

**A.VEERIYA VANDAYAR MEMORIAL  
SRI PUSHPAM COLLEGE (AUTONOMOUS)**

**POONDI-613 503, THANJAVUR (DT)**



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**SYLLABUS**  
*B.Sc., Mathematics*

**(From 2020 - 2021 onwards)**

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## **DEPARTMENT OF MATHEMATICS**

### **Programme Outcomes of B.Sc. Mathematics**

#### **P01**

Gain thorough knowledge that gives almost confidence to appear for competitive examinations conducted by TNPSC/UPSC/BSRB.

**P02** Learn need based computer courses enable them to solve computer oriented numerical problems.

**P03** Abstract courses and mathematical structures includes enable the students to prepare themselves for higher education leading to M.Sc./MCA degree courses.

**P04** Learn to articulate, analyze, synthesis, and evaluate ideas and situations in a well informed manner.

**P05** Generate hypotheses and articulate assent or dissent by employing both reason and creative thinking.

### **Programme Specific Outcomes of B.Sc. Mathematics**

**PSO1** Acquire Problem solving Skills.

**PSO2** Understand the concepts of algebra which include equations, numbers and algebraic structures.

**PSO3** Students will be able to use the concepts of analysis in solving problems. The concepts include sets, numbers, functions and convergence.

**PSO4** Understand mathematical ideas from basic axioms.

**PS05** On completion of the program the students are well poised to pursue careers in academia, industry and the other areas of Mathematics.

**B.Sc. MATHEMATICS (2020 – 2021)**

S. No.	Semester	Category	Paper Code	Title of the Paper	Maximum Marks			Minimum Marks for Pass			Hours/Week	Credits
					CIA	EE	Total	CIA	EE	Total		
1.	I	Part – I	20U1MAT1/H1	Tamil – I / Hindi – I	25	75	100	10	30	40	6	3
2.		English	20U1MAE1	English – I	25	75	100	10	30	40	6	3
3.		Core	20U1MAC1	Differential Calculus and Trigonometry	25	75	100	10	30	40	5	4
4.		Core	20U1MAC2	Analytical geometry 3-D and Integral Calculus	25	75	100	10	30	40	5	4
5.		Allied	20U1MAPHA1	Allied Physics – I	25	75	100	10	30	40	5	4
		Allied	20U2MAPHAPL	Allied Physics Practical (N.S)	-	-	-	-	-	-	3	-
6.		ES	20U1MAES	Environmental Studies	-	-	100	-	-	-	SS	1
7.	II	Part – I	20U2MAT2/H2	Tamil – II / Hindi – II	25	75	100	10	30	40	6	3
8.		English	20U2MAE2	English – II	25	75	100	10	30	40	6	3
9.		Core	20U2MAC3	Classical Algebra	25	75	100	10	30	40	4	5
10.		Core	20U2MAC4	Sequence and Series	25	75	100	10	30	40	5	5
11.		Allied	20U2MAPHA2	Allied Physics – II	25	75	100	10	30	40	5	4
12.		Allied	20U2MAPHAPL	Allied Physics Practical (N.S)	40	60	100	16	24	40	3	2
13.		SBE -I	20U2MAS1	Skill Based Elective - Non Verbal Reasoning	25	75	100	10	30	40	1	1
14.		VBE	20U2MAVE	Value based Education	25	75	100	10	30	40	SS	-
15.	III	Part – I	20U3MAT3/H3	Tamil – III / Hindi – III	25	75	100	10	30	40	6	3
16.		English	20U3MAE3	English – III	25	75	100	10	30	40	6	3
17.		Core	20U3MAC5	Differential Equations and Laplace transform	25	75	100	10	30	40	5	5
18.		Core	20U3MAC6	Vector Calculus, Fourier Series and Fourier Transforms	25	75	100	10	30	40	5	5
19.		Allied	20U3MAMSA1	Allied Mathematical Statistics - I	25	75	100	10	30	40	5	4
		Allied (NS)	20U4MAMSAPL	Allied Mathematical Statistics - I Practicals (N.S)	-	-	-	-	-	-	3	-
20.		GS	20U3MAGS	Gender Studies	-	-	100	-	-	-	SS	-

21.		Extra Credit Course	-	(MOOC) Massive open online course - I	-	-	-	-	-	-	-	-
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S. No.	Semester	Category	Paper Code	Title of the Paper	Maximum Marks			Minimum Marks for Pass			Hours/ Week	Credits
					CIA	EE	Total	CIA	EE	Total		
22.	IV	Part – I	20U4MAT4/H4	Tamil-IV / Hindi-IV	25	75	100	10	30	40	6	3
23.		English	20U4MAE4	English – IV	25	75	100	10	30	40	6	3
24.		Core	20U4MAC7	Abstract Algebra	25	75	100	10	30	40	4	5
25.		Core	20U4MAC8	Statics	25	75	100	10	30	40	5	5
26.		Allied	20U4MAMSA2	Allied Mathematical Statistics - II	25	75	100	10	30	40	5	4
27.		Allied (NS)	20U4MAMSAPL	Allied Mathematical Statistics - Practical (N.S)	25	75	100	10	30	40	3	2
28.		SBE - II	20U4MAS2	Skill Based Elective - Arithmetic Ability	25	75	100	10	30	40	1	1
29.		Extra Credit Course	-	(MOOC)Massive open online course - I	-	-	-	-	-	-	-	-
30.	V	Core	20U5MAC9	Dynamics	25	75	100	10	30	40	5	5
31.		Core	20U5MAC10	Real Analysis	25	75	100	10	30	40	5	5
32.		Core	20U5MAC11	Number Theory	25	75	100	10	30	40	5	5
33.		Core	20U5MAC12	Discrete Mathematics	25	75	100	10	30	40	4	5
34.		Major Elective-I	20U5MAEL1A 20U5MAEL1B	Numerical Methods (or) Special functions	25	75	100	10	30	40	4	3
35.		Major Elective - II	20U5MAEL2A 20U5MAEL2B	Graph Theory (or) Mathematical Modeling	25	75	100	10	30	40	4	3
36.		NME	20U5MANME	Mathematics for Finance	25	75	100	10	30	40	2	1
37.		LSD	20U6MALSD	Life Skill Development	-	-	100	-	-	-	1	-
38.	VI	Core	20U6MAC13	Complex Analysis	25	75	100	10	30	40	5	5
39.		Core	20U6MAC14	Operations Research	25	75	100	10	30	40	4	5
40.		Core	20U6MAC15	Programming in C	25	75	100	10	30	40	4	5
41.		Core – PL	20U6MACPL	Programming in C Practical	40	60	100	16	24	40	5	3
42.		Major Elective-III	20U6MAEL3A 20U6MAEL3B	Fuzzy sets and its applications (or) Formal Languages and Automata Theory	25	75	100	10	30	40	5	4
43.		Major Elective-IV	20U6MAEL4A 20U6MAEL4B	Astronomy (or) Stochastic processes	25	75	100	10	30	40	5	4
44.		CN	20U6MACN	Comprehensive test	25	75	100	10	30	40	1	1
45.		GK	20U6MAGK	General Knowledge for Competitive Examination	25	75	100	10	30	40	1	-
46.		Extension Activities	20U6MAEA	Extension Activities	-	-	-	-	-	-	-	1

<b>List of Core Options:</b>	1. Fuzzy Mathematics - I 2. Fuzzy Mathematics – II 3. Financial Mathematics 4. Lattice Theory 5. Programming in C++ 6. Difference Equations
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<b>Skill Based Subject-Area Title (offered by Dept. of Maths)</b>  Area: <b>QUANTITATIVE APTITUDE AND REASONING</b>  Paper I 20U2MAS1- Non- Verbal Reasoning  Paper II 20U4MAS2- Arithmetic Ability	<b>Non-Major Elective-Title (Offered by Dept. of Maths)</b>   V Semester: 20U5MANME- Mathematics for Finance
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### ABBREVIATIONS

ESE: Environmental Studies	LSD: Life Skill Development
VBE: Value Based Education	GK: General Knowledge
SBE: Skill Based Elective	NME: Non-Major Elective
GS: Gender Studies	EA:Extension Activities
ME:Major Elective	SS:Self Study

CC:Certificate Course	
MOOC: Massive Open Online Course	

**B.Sc., MATHEMATICS (2020 - 2021)**

<b>Parts</b>	<b>Total No.Of courses</b>	<b>Total Marks</b>	<b>Total Credits</b>	<b>Classification</b>
<b>Part - I</b>	<b>04</b>	<b>400</b>	<b>12</b>	√
<b>Part – II</b>	<b>04</b>	<b>400</b>	<b>12</b>	√
<b>Part – III</b> Core Allied Major Elective	16 06 04 <b>26</b>	1600 600 400 <b>2600</b>	76 20 14 <b>110</b>	√
<b>Part – IV</b> Environmental Studies Value based education Skill Based Elective Gender studies Non-Major Elective Life skill development General Knowledge Comprehensive Test	1 1 2 1 1 1 1 1 ----- <b>9</b>	100 100 200 100 100 100 100 100 ----- <b>900</b>	1 -- 2 -- 1 -- -- 1 ----- <b>05</b>	√
<b>Part – V</b>	<b>Extension Activity</b>		<b>1</b>	X
<b>Total</b>	<b>43</b>	<b>4300</b>	<b>140</b>	√

**Comprehensive Knowledge Test:** Objective type question pattern with 100 compulsory questions carrying 100 marks to be answered in 3 Hours with 2 credits. The portion is entire core courses.

**MOOC:** Massive Open Online Course is introduced in the third and fourth semester as an extra credit course from this academic year 2020-2021. Students can avail any one or more of the courses available in MOOC to equip their skills and knowledge themselves.

**Field Visit / Industrial Visit / Hands on Training Programme** having minimum 15 hours of contact time as an Extra Credit course is introduced for II-year UG students to gain experiential learning.

Evaluation of the visit report will be held at the end of IV Semester

**Components of Evaluation**

Internal Marks	40
External Marks	60
Total	100

**Project** is introduced for III-year students to cater for the needs of advanced learners as extra credit course

**Components of Evaluation**

Internal Marks	40	
	External Marks	60
	Total	100

**Soft Skill Development** course prescribed in V semester is changed as **Life Skill Development**.

This course will be handled by both Internal Staff and External Experts.

Mode of Assessment for this course is oral examination

**Components of Evaluation**

Internal Marks	40	
	External Marks	60
	Total	100

**Skill Based Elective** offered by the Department

- 1. Non-Verbal Reasoning**
- 2. Arithmetic Ability**

**Certificate course** offered by the Department

**Linear Programming Techniques** will be conducted for III UG Students as an Extra Credit Course

**MOOC** Online Course – Extra Credit Course

**Non – Major Elective** Course offered by the Department

**Mathematics for Finance**

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**Question Pattern for UG and PG Programmes for students to  
be admitted during 2020 – 2021 and afterwards**

**Total Marks: 75**

**QUESTION PATTERN**

**SECTION – A  
(Question 1 to 10)**

**10 x 2 = 20 Marks**

1. Short Answer Questions
2. Two Questions from each units (All are answerable)

**SECTION – B  
(Question 11 to 15)**

**5 x 5 = 25 Marks**

1. 5 Paragraph type questions with “either / or” type choice.
2. One question from each unit of the Syllabus.
3. Answer all the questions.

**SECTION – C  
(Question 16 to 20)**

**3 x 10 = 30 Marks**

1. 5 Essay type questions – any three are answerable.
2. One questions from each unit of the Syllabus.



Semester	Subject Code	Title Of The Paper	Hours Of Teaching / Week	No. of Credits
I	20U1MAT1	<b>இக்கால இலக்கியம்</b> (செய்யுள் , உரைநடை, சிறுகதை, புதினம், நாடகம் இலக்கிய வரலாறு)	6	3

**நோக்கம்**

1. இக்கால இலக்கிய வகைகளைக் கண்டறிவர்
- 2.எழுத்து,சொல் இலக்கணங்களின் அடிப்படைகளைக் கண்டறிவர்.
- 3.புதினத்தை வாயிலாக வெளிப்படும் சமூக,அரசியல்விழுமியங்களை மதிப்பிடுவர்.
4. இக்கால இலக்கியத்தின் மீதான விருப்பத்தை மிகுவித்தல்.

