 3 (Sections 3.3.1, 3.3.2) and 4 (Sections 4.6.1, 4.6.2)**
Extended Professional Component (is a part of internal component only, not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	J.P.Trembley and R.Manohar, Discrete Mathematical Structures with Applications to Computer Science Year of publication 2001, Tata McGraw-Hill, New Delhi.
Reference Books	M. Chandrasekaran, M. Umaparvathi Discrete Mathematics, PHI Learning Private Ltd. 2010. T. Veerarajan, Discrete Mathematics, Mcgraw- Hill Company Ltd, 2007
Website and e-Learning Source	http://nptel.ac.in

Mapping of COs with POs and PSOs:

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CO1	3	3	3	3	1	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3
CO3	3	3	2	3	3	3	3	3	3
CO4	3	3	2	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3

Strong-3; Medium-2; Low-1