**கூறு:1 செய்யுள்**

**நேரம்:18**

1. பாரதியார் : கண்ணன் என் காதலன்,கண்ணம்மா என் காதலி (முதல்பாடல் மட்டும்)
2. பாரதிதாசன் : தமிழின் இனிமை,தமிழ் உணர்வு
3. கவிமணி : ஒற்றுமையே ,உயர்நிலை-நாட்டுக்குழைப்போம்
4. சுரதா : சிக்கனம்

**கூறு: 2 செய்யுள்**

**நேரம்:18**

1. பட்டுக்கோட்டை கல்யாணசுந்தரம்:நாட்டுக்கொரு வீரன்
2. கண்ணதாசன் : காலக்கணிதம்
3. மு.மேத்தா: கண்ணீர் பூக்கள் ,ஊர்வலம்,தாய் ,வெளிச்சம் வெளியே இல்லை
4. அப்துல் ரகுமான் : தேவகானம் - தேர்ந்தெடுக்கப்பட்ட 5 பாடல்கள்

**கூறு: 3 சிறுகதை**

**நேரம்:18**

1. கேட்டிவி : குரல்கொடுக்கும் வானம்பாடி (1-10 )
2. கேட்டிவி : மனோரஞ்சிதம் (1-10 )

**கூறு:4 புதினம்**

**நேரம்:18**

புதினம் : துணிந்தவன் - வல்லிக்கண்ணன்

**கூறு:5 நாடகம் ,இலக்கிய வரலாறு**

**நேரம்:18**

- 1.நாடகம் : மாமன்னன் இராசராசன் - கு.வெ.பாலசுப்பிரமணியன்
- 2.இலக்கிய வரலாறு : இருபதாம் நூற்றாண்டு இலக்கியங்கள்

**பயன்கள்**

1. தமிழ் இலக்கியத்தின் மீதான ஆர்வம் மிகும்.
2. புதிய இலக்கிய வளங்களை அறிவர்.
3. கவிதை, சிறுகதை ஆகியவற்றைப் படைக்க முயல்வர்.
4. போட்டித் தேர்வுகளுக்குச் செல்பவர்கள் பயன் பெறுவர்.
5. நாடகக் கலைத்திறனை அறிவர்

Semester	Course Code	Title of The Course	Hours of Teaching/ Week	No. of Credits
<b>I</b>	<b>20U1MAE1</b>	<b>PART – II - Prose, Poetry and Communication Skills</b>	<b>6</b>	<b>3</b>

**Objective**

- **To initiate the students to understand English through Prose, Poetry and Basic Communicative Grammar.**

**Unit – I**

- Shakespeare - Shall I Compare Thee to a Summer's Day?
- John Milton - On His Blindness
- William Wordsworth - The Solitary Reaper
- P.B.Shelley - Song to the Men of England
- Robert Frost - The Road not Taken
- Nissim Ezekiel - Night of the Scorpion

**Unit – II**

- 1) The Running Rivulets of Man,
- 2) Parliament is Marking Time
- 3) The Lady in Silver Coat,
- 4) Mr. Applebaum at Play

**Unit – III**

- 1) The Feigning Brawl of an Impostor,
- 2) Thy Life Is My Lesson
- 3) Solve the Gamble,
- 4) The Stoic Penalty

**Unit – IV**

- 1) Nobility in Reasoning,
- 2) Malu the Frivolous Freak
- 3) Bharath! Gird Up Your Loins!
- 4) Honesty is the Cream Of Chastity

**Unit – V**

Parts of Speech, Nouns, Pronouns, Conjunctions, Adjectives, Articles, Verbs, Adverbs, Interjection – sentence.

**Course outcomes:**

**After the completion of this course, students will be able to**

- **understand and appreciate the English Prose, Poetry and basic functional communicative Grammar and study on style and substance.**
- **develop interest in appreciation of literature**
- **integrate the use of the four language skills: LSRW.**
- **communicate appropriately and use English effectively**
- **imbibe ethical, moral, national and cultural values**

**Prescribed Texts:**

K.T.V. *A Melodious Harmony*. Thanjavur: Rajendra Publishing House, 2017.  
Natarajan, K. *Flying Colours*. Chennai: New Century Book House (P) Ltd., 2017.  
*Advanced Grammar and Composition*. Chennai: New Century Publishing House, 2017.

Semester	Subject Code	Titles of the Paper	Hours of Teaching /Week	No. of Credits
<b>I</b>	<b>20U1MAC1</b>	<b>DIFFERENTIAL CALCULUS AND TRIGONOMETRY</b>	<b>5</b>	<b>4</b>

**Objectives:**

- To equip the student with necessary analytic and technical skills to handle the problems of mathematical in nature as well as practical problems.
- To explore the different tools for higher order derivatives,
- To plot the various curves and to solve the problems associated with differentiation of functions.

**Unit I:**

**15 Hrs**

**Successive Differentiation:** Successive Differentiation – The  $n^{\text{th}}$  derivative – Standard results – Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz formula for the  $n^{\text{th}}$  derivative of a product – Proof

**Unit II:**

**15 Hrs**

**Partial Differentiation, Maxima and minima of functions of two variables:** Successive partial derivatives – Function of function rule – Total differential coefficient – Implicit functions – Homogeneous functions – Partial derivatives of a function of two functions – Taylor's expansion of  $f(x,y)$  – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

**Unit III:**

**15 Hrs**

**Envelopes, Curvature of Plane curve:** Envelopes – Method of finding envelope – Curvature – Cartesian formula for radius of curvature – The coordinates of centre of curvature – Evolute and involute – Radius of curvature when the curve is given in polar co-ordinates –  $p$ - $r$  equation; pedal equation of a curve – Chord of curvature.

**Unit IV:**

**15 Hrs**

**Expansions:** Expansions of  $\cos n\theta$  and  $\sin n\theta$  – Expansion of  $\tan n\theta$  in powers of  $\tan \theta$  – Expansion of  $\tan A + B + C + \dots$  – Examples on formation of equations – Expansions of  $\cos^n \theta$  and  $\sin^n \theta$  in terms of functions of multiples of  $\theta$  – Expansion of  $\cos \theta$  and  $\sin \theta$  in a series of ascending powers of  $\theta$ .

**Unit V:**

**15 Hrs**

**Hyperbolic Functions and Logarithms of Complex quantities:** Hyperbolic functions – Relations between hyperbolic functions – Relations between hyperbolic functions and circular functions – Inverse hyperbolic functions – Separation into real and imaginary parts – Logarithms of complex quantities – logarithm of  $x + iy$  – General value of logarithm of  $x + iy$ .

**Course Outcomes:** After completion of the course, students will be able to

- solve the problems related to Hyperbolic Functions.
- understand the concepts of Envelope and plane curves.
- analyze the concept of differential equations and use various methods for finding the radius of curvature
- handle the problems of mathematical in nature as well as practical problems.
- acquire knowledge to write TNPSC Statistical and UG TRB exams.

**Text Book:**

1. **Calculus Volume I**, S. Narayanan and T.K.Manicavachagom Pillay, S. Viswanathan pvt. Ltd., 2014.  
Unit I : Chapter III (All sections)  
Unit II : Chapter VIII (Sections 1, 3, 4 & 5)  
Unit III: Chapter X (All sections)
2. **Trigonometry**, Narayanan and T.K. Manicavachagom Pillay, S. Viswanathan pvt. Ltd., 2014.  
Unit IV: Chapter III  
Unit V: Chapter IV (All sections) & Chapter V (Section 5)

**General References Links:**

1. [https://math.Korea.Edu/math\\_en/calculus/syllabus.Do](https://math.Korea.Edu/math_en/calculus/syllabus.Do) [Korea University]  
<https://explore.course.Stanford.edu/search?q=MATH21> [Stanford University]

Semester	Subject Code	Title of the Paper	Hours of Teaching /Week	No.of Credits
<b>I</b>	<b>20U1MAC2</b>	<b>ANALYTICAL GEOMETRY 3-D AND INTEGRAL CALCULUS</b>	<b>5</b>	<b>4</b>

**Objectives:**

- To equip the student with necessary analytic and technical skills.
- To explain the principles of integral
- To explore the standard concepts and tools at an intermediate to advance level that will serve them well towards taking more advance level course in mathematics

**Unit I**

**15 Hrs**

Analytical Geometry 3-D – The plane – The straight line – Coplanar lines - skew lines S.D.

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**Unit II**

**15 Hrs**

Sphere- Tangent plane- intersection of two spheres – Equation of tangent plane to a sphere.

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**Unit III**

**15 Hrs**

Properties of definite integrals - Reduction formulae of the types:  
 $\int x^n e^{ax} dx, \int x^n \cos ax \, dx, \int \sin^n x \, dx, \int \cos^n x \, dx, \int \sin^m x \cos^n x \, dx, \int \tan^n x \, dx$  .

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**Unit IV**

**15 Hrs**

Beta and Gamma Functions: Definitions – Convergence of  $\Gamma(n)$  – Recurrence formula of gamma function – Properties of beta function – relation between beta and gamma functions.

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**Unit V**

**15 Hrs**

Multiple integral: Double integral – Evaluation of double integral - change of order of integration – Polar coordinates - Triple integrals - Application of multiple integrals.

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**Course Outcomes:** After completion of the course, students will be able to

- enrich their knowledge in various types and methods of integral calculus.
- understand Planes, Straight lines and Spheres in Three Dimensional spaces.
- solve the problems related to multiple integrals, Beta and Gamma functions.
- solve a variety of practical problems in science and engineering.
- acquire the knowledge to write TNPSC Statistical and UG TRB exams

**Text Book:**

1. *Analytical geometry* : T.K. M. Pillai, 2015 (for Unit I & II)
2. *Calculus Vol II* : T.K. M. Pillai, 2015 (for Unit III, IV & V)

Unit I	:	Chapter 2 (Sec: 1 – 7), Chapter 3 (Sec: 1 - 8)
Unit II	:	Chapter 4 (Sec: 1 – 8)
Unit III	:	Chapter 1 (Sec: 11, 13.1 – 13.6)
Unit IV	:	Chapter 7 (Sec: 2 – 5)
Unit V	:	Chapter 5 (Sec: 2 – 5.4)

**General References Links:**

1. <https://sites.math.washington.edu/~m125/> [Washington University]  
<https://courses.maths.ox.ac.uk/node/28> [Oxford University]

Semester	Course Code	Title of the Course	Hours of Teaching /week	No. of Credits
<b>I</b>	<b>20U1MAPHA1</b>	<b>Allied Physics –I</b>	<b>5</b>	<b>4</b>

**Objectives:**

- To teach basic knowledge in various branches of Physics
- To impart the knowledge of fundamental concepts in Light, Sound and Mechanical properties of materials

**Unit I – Elasticity**

Stress – Strain –Hooke’ law-Different moduli of elasticity - Twisting couple on a cylinder – determination of coefficient of Rigidity modulus by Static Torsion method – Bending of beams – Bending moment –Experimental methods for the determination of Young’s modulus by uniform and non-uniform bending – I section girders.

**Unit – II Sound**

Simple harmonic motion - Composition of two simple harmonic motions (1) along a straight line and (2) at right angles – Lissajous figures and applications – characteristic of musical sound - decibel – phon– intensity - intensity measurement by hotwire microphone method. Acoustics of buildings – Reverberation – Reverberation time- requirements for good acoustics of buildings.

**Unit – III Thermal Physics**

Newton’s law of cooling –verification-specific heat capacity of a liquid by cooling – Bomb calorimeter – Conduction: Coefficient of thermal conductivity -- Lee’s disc method for bad conductors – Black body radiation- Stefan’s law – Deduction of Newton’s law of cooling from Stefan’s law- Solar constant – Angstrom’s pyrheliometer-temperature of the sun..

**Unit – IV Optics**

Interference – determination of thickness of a thin wire by air wedge method – Diffraction – Fresnel’s and Fraunhofer diffraction – Transmission grating – theory – Polarization – Elliptically and Circularly polarized light –Nicol prism - Quarter wave plate – Half wave plate – Optical activity – Laurent’s half shade polarimeter.

**Unit – V Relativity**

Frames of reference – Galilean transformation – inertial and non-inertial frames – Michelson-Morley experiment –Explanations of negative result – postulates of special theory of relativity-Lorentz transformation equations – time dilation – length contraction – variation of mass with velocity – mass- energy equivalence.

**Course Outcomes:**

On successful completion, students will

- be aware on the mechanical properties of materials
- have sound knowledge on sound, thermal physics and optics
- visualize the concept of relativity.

**Books for study**

A Text book of sound - N. Subrahmanyam and BrijLal.

1. Allied physics – A. Sundaravelusamy, Priya Publications, Karur-2.
2. Properties of matter – R.Murugesan.



Semester	Course Code	Title of the Course	Hours of Teaching /week	No. of Credits
<b>I &amp; II</b>	<b>20U2MAPHAPL</b>	<b>Allied Physics Practicals (NS)</b>	<b>3+3</b>	<b>-</b>

**Objectives:**

- To enrich the knowledge in basic Physics experiments
- To teach the mechanical behaviour of materials
- To introduce related experiments.

**List of Experiments Any 14 Experiments**

1. Young's modulus of a given beam – non uniform bending.
2. Rigidity modulus of a rod –Static Torsion
3. Coefficient of viscosity of a given liquid – Graduated burette method.
4. Specific heat capacity of liquid – Newton's law of cooling
5. Newton's rings – Radius of curvature of lens.
6. Air wedge – Thickness of wire
7. Spectrometer prism – A and D
8. Spectrometer grating – a wavelength of various spectral line by normal incidence
9. Field along the axis of the coil
10. Carey Fosters Bridge – specific resistance of a given coil.
11. P.O Box – Specific Resistance
12. Potentiometer – ammeter calibration
13. Figure of merit of a galvanometer –Half deflection method
14. Diode – characteristics
15. Surface tension and interfacial ST – drop weight method
16. Logic gates (AND, OR, NOT) – using discrete components.
17. Verification of Basic Logic gates.

**Course Outcomes:**

Through this course students will

- be able to understand the mechanical behaviour of materials
- understand how thickness of a wire can be determined
- gain knowledge on the function of discrete circuit components in Electronics.

Semester	Subject Code	Title Of The Paper	Hours Of Teaching/ Week	No. of Credits
II	20U2MAT2	இடைக்கால இலக்கியம் - பயன்முறைத் தமிழ் -இலக்கண இலக்கிய வரலாறு,	6	3

**நோக்கம்**

1. தமிழிலக்கிய வரலாற்றில் பக்தி இலக்கியங்கள் பெறும் சிறப்பை உணர்வர்.
2. சமய வழிச் சமூக மாற்றத்தின் பெறுவர்.
3. சமய நல்லிணக்க உணர்வை மாணவர்கள் பெறுவர்.

**கூறு: 1**

**நேரம்:18**

1. திருஞானசம்பந்தர் தேவாரம் : சீகாழி திருப்பதிகம்—  
அடலேற அமருங்கொடி அன்ன (பா.எ.360—370)
2. திருநாவுக்கரசர் தேவாரம் : திருவையாற்றுப் பதிகம்  
விடகிலேன், அடிநாயேன்; வேண்டியக் கால் யாதொன்றும்  
(பா.எ.124 —133)
3. சுந்தரர் தேவாரம் : திருமழபாடி பதிகம்  
பொன் ஆர் மேனியனே! புலித்தோலை அரைக்கு அசைத்து,(பா.எ.1-10  
பாடல்கள் ) 4. மாணிக்கவாசகர் : திருவாசகம் - பிடித்த பத்து

**கூறு: 2**

**நேரம்:18**

1. பெரியாழ்வார் : திருமொழி - தாய்ப்பால் உண்ண அழைத்தல் 129—138 வரை  
10 பாசுரங்கள்
2. குலசேகர ஆழ்வார்: பெருமாள் திருமொழி- இராமர் தாலாட்டு - 719—729  
11 பாசுரங்கள்
3. ஆண்டாள் நாச்சியார்: நாச்சியார் திருமொழி - திருமணக்கனவை உரைத்தல்
4. திருப்பாணாழ்வார் : அமலனாதிபிரான் - 10 பாசுரங்கள்

**கூறு: 3**

**நேரம்:18**

1. குமரகுருபரர் : வருகைப் பருவம் - 10 பாடல்கள்
2. திரிகூடராசப்பக்கவிராயர் : குற்றாலக் குறவஞ்சி - குறத்தி மலைவளம் கூறல்
3. வீரமாமுனிவர் : தேம்பாவணி - காட்சிப்படலம் முழுவதும்
4. உமறுப்புலவர் : சீறாப்புராணம்-விலாதத்துக் காண்டம்-கதீஜா கனவு கண்ட  
படலம்

**கூறு: 4 பயன்முறைத்தமிழ்**

**நேரம்:18**

எழுத்தியல்: உயிரெழுத்து, மெய்யெழுத்து, உயிர்மெய்யெழுத்து,முதலெழுத்து, சார்பெழுத்து, மொழிக்கு முதலாகவும் இறுதியாகவும் வரும்எழுத்துக்கள்,போலி. சொல்லியல்: இலக்கண, இலக்கிய வகையிலான சொற்கள். பொதுவியல் : எழுத்துப் பிழைகளை நீக்குதல்,எழுத்துப் பிழைகளும் திருத்தங்களும்,வலி மிகுதல்,வலிமிகாமை ,வாக்கிய அமைப்புக்கள், நிறுத்தற் குறியீடுகள்.

**கூறு:5இலக்கணஇலக்கிய வரலாறு**

**நேரம்:18**

1. இலக்கண வரலாறு (தமிழ்த்துறை வெளியீடு)
2. தமிழ் இலக்கிய வரலாறு: இடைக்கால இலக்கியம்

**பயன்கள்**

1. பல்வகை சமய இலக்கியப் போக்குகளை அறிந்து கொள்வர்.
- 2.சமயவழித் தமிழரின் வாழ்வியலை அறிவர்.
3. பல்வகை சமயக் கோட்பாட்டினை அறிந்துகொள்வர்.
4. பிழையின்றி எழுதப் பழகுவர்.
5. சமயங்களின் இன்றியமையாமையை உணர்வர்

Semester	Course Code	Title of The Course	Hours of Teaching/ Week	No. of Credits
<b>II</b>	<b>20U2MAE2</b>	<b>PART – II- Extensive Readers and Communicative Skills</b>	<b>6</b>	<b>3</b>

**Objective**

- **To impart language and communicative skills through short stories, one-act plays and communicative grammar.**

**Unit – I**

- Shakespeare – The Seven Stages of Man
- Longfellow – A Psalm of Life
- Nissim Ezakiel – Enterprise
- William Wordsworth – The world is too much with us

**Unit – II**

- Anton Chekhov – The Bear
- Cedric Mount – The Never-Never Nest
- Farrell Mitchell – The Case of the Stolen Diamonds
- M.V. Rama Sharma – The Mahatma

**Unit - III**

- Fyodor Dostoyevsky – The Christmas Tree and the Wedding
- The Duchess – The Jewelry
- O. Henry – The Romance of a Busy Broker

**Unit – IV**

Tense, Question Tag, Dialogue Writing, Paragraph Writing, Adjectives, Adverb

**Unit – V**

Voices, Degrees of Comparison, Direct and Indirect

**Course outcomes**

**After the completion of this course students will be able to**

- **promote the linguistic and communicative objectives through the study of poems, short stories and the communicative grammar.**
- **gain language and communicative skills through short stories**
- **identify and differentiate different forms of literature.**
- **engage in reflective writing after learning the prescribed lessons.**
- **enhance the communicative skills through LSRW**

**Prescribed Texts:**

- *Voices of Vision*, Board of Editors, NCBH, Chennai, 2016.
- Communicative Grammar*, The Department of English Course Material.

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
<b>II</b>	<b>20U2MAC3</b>	<b>CLASSICAL ALGEBRA</b>	<b>4</b>	<b>5</b>

**Objectives:**

- To explain the systems of linear equations.
- To impart the knowledge of determinants and their properties.
- To teach the uses of eigenvalues and eigenvectors of a matrix.

**Unit I**

**12 Hrs**

**Matrices:** Characteristic roots and characteristic vectors - Linear transformation - the characteristic equation of transformation - Cayley-Hamilton theorem - Diagonalisation of a matrix - orthogonal matrices.

**Unit II**

**12 Hrs**

**Theory of equations:** Relation between roots and coefficients- symmetric functions of the roots in terms of the coefficients- imaginary roots and irrational roots- sum of the powers of the roots of an equation.

**Unit III**

**12 Hrs**

**Transformation of equations:** Transformation of equations - Reciprocal equations- standard forms to increase and decrease the roots of a given equation by a given quantity- Removal of terms- Descartes' rule of sign.

**Unit IV**

**12 Hrs**

**Binomial theorem:** Binomial theorem - positive integral index - the greatest coefficient in the expansion of  $(1 + x)^n$  - Binomial theorem for a rational index - particular cases of the Binomial expansions - Numerically greatest terms - summation of a series

**Unit V**

**12 Hrs**

**Exponential and Logarithmic series:** Exponential limit - the exponential theorem - summation - Logarithmic series - modification of the logarithmic series - summation

**Course Outcomes:** After completion of the course, students will be able to

- understand the importance of roots of real and complex polynomials
- learn various methods to obtain roots.
- familiarize themselves with relations, equivalence relations and partitions.
- apply the appropriate tests to find the convergence or divergence of an infinite series.
- acquire the knowledge to write TNPSC Statistical and UG TRB exams.

**Text Book:**

1. **Engineering Mathematics**, Vol.I. P.Kandasamy, K.Thilagavathi, K.Gunavathi, S.Chand& sons, second edition,1996  
Unit – I: Matrices: Chapter 5
2. **Algebra Volume I**, T.K.M. Pillay, T. Natarajan and K.S.Ganapathy, S. Viswanathan (Printers & Publishers) Pvt. Ltd., 2015.  
Unit II : Chapter 6 (Sections 1 - 13)  
Unit III : Chapter 6 (Sections 15 – 19, 24)  
Unit IV : Chapter 3 (Sections 1, 5, 6, 8, 10)  
Unit V : Chapter 4 (Sections 1, 2, 3, 5, 6, 9)

**General References:**

1. S. Arumugam and A. Thangapandiissac, Theory of equations and Trigonometry
2. A. Singaravelu, Engineering Maths Volume I

**General References Links:**

1. <https://explore.course.stanford.edu/search?q=MATH51>[Stanford University]
2. <https://courses.maths.ox.ac.uk/node/37616>[Oxford University]

Semester	Subject Code	Title of the Paper	House of Teaching / Week	No.of Credits
<b>II</b>	<b>20U2MAC4</b>	<b>SEQUENCE AND SERIES</b>	<b>5</b>	<b>5</b>

**Objectives:**

- To equip the students with the knowledge of the fundamental concepts of sequences and power series.
- To encourage logical arguments and to convey the power of abstract methods.
- To find an infinite series is convergent or divergent by selecting the appropriate test.

**Unit I**

**15 Hrs**

Sets, Sequences – Aggregate: Upper and lower bounds – Bounded sequences – monotonic sequence always tends to a limit, finite or infinite

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**Unit II**

**15 Hrs**

Some general theorems concerning infinite series – series of positive terms – comparison tests – Cauchy’s condensation test – D-Alembert’s ratio test - Definition of convergence, Divergence and Oscillation- Necessary condition for convergence- convergence of  $\sum \frac{1}{n^p}$  and Geometric series.

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**Unit III**

**15 Hrs**

Cauchy’s root test and their simple problems - Raabe’s test – Absolutely convergent series - Alternative series with simple problems.

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**Unit IV**

**15 Hrs**

Summation of series – Summation by different series – recurring series.

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**Unit V**

**15 Hrs**

Inequalities- Geometric and Arithmetic means- Weirstrass inequalities- Cauchy’s inequality.

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**Course Outcomes:** After completion of the course, students will be able to

- understand and apply the basic definitions and concepts in set and function theory.
- know the nature of a logical argument and their mathematical proof and to produce examples of these.
- understand the definitions of limits and convergence in the context of sequences and series of real numbers.
- compute limits of sequences involving elementary functions.
- prove simple statements involving convergence arguments.

**Text Book:**

1. **Algebra Volume I**, T.K.M. Pillay, T. Natarajan and K.S.Ganapathy,  
S. Viswanathan (Printers & Publishers) Pvt. Ltd., 2015.  
Unit I : Chapter 2 (Sec: 4 – 7), Pages: 20 - 40  
Unit II : Chapter 2 (Sec: 8 – 16), Pages: 41 - 68  
Unit III: Chapter 2 (Sec: 17 – 19, 21 – 24), Pages: 68 - 88  
Unit IV: Chapter 5 (Sec: 1 – 7), Pages: 246 – 281
1. **Algebra Volume II**, T.K.M. Pillay, T. Natarajan and K.S.Ganapathy,  
S. Viswanathan (Printers & Publishers) Pvt. Ltd., 2015.  
Unit V :Chapter 4 (Sec: 1 – 12), Pages: 179 - 212

**General Reference:**

*Sequence and series: S. Arumugam and Isaac*

**General References Links:**

1. <https://courses.maths.ox.ac.uk/node/43846>[Oxford University]
2. <https://explore.course.stanford.edu/search?q=MATH21>[Stanford University]

Semester	Course Code	Title of the Course	Hours of Teaching/ week	No. of Credits
<b>II</b>	<b>20U2MAPHA2</b>	<b>Allied Physics –II</b>	<b>5</b>	<b>4</b>

**Objectives:**

- To teach the basic knowledge in various branches of Physics
- To introduce the fundamentals in electricity and magnetism.
- To impart sufficient knowledge in the concept of atom and nucleus.

**Unit – I Magnetism**

Gauss's law for magnetism - Diamagnetism - Paramagnetism - Ferromagnetism- Properties - Electromagnetism: Magnetic field intensity - Biot-Savart's law -Magnetic field due to straight current carrying conductor - field along the axis of a coil - solenoid - Ampere's theorem.

**Unit – II Electricity**

Kirchhoff's laws and their applications -Wheatstone's Bridge - Carey Foster's Bridge. Electromagnetic induction: Laws of electromagnetic induction - expression for induced e.m.f - self inductance of a solenoid - Rayleigh's method - Mutual inductance of solenoids- coefficient of coupling -Eddy currents and its applications.

**Unit – III Atomic Physics**

Vector atom model - quantum numbers - Pauli's exclusion principle - Periodic classification of elements - Photoelectric effect - Einstein's photo electric equation - experimental verification - Photomultiplier tube. X-rays: continuous and characteristic X-rays -Mosley's law and its importance-Bragg's Law - Bragg 's spectrometer -Crystal structure determination.

**Unit – IV Nuclear Physics**

Nuclear size -mass - charge - spin magnetic moment - packing fraction - nuclear stability and binding energy - Liquid-drop model - shell model - nuclear fission-multiplication factor - critical size - chain reaction - nuclear fusion -stellar energy-Thermonuclear reaction-controlled thermonuclear reaction - nuclear reactor.

**Unit – V Electronics**

Necessity of modulation - Different types of modulation -Demodulation - junction Diode Detector - Ionosphere and propagation of radio waves - AND,OR,NOT,NOR,NAND gates - Laws of Boolean algebra - De'Morgan's theorems - NAND and NOR as Universal building block.



**Course Outcomes:**

Through this course, students will

- gain knowledge on Electricity and Magnetism
- know about atoms and nucleus
- understand the fundamentals on electronics.

**Books for study**

1. Modern Physics – R. Murugesan and Kiruthikaprasath
2. Electricity & Magnetism – BrijLal and N. Subramanyam
3. Allied physics – A. Sundaravelusamy, Priya publications, Karur-2.

Semester	Subject Code	Title of the Paper	Hours of Teaching /Week	No.of Credits
Semester	Course Code	Title of the Course	Hours of Teaching /week	No. of Credits
<b>I &amp; II</b>	<b>20U2MAPHAPL</b>	<b>Allied Physics Practicals (NS)</b>	<b>3+3</b>	<b>2</b>

**Objectives:**

- To enrich the knowledge in basic Physics experiments
- To teach the mechanical behaviour of materials
- To introduce related experiments.

**List of Experiments Any 14 Experiments**

1. Young's modulus of a given beam – non uniform bending.
2. Rigidity modulus of a rod –Static Torsion
3. Coefficient of viscosity of a given liquid – Graduated burette method.
4. Specific heat capacity of liquid – Newton's law of cooling
5. Newton's rings – Radius of curvature of lens.
6. Air wedge – Thickness of wire
7. Spectrometer prism – A and D
8. Spectrometer grating – a wavelength of various spectral line by normal incidence
9. Field along the axis of the coil
10. Carey Fosters Bridge – specific resistance of a given coil.
11. P.O Box – Specific Resistance
12. Potentiometer – ammeter calibration
13. Figure of merit of a galvanometer –Half deflection method
14. Diode – characteristics
15. Surface tension and interfacial ST – drop weight method
16. Logic gates (AND,OR,NOT) – using discrete components.
17. Verification of Basic Logic gates.

**Course Outcomes:**

Through this course students will

- be able to understand the mechanical behaviour of materials
- understand how thickness of a wire can be determined
- gain knowledge on the function of discrete circuit components in Electronics.

<b>II</b>	<b>20U2MAS1</b>	<b>Skill Based Education – I Non- Verbal Reasoning</b>	<b>1</b>	<b>1</b>
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**Objectives:**

- To teach the students to think and to acquire knowledge and skills through logical reasoning.
- To inculcate the habit of self-learning

**Unit – I**

**15 Hrs**

Classification and Analytical Reasoning, Mirror images, Figure Matrix and Paper folding. Paper cutting, Problems on cubes and dice, Dot situation.

**Unit – II**

**15 Hrs**

Paper cutting, problems on cubes and dice, Dot situation, construction of squares and triangles.

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**Course Outcomes:** After completion of the course, students will be able to

- understand and analyse visual information.
- solve problems using visual reasoning.
- acquire the knowledge to write the competitive examinations

**Text Book:**

*“A modern approach to non-verbal reasoning”- R.S. Aggarwal, S.Chand and Company Ltd., New Delhi- 55 (2007)*

Unit - I Chapters 3 (206-212) Cha 4(241-250), Cha 5 (267-270) Cha9 (313-318)

Cha10(321-326)

Unit – II Chapter 11 (327 – 337) Chapter 14 (351-361)

Chapter 15 (395-400) Chapter 16 (404 – 412).

Semester	Subject Code	Title Of The Paper	Hours Of Teaching / Week	No. of Credits
III	20U3MAT3	காப்பியங்கள், கட்டுரைகள், இலக்கிய வரலாறு	6	3

### நோக்கம்

1. காப்பியங்களின் உள்ளடக்கம், உத்திகளைக் கற்றுக்கொடுத்தல்.
2. காலந்தோறும் காப்பியங்களில் காணலாகும் பாடுபொருள்களின் மாற்றங்களை எடுத்துரைத்தல்.
3. காப்பியச்சுவையை மாணவர்கள் அறிந்து கொள்ளச் செய்தல்.

### கூறு:1காப்பியங்கள்

நேரம்:18

1. சிலப்பதிகாரம்: மதுரைக்காண்டம்-வழக்குரைகாதை
2. மணிமேகலை; மலர்வனம் புக்ககாதை
3. சீவக சிந்தாமணி: சுரமஞ்சரியார் இலம்பகம்
4. கம்பராமாயணம்: கங்கைப் படலம்

### கூறு:2 காப்பியங்கள்

நேரம்:18

1. பெரியபுராணம் : மெய்ப்பொருள் நாயனார் புராணம்-முழுவதும்
2. அரிச்சந்திரபுராணம்: மயான காண்டம்
3. தேம்பாவணி: திருமணப் படலம்-1-10 பாடல்கள்
4. சீறாப்புராணம் : நபி அவதாரப் படலம்-1-10 பாடல்கள்

### கூறு: 3 கட்டுரைத் தொகுப்புகள்

நேரம்:18

1. கேட்டிவி - இராகபாவம் (1-10 )
2. கேட்டிவி - பயணங்கள் தொடரும்

### கூறு:4கட்டுரைக்கடிதங்கள் மொழிபெயர்ப்புப் பயிற்சிகள்

நேரம்:18

பயிற்சிக்கட்டுரைகளும் கடிதங்களும் -பாவை வெளியீடு  
கட்டுரைப் பயிற்சி - 10 மதிப்பெண்கள்  
மொழிபெயர்ப்புப் பயிற்சி - 5 மதிப்பெண்கள்

### கூறு:5 இலக்கிய வரலாறு

நேரம்:18

காப்பிய இலக்கியங்கள் - சிற்றிலக்கியங்கள்

### பயன்கள்

1. காப்பியங்கள் வாயிலாக அக்காலச் சமுதாயச் சூழலை அறிவர்.
2. பல்வேறு காப்பியங்களையும் ஒப்பிட்டு அவற்றின் தனித்தன்மைகளை அறிந்துகொள்வர்.
3. மீட்டுருவாக்கச் சிந்தனைகளை அறிவர்.
4. கட்டுரை எழுதும் திறன் பெறுவர்.
5. கடிதங்கள் எழுதும் பயிற்சி பெறுவர்.

Semester	Course Code	Title of The Course	Hours of Teaching /Week	No. of Credits
<b>III</b>	<b>20U3MAE3</b>	<b>PART - II Shakespeare, Extensive Readers And Communicative Skills</b>	<b>6</b>	<b>3</b>

**Objective**

- **To introduce the language and creativity of the world-renowned dramatists and novelists to enhance the communicative skills of the learners.**

**Unit – I**

Julius Caesar  
The Merchant of Venice

**Unit – II**

Macbeth  
Twelfth Night

**Unit – III**

Romeo and Juliet  
Tempest

**Unit – IV**

Thomas Hardy – The Mayor of Casterbridge

**Unit – V**

Note making, Hints Developing, Expansion of Ideas and Proverbs, Clauses and Sentence, Structure: Simple, Compound and Complex.

**Course outcomes**

**After the completion of this course students will be able to**

- **promote their communicative skills through the study of Shakespeare and modern communicative methods.**
- **expand their perception interacting with the culture across the world**
- **imbibe moral and ethical prescriptions**
- **appreciate the creative genius and affluent expressions of Shakespeare**
- **develop the creative and analytical faculty**

**Prescribed Texts:**

Natarajan, K.ed. *Selected Scenes from Shakespeare*. Chennai: NCBH, 2017.  
Hardy, Thomas. *The Mayor of Casterbridge*. (abridged) Chennai: Macmillan Publishers, 2012.  
*Communicative Grammar*. Department of English Edition. 2017.

Semester	Subject Code	Title of the Paper	House of Teaching / Week	No.of Credits
<b>III</b>	<b>20U3MAC5</b>	<b>DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS</b>	<b>5</b>	<b>5</b>

**Objectives:**

- To impart the knowledge on the method of solving ordinary differential Equations of First Order, Second Order and Partial Differential equations.
- To teach the properties of special functions by their differential representations and symmetries
- To teach the properties of Laplace Transform which may be solve by the application of special functions..

**Unit I**

**15Hrs**

Formation of differential equation – equation of the first order and the first degree - exact differential equation – rules for finding integrating factors – Equation of first order, but of higher degree - Clairaut's form.

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**Unit II**

**15 Hrs**

Linear differential equations with constant coefficients: Particular Integral – methods for finding P.I. - linear equations with variable coefficients.

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**Unit III**

**15 Hrs**

Variation of parameters- Total differential equation  $Pdx+Qdy+Rdz=0$ – rules for integrating  $Pdx + Qdy + Rdz = 0$

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**Unit IV**

**15 Hrs**

Partial differential equation- Four standard types- Lagrange's method for solving  $Pq + Qq = R$

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**Unit V**

**15 Hrs**

Laplace transform – Laplace transform of periodic functions – some general theorems - Inverse transforms - Solving second order differential equations using Laplace transform - problems.

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**Course Outcomes:** After completion of the course, students will be able to

- acquire knowledge to solve Differential and Partial Differential Equations.
- solve higher order linear differential equations.
- expose differential equation as a powerful tool to solve the problems in Physical and Social sciences.
- demonstrate competency to solve linear PDE by Lagrange's method
- analyze the concepts of Laplace transforms and inverse Laplace transforms to solve ODE with constant coefficients

**Text Book**

***Calculus, volume III***, S. Narayanan, T.K.M. Pillai, 2014.

Unit I : Chapter 1 (sec: 1 – 6), Pages: 1 – 38

Unit II : Chapter 2 (sec: 1 – 4, 8), Pages: 49 – 75, 81–89

Unit III : Chapter 2 (sec: 10), Chapter 3 (sec: 7), Pages: 91–95, 108–114

Unit IV : Chapter 4 (sec: 1 – 6), Pages: 115 – 145

Unit V : Chapter 5 (sec: 1 – 8), Pages: 154 – 189

**Reference Books**

1. Engineering Mathematics- A. Singaravelu.
2. Ordinary and partial differential equations- M.D. Raisinghania and R.S. Aggarwal S.Chand & Company Ltd, New Delhi.

**General References Links:**

1. [https://science.korea.edu/science\\_en/undergraduate/under\\_math3.do](https://science.korea.edu/science_en/undergraduate/under_math3.do)  
[Korea University college of Science]
2. <https://science.utm.my/ug/course-list-old/sscm1703/>  
[Universiti Teknologi Malaysia]

Semester	Subject Code	Title of the Paper	House of Teaching / Week	No.of Credits
III	20U3MAC6	<b>VECTOR CALCULUS, FOURIER SERIES AND FOURIER TRANSFORMS</b>	5	5

**Objectives:**

- To enable the students to learn about the expansion of vector calculus
- To teach the expansions of Fourier series and Fourier Transforms.
- To enable the students to understand the Fourier series of a given periodic function.

**Unit I** **12 Hrs**

**Vector differentiation:** Differentiation of vectors – Gradient, Divergence and Curl

**Unit II** **12 Hrs**

**Vector integration:** Integration as inverse of differentiation – The line integral – Surface integral – Gauss's Divergence Theorem, Green's theorem, Stoke's theorem (Without Proof).

**Unit III** **12 Hrs**

**Fourier Series:** Periodic functions – Fourier Series – Dirichlet's Conditions – Even and odd functions- Half range sine series – Half range cosine series.

**Unit IV** **12 Hrs**

**Fourier series:** Change of interval – Parseval's Theorem, Harmonic Analysis.

**Unit V** **12 Hrs**

**Fourier Transforms:** Definition – Integral Transforms – Properties of Fourier Transforms – Parseval's identity – Infinite Fourier cosine and sine transform.

**Course Outcomes:** After completion of the course, students will be able to

- determine and apply the important quantities associated with vector fields such as divergence, curl and scalar potential.
- know the geometrical and physical significance of vector differentiation and to apply them
- analyze the line integral, surface integral, volume integral and inter-relations among them.
- understand and evaluate Fourier series of a given periodic function.
- acquire the knowledge to write TNPSC Statistical and UG TRB exams.

**Text Book:**

**Mathematics Volume IV: Vector Calculus, Fourier series and Fourier Transforms,**  
P. Kandasamy and K. Thilagavathy, S. Chand & Company Ltd, New Delhi.

Unit I : Vector Calculus: Pages 1 – 23.

Unit II : Vector Calculus: Pages 24 - 50

Unit III: Fourier series: Pages 93 - 144

Unit IV: Fourier series: Pages 145 – 174, 176 – 182

Unit V : Fourier Transforms: Pages 196 - 226

**Reference Books:**

1. Vector Algebra and Analysis- T.K.M. Pillai.
2. Calculus Volume III- T.K.M. Pillai.
3. Engineering Mathematics- A. Singaravelu.



Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
<b>III</b>	<b>20U3MAMSA1</b>	<b>Allied- MATHEMATICAL STATISTICS- I</b>	<b>5</b>	<b>4</b>

**Objective:**

- To teach the students about the concept of probability, one dimensional and two dimensional random variables
- To enrich the knowledge of discrete and continuous probability distributions.
- To teach the students to solve the problems on curve fitting.

**Unit I**

**15 Hrs**

Random variables- distribution function- discrete random variable – Probability mass function - Discrete distribution function - continuous random variable- Probability density function – Continuous distribution function.

**Unit II**

**15 Hrs**

Two dimensional random variable: joint probability mass function – continuous probability function - Marginal Distribution Function – Stochastic independence - Mathematical Expectations - Properties of expectation – Properties of variance – simple problems only

**Unit III**

**15 Hrs**

M.G.F – Cumulants - Characteristic Functions - Binomial, Poisson distributions – Moments, mode and MGF only

**Unit IV**

**15 Hrs**

Normal distribution- Gamma distribution- Beta distribution (without problems) - Exponential distribution

**Unit V**

**15 Hrs**

Correlation: Karl pearson coefficient of correlation–Rank correlation – Regression: Linear regression – Regression coefficient – properties of regression coefficients – related problems

**Course Outcomes:** After completion of the course, students will be able to

- gain wide knowledge in probability, since probability plays a major role in solving real life problems
- apply these techniques in solving real life problems.
- demonstrate the concept of Mathematical expectation.
- apply the types of Probability Distribution in many ways.
- analyze the Correlation and Regression concepts.

**Text book**

***“Fundamentals of Mathematical statistics”, S.C. GUPTA, V.K. KAPOOR, Sultan Chand & Sons, 2014 (11<sup>th</sup> revised edition)***

Unit I : Chapter 5 (Sec. 5.1 - 5.4)

Unit II : Chapter 5 (Sec. 5.5- 5.5.6)

Chapter 6 (Sec. 6.1 - 6.5)

Unit III: Chapter 7 (Sec.7.1-7.3.1)

Chapter8(Sec.8.4, 8.4.1, 8.4.2, 8.4.5, 8.4.6, 8.5, 8.5.2 - 8.5.5)

Unit IV: Chapter 9 (Sec.9.2, 9.2.1-9.2.3, 9.2.5, 9.2.11, 9.3, 9.5, 9.8)

Unit V : Chapter 10 (Sec.10.2-10.4& 10.7)

Chapter 11 (Sec.11.1-11.2.2)

**General Reference**

*Dr. P.R. Vittal “Mathematical Statistics” Margham Publications Chennai.*

**General References Links:**

1. [https://science.korea.edu/science\\_en/undergraduate/under\\_math3.do](https://science.korea.edu/science_en/undergraduate/under_math3.do)  
[Korea University college of Science]
2. <http://www.bath.ac.uk/catalogues/2019-2020/ma/MA10211.html>  
[University of Bath, United Kingdom]

Semester	Subject Code	Title of the Paper	Horse of Teaching / Week	No.of Credits
<b>III &amp; IV</b>	<b>20U4MAMSAPL</b>	<b>Allied – Data Analysis using SPSS (NS)</b>	<b>3 + 3</b>	<b>-</b>

**Objectives:**

- To teach the simple, ideal, statistical and communication models.
- To explain the development of codes for transmission and detection of information.
- To impart more professional statistical software programs.

1. Measures of Central Tendency & Measures of dispersion.
2. Moments, Skewness and kurtosis
3. Fitting of Binomial distribution
4. Fitting of Poisson distribution
5. Fitting of Normal distribution
6. Correlation and Regression
7. Goodness of fit
8. Large sample tests
9. T- test
10. Variance tests confidence intervals

**Course Outcomes:** After completion of the course, students will be able to

- respond appropriately for the issues that may arise when analyzing real data sets and communicating results.
- develop novice-level statistical thinking particularly with respect to linking appropriate inferences to study the design.
- demonstrate the ability to select and use the statistical models like normal distribution, t-distribution, binomial distribution, etc.

Semester	Subject Code	Title Of The Paper	Hours Of Teaching/ Week	No. of Credits
<b>IV</b>	<b>20U4MAT4</b>	<b>சங்க இலக்கியம் - அற இலக்கியம் - செம்மொழி தமிழ்- இலக்கிய வரலாறு</b>	<b>6</b>	<b>3</b>

**நோக்கம்:**

- 1.பழந்தமிழ் இலக்கியங்களின் திணைத்துறைக் கோட்பாடுகளை அறிதல்.
- 2.திணைசார் சமுதாய வாழ்வின் பல்வேறுபட்டப் பரிமாணங்களைப்
- 3.புலவர்கள் வாயிலாகவும் திணை இலக்கியத்தின் வாயிலாகவும் அறிதல்.
- 4.பழந்தமிழ் இலக்கியங்களின் உயர்தனித்தன்மை வாய்ந்த சிறப்பியல்புகளை அறிதல்.

**கூறு: 1 எட்டுத்தொகை**

**நேரம்:18**

**குறுந்தொகை**

- 1.குறிஞ்சி : தலைவன் கூற்று-யாயும் ஞாயும் யாராகியரோ - பா.எ.-40
- 2.முல்லை : தலைவி கூற்று-கருங்கால் வேம்பின் ஒண்பூ யாணர் - பா.எ.-24
- 3.மருதம் : தோழி கூற்று-யாய் ஆகியளே விழவு முதலாட்டி - பா.எ.-10
- 4.நெய்தல் : தலைவி கூற்று :நள்ளன் றன்றே யாமம் - பா.எ.-6
- 5.பாலை: செவிலி கூற்று-பறைபடப் பணிலம் - பா.எ.-15

**நற்றிணை**

1. குறிஞ்சி-நின்ற சொல்லர் பா.எ. 1
2. முல்லை:இறையும் அருந்தொழில் -பா.எ.161
3. மருதம்:அறியாமையின் அன்னை - பா.எ.50
4. நெய்தல்:இவளே கானல் நண்ணிய - பா.எ.45
5. பாலை:புணரில் புணராது பொருளே-பா.எ.16

**கலித்தொகை**

1. பாலை: எறித்தரு கதிர் தாங்கி- பா.எ.9
2. குறிஞ்சி : காமர் கடும்புனல்- பா.எ.39

**அகநானூறு**

1. குறிஞ்சி:நீர்நிறம் கரப்ப-பா.எ.18
2. முல்லை: வந்துவினை- பா.எ.44

**கூறு: 2 எட்டுத்தொகை**

**நேரம்:18**

1. ஐங்குறுநூறு : குறிஞ்சி -அன்னாய் வாழிப்பத்து -பா.எ.201-210
2. புறநானூறு : பாடல் எண்கள் - 9,16,20,51,109
3. பதிற்றுப்பத்து:ஆறாம் பத்து-

பா.எ.1 வடுவடு நுண்ணுயிர், பா.எ.2.கொடி நுடங்கு நிலைய

4. பரிபாடல் : ஏழாம்பாடல் - வையை

**கூறு: 3 பத்துப்பாட்டு**

**நேரம்:18**

1. குறிஞ்சிப்பாட்டு: முழுவதும்

கூறு: 4 அறநூல்கள்

நேரம்:18

1. திருக்குறள்: செய்ந்நன்றியறிதல் ,வினைத்திட்டம்,நெஞ்சொடு கிளத்தல்
2. மூதுரை: 1-10 பாடல்கள்
- 3.நல்வழி: 11-20 பாடல்கள்
- 4.நீதிநெறி விளக்கம்: 51-60 பாடல்கள்

கூறு:5

நேரம்:18

அ. செம்மொழித் தமிழ்— இலக்கிய வரலாறு :

செம்மொழி வரலாறு : மொழி விளக்கம்-மொழிக்குடும்பங்கள்-உலகச் செம்மொழிகள் -இந்தியச் செம்மொழிகள் — செம்மொழித் தகுதிகள் - வரையறைகள் - தமிழின் தொன்மை -தமிழ்ச் செம்மொழி நூல்கள்.

ஆ. இலக்கிய வரலாறு: சங்க இலக்கியங்கள் ,பதினெண் கீழ்க்கணக்கு நூல்கள்

பயன்கள்

- 1.பழந்தமிழ் இலக்கியங்களை ஆய்வியல் நோக்கில் அணுகுவதற்கான வழிமுறைகளை உணர்த்துதல்.
- 2.பண்டைத்தமிழரின் அக, புற வாழ்வியலை மாணவர்கள் அறியச் செய்தல்
- 3.அறத்தின் பெருமையை உணர்வர்
- 4.ஒழுக்க நெறிகளைப் பின்பற்றுவர்
- 5.தமிழ் செம்மொழியின் பண்புகளை உணருதல்
- 6.சங்க இலக்கியத்தின் தொன்மை உணர்தல்

Semester	Course Code	Title of The Course	Hours of Teaching/ Week	No. of Credits
<b>IV</b>	<b>20U4MAE4</b>	<b>PART - II English For Competitive Examinations</b>	<b>6</b>	<b>3</b>

**Objective**

- **To prepare the learners for competitive examinations and to teach the fundamentals of practical communication.**

**Unit – I**

**Grammar** – Number, Subject, Verb, Agreement, Articles, Sequence of Tenses, Common Errors

**Unit – II**

**Word Power** - Idioms & Phrases, one-word substitutes, Synonyms, Antonyms, Words we often confuse, foreign words & phrases, spelling.

**Unit – III**

Reading & Reasoning – Comprehension, Jumbled Sentences.

**Unit – IV**

**Writing Skills** – Paragraph, Précis Writing, Expansion of an idea, Report Writing, Essay, Letters, Reviews (Film & Book)

**Unit – V**

**Speaking**- Public speaking, Group Discussion, Interview, Spoken English.

**Course outcomes**

**After the completion of this course students will be able to**

- **develop English language skills by equipping themselves to face competitive exams**
- **improve English language abilities and gain the skills of writing and vocabulary building**
- **gain confidence to face competitive exams**
- **assimilate grammatical rule clearly and precisely**
- **hone their presentation and public speaking skills**

**Prescribed Text:**

*English for Competitive Examinations*, NCBH, Chennai, Dec. 2019.

Semester	Subject Code	Title of the Paper	House of Teaching / Week	No.of Credits
<b>IV</b>	<b>20U4MAC7</b>	<b>ABSTRACT ALGEBRA</b>	<b>4</b>	<b>5</b>

**Objectives:**

- To teach the students to gain the knowledge about Groups, Subgroups, Normal subgroups, Homomorphism and Rings.
- To enrich the students with the knowledge of normal subgroups and quotient groups.
- To explain about ideals, quotient rings and Euclidean rings.

**Unit I**

**18Hrs**

Definition of a group – example, lemma - Sub Groups- counting principle- Normal subgroups and Quotient groups.

**Unit II**

**18Hrs**

Homomorphism- Automorphism

**Unit III**

**18Hrs**

Cayley's Theorem- Permutation group- Another Counting principle- applications.

**Unit IV**

**18Hrs**

**Ring Theory:** Definition and Examples of Rings- Some special classes of Rings- Homomorphisms- ideals and Quotient Rings- More ideals and Quotient Rings- The field of quotients of an integral domain.

**Unit V**

**(Self study)**

**18Hrs**

**Vector Space:** Elementary Basic concepts- Linear independence and Bases, Dual spaces- Inner product spaces.

**Course Outcomes:** After completion of the Course, students will be able to

- understand subgroups, normal subgroups and quotient groups.
- illustrate the homomorphism, automorphism and permutation groups.
- explain the concept of Rings and some special classes of Rings.
- extend their knowledge for further exploration of the subject.
- acquire the knowledge to write Polytechnic TRB/ UG TRB Competitive exams.

**Text Book:**

**“Topic in Algebra”** By I.N.Herstein, Wiley,2014. (Second edition)

Unit I	:	Chapter 2 (2.1 to 2.6)
Unit II	:	Chapter 2 (2.7 to 2.8)
Unit III	:	Chapter 2 (2.9 to 2.11)
Unit IV	:	Chapter 3 (3.1 to 3.6)
Unit V	:	Chapter 4 (4.1 to 4.4)

**General References:**

1. *Modern Algebra* - A.R.Vasistha
2. *Modern Algebra* - Dr. S.Arumugam
3. *A Course in Abstract Algebra* – Vijay K Khanna, S.K. Bhambri

**General Reference Links:**

1. <https://courses.maths.ox.ac.uk/node/43835> [Oxford university]
2. <https://www.u;.matirs.cam.ac.uc./documenst schedulos.pdf>. [Cambridge]



Semester	Subject Code	Title of the Paper	Hours of Teaching /Week	No.of Credits
<b>IV</b>	<b>20U4MAC8</b>	<b>STATICS</b>	<b>5</b>	<b>5</b>

**Objectives:**

- To enable the students to gain the knowledge about Forces and Equilibrium of Strings.
- To explain about moments, couples and resultants.
- To enrich the knowledge of Friction and their laws.

**Unit I**

**15 Hrs**

Forces acting at a point: Definitions:- Resultant and Components- Parallelogram of forces- Analytic expression for the resultant of the forces acting at a point- Triangle of forces- Perpendicular Triangle of forces- Converse- The polygon of forces- Lami's theorem.

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**Unit II**

**15 Hrs**

Parallel forces and Moments:- Resultant of two like parallel forces- Resultant of two unlike and unequal parallel forces- Resultant of number of parallel forces- conditions of equilibrium of three coplanar forces- Moment of a force- Varignon's theorem of moment- principle of moments. – Moment of a force about an axis.

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**Unit III**

**15 Hrs**

Couples:- Definition- Equilibrium of two couples- Equivalence of two couples- couples in parallel planes- Resultant of Coplanar forces- Resultant of a couple and a force and related theorems.

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**Unit IV**

**15 Hrs**

Friction:- Definition- Laws of frictions- co-efficient of friction- Angle of friction- Cone of friction- Equilibrium of a particle on a rough inclined plane- Equilibrium of a body on a rough inclined plane under a force parallel to the plane- Equilibrium of a body on a rough inclined plane under any force.

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**Unit V**

**15 Hrs**

Equilibrium of Strings: Equation of a common catenary- important formulae- Geometrical properties of common catenary- Approximations to the shape of catenary- the parabolic catenary- suspension bridges.

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**Course Outcomes:** After completion of the course, students will be able to

- analytically represent the coplanar forces and reduce a system of forces to a single force.
- define Friction, its coefficient, Angle of Friction and Cone of Friction.
- gain knowledge about Forces and Equilibrium of Strings.
- construct free-body diagrams and to calculate the reactions necessary to ensure static equilibrium.
- acquire the knowledge to write TNPSC Statistical and UG TRB exams.

**Text Book:**

*“Statics”, Dr. M.K. Venkatraman: Agasthiar Publication, Trichy.2014.*

Unit I	:	Chapter 2 (Sec 1 to Sec 9)
Unit II	:	Chapter 3 (Sec 1 to Sec 14)
Unit III	:	Chapter 4
Unit IV	:	Chapter 7 (Sec 1 to Sec 8, Sec 10 to Sec 12)
Unit V	:	Chapter 11

**General References Links:**

1. [https://catalog.metu.edu.tr/course.php?course\\_code=5690205](https://catalog.metu.edu.tr/course.php?course_code=5690205)  
[Middle East Technical University]
2. <https://www.adelaide.edu.au/course-outlines/109875/1/sem-1/>  
[University of Adelaide, Australia]

Semester	Subject Code	Title of the Paper	House of Teaching / Week	No. of Credits
<b>IV</b>	<b>20U4MAMSA2</b>	<b>Allied- MATHEMATICAL STATISTICS- II</b>	<b>5</b>	<b>4</b>

**Objectives:**

- To enable the students to get the basic knowledge of Sampling and test of significance.
- To explain the nature of data with the help of various statistical tools.
- To teach the concepts of  $\chi^2$  t, F - distributions and its applications.

**Unit I**

**15 Hrs**

**Large sampling theory:** Types of sampling- test of significance- null hypothesis- error in sampling- Critical regions and level of significance- test of significance for large-samples- sampling of attributes.

**Unit II**

**15 Hrs**

**$\chi^2$  Distribution:**  $\chi^2$ - variates- derivation of the  $\chi^2$  distribution (Method of M.G.F only)- M.G.F, C.G.F- mode and skewness - additive property -  $\chi^2$  probability curve - Theorems on  $\chi^2$  distribution - Application of  $\chi^2$ - distribution: Inference about a population variance – goodness of fit test.

**Unit III**

**15 Hrs**

**Student's t-distribution:** Derivation of t-distribution - constants of t-distribution- limiting of t-distribution- application of t-distribution - test of single mean, difference of mean.

**Unit IV**

**15 Hrs**

**F-distribution:** Derivation of F-distribution- constant of F-distribution- mode of F-distribution- application of F-distribution - test for equality of two population variance (only simple problems of F- distribution). – Relation between t and F and relation between F and  $\chi^2$  tests.

**Unit V**

**15 Hrs**

**Analysis of variance:** Introduction - one way, two way classifications - Experimental designs: Randomized block design - Latin squares

**Course Outcomes:** After completion of the course, students will be able to

- acquire the knowledge of continuous random variables and testing hypothesis
- demonstrate the use of Chi-square distribution.
- understand the nature of data with the help of various statistical tools
- analyze the concepts of sampling techniques and procedure for testing of hypothesis for large samples
- acquire the knowledge to write TNPSC Statistical and UG/PG TRB exams.

**Text Books:**

1. *Fundamentals of mathematical statistics*, S.C Gupta, V. K. Kapoor (11<sup>th</sup> edition) - Sultan Chand & Sons 2002.  
Unit I : Chapter: 14 (Sec. 14.1 – 14.7.2)  
Unit II : Chapter: 15 (Sec. 15.1- 15.4, 15.6(15.6.1-15.6.2))  
Unit III : Chapter: 16 (16.2, 16.3(16.3.1, 16.3.2))  
Unit IV : Chapter: 16(16.5- 16.8)
2. *‘Statistical Methods’ Vol. II*, Dr. S.P. Gupta, Sultan Chand & Sons 2008.  
Unit V : Chapter: 5, 6

**General Reference:**

Dr. P.R. Vittal “Mathematical Statistics” Margham Publications Chennai.

**General Reference Links:**

1. <https://acadinfo.wustl.edu/CourseListings/CourseInfo.aspx?sem=FL2020&sch=L&dept=L24&crs=494> [Washington University]  
<https://www.maths.cam.ac.uk/undergrad/files/coursesIB.pdf> [Cambridge]

Semester	Subject Code	Title of the Paper	Horse of Teaching / Week	No.of Credits
<b>III &amp; IV</b>	<b>20U4MAMSAPL</b>	<b>Allied – Mathematical Statistics Practical (NS)</b>	<b>3 + 3</b>	<b>2</b>

**Objectives:**

- To teach the simple, ideal, statistical and communication models.
- To explain the development of codes for transmission and detection of information.
- To impart more professional statistical software programs.

1. Measures of Central Tendency & Measures of dispersion.
2. Moments, Skewness and kurtosis
3. Fitting of Binomial distribution
4. Fitting of Poisson distribution
5. Fitting of Normal distribution
6. Correlation and Regression
7. Goodness of fit
8. Large sample tests
9. T- test
10. Variance tests confidence intervals

**Course Outcomes:**

After completion of the course, students will be able to

- respond appropriately for the issues that may arise when analyzing real data sets and communicating results.
- develop novice-level statistical thinking particularly with respect to linking appropriate inferences to study the design.
- demonstrate the ability to select and use the statistical models like normal distribution, t-distribution, binomial distribution, etc.

Semester	Subject Code	Title of the Paper	Hours of Teaching /Week	No.of Credits
<b>IV</b>	<b>20U4MAS2</b>	<b>Skill Based Education-II Arithmetic Ability</b>	<b>1</b>	<b>1</b>

**Objectives:**

- To enrich the problem-solving skills
- To teach mathematical ideas for real-world problems.
- To inculcate the habit of self-learning.

**Unit I**

**15 Hrs**

H.C.F and L.C.M of numbers, Simplifications

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**Unit II**

**15 Hrs**

Average, Problems on Ages and Percentage

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**Course Outcomes:**

After completion of the course, students will be able to

- recognise, describe and represent numbers and their relationships.
- estimate, calculate with competence and confidence in solving problems.
- acquire the knowledge to write competitive exams.

**Text Book:**

*Quantitative Aptitude - R.S. Aggarawal, S. Chand and company Ltd. New Delhi- 55*

Unit I : Chapter 2(Page 30-36) and Chapter 4 (Page 67 to 75)

Unit II : Chapters 6 (Page 139 to 155),  
Chapter 8 (Page 182 to 189), Chapters 10 (Page 208 to 217)

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
<b>V</b>	<b>20U5MAC9</b>	<b>DYNAMICS</b>	<b>5</b>	<b>5</b>

**Objectives:**

- To teach the methods of plane dynamics, motion of a particle and system of particles and their properties .
- To explain about projectiles with and without resistance, Motion under central force, planetary orbits and their properties .
- To explore the concept of impulse, impulsive forces and the collision of elastic bodies.

**Unit I**

**15 Hrs**

**Projectiles:** The path of projectiles characteristics of the motion- range- the velocity- direction of the projectiles- Given the magnitude of the velocity of projection there are two directions of projection for the particle so as to reach a given Range on an inclined plane.

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**Unit II**

**15 Hrs**

**Collision of Elastic bodies:** Definitions- Fundamental laws of impact- impact of a smooth sphere on fixed smooth plane- Direct impact of two smooth spheres- Loss of K.E. due to direct impact of smooth spheres-Dissipation of energy due to impact.

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**Unit III**

**15 Hrs**

**Simple Harmonic Motion (SHM):** SHM in straight line- General solution of SHM equation- Geometrical representation of a SHM- Composition of two SHMS of the same period and in the same straight line- composition of two SHM's of the same period in two perpendicular directions- motion of a particle suspended by a spiral spring.

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**Unit IV**

**15 Hrs**

**Motion under the action of central forces:** Velocity and acceleration in polar Coordinates. Differential equation of Central orbits- Perpendicular from the pole in the tangent- Formulae in polar coordinates- Pedal equation of the central orbits- velocities in a central orbit- Given the law of force to the pole find the orbit.

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**Unit V**

**15 Hrs**

**Moment of Inertia and motion of a rigid body about a fixed axis:** Definitions- Theorem of parallel axes- theorem of perpendicular axes- M.I in some particular cases- motion of a rigid body about a fixed axis- Introduction- K.E of a rigid body rotating about a fixed axis- Angular momentum of a rigid body about the axis of rotation- motion of a rigid body about a axis of rotation.

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**Course Outcomes:** After completion of the course, students will be able to

- remember the notions of Simple harmonic motion and seconds pendulum
- understand the concept of projectiles and its properties by solving some simple problems related to it.
- know the knowledge of Moment of Inertia and motion of a rigid body about a fixed axis.
- solve the simple problems regarding impulsive forces and the collision of elastic bodies.
- acquire the knowledge to write TNPSC Statistical and UG TRB exams.

***Text Book***

Dynamics, **Dr. M. K. Venkatraman, Agasthiar Publication, Trichy, 2014**  
(Twelfth Edition)

Unit I : Chapter 6 (Sec 6.1 to 6.15)

Unit II : Chapter 8 (Sec 8.1 to 8.9)

Unit III : Chapter 1 (Sec 10.1 to 10.9)

Unit IV : Chapter 11 (Sec 11.1 to 11.13)

Unit V : Chapter 12 (Sec 12.1 to 12.4), Chapter 13 (Sec.13.1 to 13.5)

**General References:**

Dynamics - Dr. K.ViswanathNaik and Dr. M.S.Kasi.

**General References Links:**

1. <https://courses.maths.ox.ac.uk/node/43927> [Oxford University]
2. <https://www.maths.cam.ac.uk/undergrad/files/coursesIA.pdf> [Cambridge]



Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
<b>V</b>	<b>20U5MAC10</b>	<b>REAL ANALYSIS</b>	<b>5</b>	<b>5</b>

**Objective:**

- To enrich the knowledge of some basic properties of the field of real numbers
- To teach about the sequences and convergence of sequences, series of real numbers and its convergence.
- To introduce the concept of open set, closed set, neighbourhood, etc.

**Unit I**

**18Hrs**

**Real Numbers:** Introduction – The Field axioms – Field Properties – Order in  $\mathbb{R}$  – Absolute value – Completeness – Some important subsets of  $\mathbb{R}$  – Representation of real numbers as a points on a straight line – Intervals – Countable and Uncountable sets.

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**Unit II**

**18Hrs**

**Neighbourhoods and Limit points:** Introduction – Neighbourhoods – Open sets – Closed sets – Limit points of a set – Closure of a set – Interior of a set – Compactness – Connectedness.

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**Unit III**

**18Hrs**

**Limits and Continuity:** Limits – Continuous functions – Types of discontinuities – Algebra of continuous functions – boundedness of continuous functions – Intermediate value theorem – Inverse function theorem – Uniform continuity.

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**Unit IV**

**18Hrs**

**Derivatives:** Introduction – Derivability and continuity – Algebra of derivatives – Inverse function theorem for derivatives – Darboux's theorem.

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**Unit V**

**(Self Study)**

**18Hrs**

**Mean value theorems:** Rolle's theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's theorem – Taylor's series – Power series expansions of some standard functions.

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**Course Outcomes:** After completion of the course, students will be able to

- identify the relation between completeness and compactness of sets in metric space.
- understand the countable, uncountable, open, closed and compact sets.
- handle fundamental properties of the real numbers that lead to the formal development of real analysis
- understand limits and their use in sequences, series, differentiation and integration.
- abstract ideas and rigorous methods in mathematical analysis which can be applied in practical problems.

***Text Book***

“A First course in REAL ANALYSIS”, M.K.Singal and Asha Rani Singal, R. Chand & Co, 2014.

Unit I	:	Chapter 1
Unit II	:	Chapter 2
Unit III	:	Chapter 5
Unit IV	:	Chapter 6 (Sec 1 to 5)
Unit V	:	Chapter 7 (Sec 1 to 6)

**General References**

1. Real Analysis - Albert smith E.E.
2. Real Analysis - Walter Rudin.

**General Reference Links:**

1. <https://courses.maths.ox.ac.uk/node/9> [Oxford]
2. <https://math.duke.edu/introduction-real-analysis> [ Duke ]

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
<b>V</b>	<b>20U5MAC11</b>	<b>NUMBER THEORY</b>	<b>5</b>	<b>5</b>

**Objectives:**

- To teach the basic concept of divisibility, prime numbers and their primitive roots.
- To introduce the Mobius function, Mangoldt function and Liouville's function. To explain congruences and residue systems.

**Unit I**

**12 Hrs**

The Fundamental Theorem of Arithmetic: Introduction- Divisibility- Greatest Common divisor- Prime numbers- The fundamental theorem of arithmetic- The series of reciprocals of the primes- The Euclidean algorithm- The greatest Common divisor of more than two numbers.

**Unit II**

**12 Hrs**

Arithmetical Functions and Dirichlet multiplication: - The Möbius function  $\mu(n)$ - The Euler totient function- A relation connecting  $\phi$  and  $\mu$  - A product formula for  $\mu(n)$ - the Dirichlet product of arithmetical functions- Dirichlet inverses and the Möbius inversion formula.

**Unit III**

**12 Hrs**

The Mangoldt function  $\Lambda(n)$  - multiplicative functions- Multiplicative function and Dirichlet multiplication- The inverse of a completely multiplicative function- Liouville's function  $A(n)$  - the divisor functions  $\sigma_\alpha(n)$ - Generalized convolutions- formal power series.

**Unit IV**

**12 Hrs**

Averages of Arithmetical Functions: - The big oh notation Asymptotic equality of functions- Euler's summation formula- some elementary asymptotic formulas- the average order of  $d(n)$

**Unit V**

**12 Hrs**

Congruences: Definition and basic properties of congruence's- Residue classes complete residue systems- Linear congruence's – solved problems and examples.

**Course Outcomes:** After completion of the course, students will be able to

- know the basic definitions and theorems in number theory.
- find the primitive roots, Möbius values and Euler totient values
- interpret the concepts of divisibility, prime number, congruence and number theorems.
- understand the logic and methods behind the major proofs in Number Theory.
- extend their knowledge to pursue research in this field.

**Text Book:**

*Analytic Number Theory by Tom.M.Apostol.*

Unit I	Chapter 1 (1.1 - 1.8)
Unit II	Chapter 2 (2.1 - 2.7)
Unit III	Chapter 3 (2.8 – 2.15)
Unit IV	Chapter 5 (3.1- 3.5)
Unit V	Chapter 9 (5.1- 5.3)

**General References:**

1. *Number Theory* - George E.Andrews
2. *Introduction to theory of Number* - G.H.Hardy and E.M.Wright.
3. *Basic Number Theory* - S.B.Malilk
4. *Elements of Number Theory* - S.Kumaravelu and SusheelaKumaravelu.

**General Reference Links:**

1. <https://courses.maths.ox.ac.uk/node/44147> [Oxford University]
2. <https://courses.maths.ox.ac.uk/node/42547>[Oxford University]
3. <https://explorecourses.stanford.edu/search?q=MATH152> [Stanford]

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
<b>V</b>	<b>20U5MAC12</b>	<b>DISCRETE MATHEMATICS</b>	<b>4</b>	<b>5</b>

**Objectives:**

- To teach the recurrence relation, homogeneous and non homogeneous relations.
- To introduce the logical Concepts to students.
- To explain the concept of lattice, Boolean algebra and generating functions.

**Unit I**

**15 Hrs**

Recurrence relations and generating function: Recurrence-an introduction-polynomials and their evaluations- Recurrence relations- solution of finite order Homogeneous (linear) Relations- Solution of Non-Homogeneous relations.

**Unit II**

**15 Hrs**

Logic: TF- statements - connectives- atomic and compound statements-well formed (statements) Formulae – parsing trees.

**Unit III**

**15 Hrs**

Logic: Truth table of a formula- Tautology- Tautological Implications and Equivalence of Formulae. Replacement process- Functionally Complete sets of connectives and Duality law.

**Unit IV**

**15 Hrs**

Lattices and Boolean Algebras: Lattices- some properties of lattices- New lattices- Modular and distributive lattices.

**Unit V**

**15 Hrs**

Automata and Languages: Finite Automata – definition of finite automation – Representation of finite automation - Acceptability of a string by a finite automation - Languages accepted by a finite automation - Non-deterministic finite automata.

**Course Outcomes:** After completion of the course, students will be able to

- understand lattices and their applications in the field of engineering and computer science.
- explain logically valid forms of arguments to avoid logical errors by studying mathematical logic.
- know the concept of Automata and Languages .
- acquire the knowledge in Mathematical reasoning, combinatorial analysis, discrete structures and Applications.
- extend their knowledge to pursue research in this field.

**Text Book:**

**“Discrete Mathematics”** by Dr. M.K.Venkatraman Dr.N.Sridharan,  
N.Chandrasekeran, the National Publishing Company, 2003.

Unit I	:	Chapter: 5	Sec 1-5 (Pages: 5.01- 5.19)
Unit II	:	Chapter: 9	Sec 1- 5 (Pages: 9.1- 9.20)
Unit III	:	Chapter: 9	Sec 6- 10 (Pages: 9.21- 9.42)
Unit IV	:	Chapter: 10	Sec 1- 4 (Pages: 10.1- 10.32)
Unit V	:	Chapter: 12	Sec 1 –7 (Pages: 12.1- 12.16)

**General References:**

Koleman and Bushy- Discrete mathematical structures, prentice Hall of India, New Delhi- 2002

**General Reference Links:**

1. <https://www.cst.cam.ac.uk/teaching/2021/DiscMath>  
[University of Cambridge]
2. <https://explorecourses.stanford.edu/search?q=CS157>  
[Stanford]

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
<b>V</b>	<b>20U5MAEL1A</b>	<b>Major Elective - I NUMERICAL METHODS</b>	<b>4</b>	<b>3</b>

**Objective:**

- To introduce popular numerical methods to students.
- To introduce Numerical differentiation, integration and solution of Ordinary differential equations.
- To explain about solving the linear system of equations numerically.

**Unit I**

**12 Hrs**

The solution of numerical algebraic and Transcendental Equations. The Bisection Method- iteration method- Order of convergence- Regula False method- Newton Raphson Method- order of convergence.

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**Unit II**

**12 Hrs**

Solution of simultaneous linear algebraic equation. Gauss elimination method- Gauss Jordan method- inversion of a matrix using Gauss elimination method- Gauss Jacobi method- Gauss- Seidel method.

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**Unit III**

**12 Hrs**

Interpolation - Gregory Newton forward interpolation formula - Backward interpolation formula- Gauss forward interpolation formula - Backward interpolation formula - Lagrange's interpolation formula - different forms of Lagrange's interpolation formula.

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**Unit IV**

**12 Hrs**

Numerical Differentiation and integration- Newton's forward and backward difference method to compute derivatives- the trapezoidal- Ramberg's method- Simpson's one third rule- Simpson's 3/8 rule- weddle's rule.

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**Unit V**

**(Self study)**

**12 Hrs**

Numerical Solution of ordinary Differential Equations-Power series approximation- solution by Taylor's series- Picard's method of successive approximations- Euler method- modified Euler method- Runge- Kutta method- orders 2 and 4.

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**Course Outcomes:** After completion of the course, students will be able to

- solve algebraic and transcendental equations.
- find the solution of system of linear Algebraic Equations.
- identify the problems in Interpolation with equal and unequal intervals and solve it.
- find and solve problems using Newton's difference formulae.
- acquire the knowledge to write TNPSC Statistical, UG TRB, Polytechnic TRB exams.

**Text Book:**

*“Numerical methods” (2001), P.Kandasamy, K.Thilagavathy K.Gunavathy, S.Chand & Company Ltd., New Delhi.*

- Unit I : Chapter: 3 (3.1.1 to 3.4.3), Pages: 69 - 96  
Unit II : Chapter: 4 (4.1- 4.3 and 4.7 - 4.9), Pages: 112-126, 145-158  
Unit III: Chapter: 6 (6.1-6.6), Pages: 209 – 225,  
Chapter: 7 (7.1-7.4), Pages: 231 – 240,  
Chapter: 8 (8.7 only), Pages: 271 - 276.  
Unit IV: Chapter: 9 (9.1- 9.3, 9.6- 9.15), Pages: 281 - 317  
Unit V : Chapter: 11 (11.1- 11.15), Pages: 348 - 393

**General References:**

1. S.Sastri - Introduction methods of Numerical Analysis
2. M.K.Ventataraman - Numerical methods in science and Engineering- 3<sup>rd</sup> Editor.
3. A.Singaravelu - Numerical methods.

**General Reference Links:**

1. <https://explorecourses.stanford.edu/search?q=CME206> [Stanford University]
2. <https://courses.maths.ox.ac.uk/node/44065> [Oxford]



Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No.of Credits
<b>V</b>	<b>20U5MAEL1B</b>	<b>Major Elective – I SPECIAL FUNCTIONS</b>	<b>4</b>	<b>3</b>

**Objectives:**

- To impart the properties of special functions by their integral representations and symmetries.
- To explain the properties of Bessel Equations which may be solved by application of special functions.
- To teach the Legendre equations and Legendre Polynomials.

**Unit I**

**12 Hrs**

**IMPROPER INTEGRALS AND SERIES SOLUTIONS** - Improper integrals- Gamma and Beta functions, Series solutions-Ordinary point, regular singular point of second order linear ordinary differential equation, series solution to a second order linear ordinary differential equation about an ordinary point and a regular singular point.

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**Unit II**

**12 Hrs**

**BESSEL FUNCTIONS** - Bessel's equation, Bessel functions, Recurrence relations, Orthogonality property, Generating function, Equations reducible to Bessel's equation, Modified Bessel functions.

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**Unit III**

**12 Hrs**

**LEGENDRE POLYNOMIALS** - Legendre's equation, Legendre Polynomials, Rodrigue's formula generating function, recurrence relations, orthogonality property.

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**Unit IV**

**12 Hrs**

**HERMITE AND LAGUERRE POLYNOMIALS** - Hermite and Leguerre equations and their solutions-Polynomials, Rodrigue's formula, generating functions, recurrence relations, orthogonality property.

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**Unit V**

**(Self Study)**

**12 Hrs**

**BOUNDARY VALUE PROBLEMS** - Solution of Boundary Value Problems involving Bessel functions & Legendre polynomials

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**Course Outcomes:** After completion of the course, students will be able to

- understand integral calculus and special functions of various engineering problems.
- know the application of some basic mathematical methods via all these special functions.
- understand the properties of Legendre Polynomial which may be solved by application of special functions.
- solve the boundary value problems involving Bessel functions.
- acquire the knowledge to write TNPSC Statistical, UG TRB, Polytechnic TRB exams.

**Text Book:**

**“Higher Mathematics for Engineering and Sciences”**, Venkatraman. M. K., The National Publishing Company, Fourth Edition, 2006.

**Reference Books:**

1. Andrews.L.A., “Special Function for Scientist and Engineers”, McGraw-Hill, 1992.
2. Narayanan, S. ManicavachagamPillay and Ramanaiah.G, “Advanced Mathematics for Engineering Students”, Vol. II S.Viswanathan Printers Private Limited, Madras, 1985
3. Grewal, B.S., “Higher Engineering Mathematics”, Khanna Publishers, Delhi, 2005.  
Jain R.K &Iyengar, S.R.K. “Advanced Engineering Mathematics”, Narosa Publishing House, New Delhi, 2002.

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No. of Credits
<b>V</b>	<b>20U5MAEL2A</b>	<b>Major Elective - II GRAPH THEORY</b>	<b>4</b>	<b>3</b>

**Objectives:**

- To explain the applications of graph Theory in other disciplines.
- To teach the basic concepts of Graphs, sub-graphs, degree, connectivity, walks, trials and paths.
- To enrich the knowledge of Matchings, Planarity and colourability.

**Unit I**

**12 Hrs**

**Graphs and Subgraphs:** Introduction, definition – Degrees, subgraphs, Isomorphism, Ramsey numbers – Independent sets and coverings – Intersection graphs and line graphs – matrices and operations on graphs

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**Unit II**

**12 Hrs**

**Degree sequences and connectedness:** Degree sequences and graphic sequences – Walks, trials and paths – connectedness and components – Blocks and connectivity

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**Unit III**

**12 Hrs**

**Eulerian and Hamiltonian Graphs, Trees:** Eulerian and Hamiltonian Graphs – Trees – characterization of trees – centre of a tree

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**Unit IV**

**12 Hrs**

**Matchings and Planarity:** Matchings – Matchings in Bipartite graphs – Planarity – Definition – characterization of planar graphs – Thickness, crossing and outer planarity

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**Unit V**

**(Self Study)**

**12 Hrs**

**Colourability:** chromatic number- Chromatic index – Five colour theorem – Four colour problem – Chromatic Polynomials.

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**Course Outcomes:** After completion of the course, students will be able to

- acquire the knowledge of basic concepts in graph theory.
- Recognize the special graphs like Eulerian graphs and Hamiltonian graphs.
- apply the principles and concepts of graph theory in practical situations.
- know the concept of matchings in Graphs and their applications in day to day life problems
- analyze the concepts of Planar graphs.

**Text Book:***An invitation to Graph theory - Dr. S. Arumugam & S. Ramachandran, SCITECH publications (India) Pvt. Ltd., Chennai, 2006.*

Unit I	:	Chapter 2
Unit II	:	Chapter 3 and 4
Unit III	:	Chapter 5 and 6
Unit IV	:	Chapter 7 and 8
Unit V	:	Chapter 9

**General References:**

1. Graphs Theory with Applications to Engineering and computer science - NarsinghDeo, Printice- Hall of India Private Ltd, 2014.
2. Graph Theory- F.Harary, Narosa.
3. Graph Theory – Dr.S.A. Choudam, Macmillan.

**General Reference Links:**

1. <https://utsc.calendar.utoronto.ca/course/matc32h3> [University of Toronto]  
<https://explorecourses.stanford.edu/search?q=MATH107> [Stanford]

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
<b>V</b>	<b>20U5MAEL2B</b>	<b>Major Elective – II Mathematical Modeling</b>	<b>4</b>	<b>3</b>

**Objectives:**

- To introduce the basic concepts of Mathematical Modelling.
- To make the students familiarize the mathematical concepts and skills presented in the context of real-world applications.
- To teach suitable methods to adopt the problem using several mathematical concepts.

**Unit I**

**12 Hrs**

Simple situation requiring Mathematical modeling and technique-Classification of mathematical models-some characteristics of mathematical models-Modelling through Geometry-Modelling through Algebra-Modelling through Trigonometry-Modelling through Calculus-Limitations of Mathematical modeling.

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**Unit II**

**12 Hrs**

Mathematical Modelling through differential Equations-Linear Growth and Decay Models-Non-Linear Growth and Decay models-Compartment models-Modelling in Dynamics through Ordinary differential equations of first order- Mathematical modeling of Geometrical problems through ordinary differential equations of first order.

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**Unit III**

**12 Hrs**

Mathematical Modelling in Population Dynamics-Modelling of Epidemics through systems of Ordinary differential equations of first order-Compartment models through systems of ordinary differential equations-Modelling in Economics through systems of ordinary differential equations of first order.

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**Unit IV**

**12 Hrs**

Mathematical models in Medicine, Arms Race, Battles and International Trade in terms of systems of ordinary differential equations-Modelling in Dynamics through systems of Ordinary Differential equations of first order.

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**Unit V**

**(Self Study)**

**12 Hrs**

Mathematical modeling of Planetary motions – Modelling of Circular motion and motion of Satellites.

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**Course Outcomes:** After completion of the course, students will be able to

- learn the applications of mathematics in real life problems.
- create mathematical models of empirical or theoretical phenomena in domains such as the physical, natural, or social science;
- create variables and other abstractions to solve the mathematical problems in conjunction with previously-learned fundamental mathematical skills
- draw inferences from models using mathematical techniques including problem solving, quantitative reasoning, and exploration.
- take an analytical approach to problems in their future endeavors.

***Text Book:***

***‘Mathematical Modelling’ by J.N.Kapur***

Unit I	:	Chapter 1.1-1.9
Unit II	:	Chapter 2.1-2.6
Unit III	:	Chapter 3.1-3.4
Unit IV	:	Chapter 3.5-3.6
Unit V	:	Chapter 4.1-4.2

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No.of Credits
<b>V</b>	<b>20U5MANME</b>	<b>Non – Major Elective – Mathematics for Finance</b>	<b>2</b>	<b>1</b>

**Objective:**

- To enable other department students to know some basic ideas on algebra.
- To enrich the knowledge of simple interest and compound interest.

**Unit I**

**15 Hrs**

Arithmetic progression and geometric progression - Determinants - Cramer's rule.

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**Unit II**

**15 Hrs**

Simple interest- Compound interest and Depreciation- present value- Discounting- Annuity.

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**Course Outcomes:** After completion of the course, students will be able to

- acquire the problem-solving skills.
- calculate simple interest and compound interest.
- acquire the knowledge to write competitive exams.

**Text Book:**

**Business Mathematics and Statistics**, P. Navaneetham, Jai Publication, June-2010

Unit I : Chapter 1, Part I (Pages: 1 – 33)

Chapter 4, Part I (Pages: 147 – 175)

Unit II : Chapter 2 Part II (Pages: 43 – 74)

**General Reference:**

*Business Mathematics: D.C. Sanchetic, V.K. Kapoor Sultan Chand & Sons, New Delhi..*

Semester	Course Code	Title of The Course	Hours of Teaching/ Week	No. of Credits
<b>V</b>	<b>20U5MALSD</b>	<b>LIFE SKILLS DEVELOPMENT Employability Skill</b>	<b>1</b>	<b>-</b>

**Course objectives**

- To enhance one's ability to be fully self aware by helping oneself to overcome all fears and insecurities and to grow fully from inside out and outside in.
- To increase one's knowledge and awareness of emotional competency and emotional intelligence at place of study/work.
- To provide opportunity for releasing one's potential through practical experience.
- To develop interpersonal skills and adopt good leadership behaviour for empowerment of self and others.
- To set appropriate goals, manage stress and time efficiently.
- To manage competency- mix at all levels for achieving excellence with ethics.

**Unit – I**

**(30 hrs)**

**Communication and Professional skills**

1. Writing and different modes of writing.
2. Digital Literacy.
3. Effective use of social media.
4. Non verbal communication.
5. Resume skills.
6. Presentation skills.
7. Listening as a Team skill.
8. Brainstorming.
9. Social and cultural Etiquettes.
10. Internal communication.

**Unit – II**

**(30 hrs)**

**Leadership, management and Universal Human Value**

1. Leadership skills.
2. Managerial skills.
3. Entrepreneurial skills.
4. Innovative Leadership and Design thinking.
5. SWOT (Strengths, Weaknesses, Opportunities and Threats Analysis)
6. EQ (Emotional Quotient)
7. Love and Compassion.
8. Truth.
9. Non Violence.
10. Righteousness.
11. Ethic and Integrity.

**Course outcomes**

At the end of the programme learners will be able to:

- Gain Self Competency and Confidence.
- Practice Emotional Competency.
- Gain Intellectual Competency.
- Gain an edge through Professional Competency.
- Aim for high sense of Social Competency.
- Be an integral Human Being.



**References:**

1. Bailey, Stephen, Academic Writing : A handbook for International Students, 2010 Rourlege.
2. Shlpa Sablok Bhardwaj (2018). Computer Applications for Class 9 MS Office Blueprint Education (Contributor).
3. [http:// WWW.lyfemarketing.com / blog / how-digital – marketing – works/](http://WWW.lyfemarketing.com/blog/how-digital-marketing-works/)
4. [http:// WWW.thoughtco.com/what-is-nnverbasl - communication - 1691351](http://WWW.thoughtco.com/what-is-nnverbasl-communication-1691351)
5. [http:// WWW.wikihow.com/Write-a-Neat-Resume](http://WWW.wikihow.com/Write-a-Neat-Resume)
6. [http:// WWW.gildabonanno.com/presentation-skill-coaching-videos](http://WWW.gildabonanno.com/presentation-skill-coaching-videos)
7. [http:// blog.vantagecircle.com/active-listening/](http://blog.vantagecircle.com/active-listening/)
8. Osborn, A.F. (1963) Applied imagination: Principles and procedures of creative problem solving (Third Revised Edition). New York, NY: Charles Scribner's Sons.
9. [http:// WWW.thespruce.com/what - is - etiquette – and – why – is- it- important – 1216650](http://WWW.thespruce.com/what-is-etiquette-and-why-is-it-important-1216650)
10. [http:// WWW.talkfreely.com/blog/internal-and-eternal-communication](http://WWW.talkfreely.com/blog/internal-and-eternal-communication)

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
<b>VI</b>	<b>20U6MAC13</b>	<b>Complex Analysis</b>	<b>5</b>	<b>5</b>

**Objective:**

- To explain the nature of complex number system.
- To explain the properties of function defined on the complex systems.
- To impart the famous theorems on complex theory.

**Unit I**

**18Hrs**

**Complex numbers:** Complex numbers – Functions of a complex variable – Limits – Theorems on limit – Continuous functions – Differentiability – The Cauchy Riemann equations – Analytic functions – Harmonic functions(Except Milne-Thompson method).

**Unit II**

**18Hrs**

**Bilinear transformation:** Introduction – Elementary transformations – Bilinear transformation – cross ratio – fixed points of bilinear transformation – some special bilinear transformations.

**Unit III**

**18Hrs**

**Complex integration:** Introduction – definite integral – Cauchy's Theorem – Cauchy's integral formula – Maximum modulus theorem – Higher derivatives – Cauchy's inequality – Liouville's theorem – Fundamental theorem of algebra – Morera's theorem.

**Unit IV**

**18Hrs**

**Series Expansions:** Introduction – Taylor's series – Laurent's series – Zeros of an analytic function – singularities and poles – Riemann's theorem – meromorphic function.

**Unit V**

**(Self Study)**

**18Hrs**

**Calculus of residues:** Residues – Cauchy's Residue theorem – Argument theorem – Rouché's theorem – Evaluation of definite integral – Contour integration types.

**Course Outcomes:** After completion of the course, students will be able to

- understand the techniques of complex analysis effectively to establish mathematical results.
- investigate a function for its analyticity.
- examine the relationship between conformal mapping and analytic functions
- compute contour integrals directly and by the fundamental theorem.
- acquire knowledge to write TNPSC Statistical, UG TRB, Polytechnic TRB exams.

**Text Book:**

**“Complex Analysis”** by S.Arumugam, A. Thangapandi Isaac, A. Somasundaram, Scitech Publications, 2014.

Unit I	:	Chapter 1 (Sec: 1.1), Pages: 1 – 2
		Chapter 2 (Sec: 2.1 – 2.8), Pages: 24 – 52
Unit II	:	Chapter 3 (Sec: 3.1 – 3.5), Pages: 74 – 100
Unit III	:	Chapter 6 (Sec: 6.1 – 6.4), Pages: 132 – 170
Unit IV	:	Chapter 7 (Sec: 7.1 – 7.4), Pages: 173 – 207
Unit V	:	Chapter 8 (Sec: 8.1 – 8.3), Pages: 209 – 254

**General References:**

1. “Foundations of complex Analysis” by S.Ponnusamy- Narosa Publishing House- New Delhi Chennai.
2. “Functions of a complex variables with applications” by E.G. Phillis (1968)- Oliver & Boy D, Edinburg.

**General Reference Links:**

1. <https://courses.maths.ox.ac.uk/node/9> [Oxford]  
<https://services.math.duke.edu/~ng/math633s14/syllabus.pdf> [Duke]

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
<b>VI</b>	<b>20U6MAC14</b>	<b>OPERATIONS RESEARCH</b>	<b>4</b>	<b>5</b>

**Objectives:**

- To teach the various methods of solving Linear Programming Problems, Transportation Problems, Assignment Problems and their applications.
- To learn Network Scheduling.
- To familiarize the theory of games.

**Unit I**

**15 Hrs**

Operations Research- An overview: Nature and characteristic Features of OR- Models in OR- OR and Decision Making- Applications and Limitations of OR- Linear Programming Problem: Formulation and Graphical methods.

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**Unit II**

**15 Hrs**

Simplex Method – Big M method - Two phase- Simplex Method-Duality in Linear Programming: Formulation of Primal Dual Pairs – Mathematical formulation of duality - problems.

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**Unit III**

**15 Hrs**

Dual Simplex Method - Network Scheduling by PERT/ CPM: Critical path Method and PERT calculations.

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**Unit IV**

**15 Hrs**

Transportation Problem and Assignment Problem.

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**Unit V**

**(Self Study)**

Game Theory: Optimal solution of two person zero- sum games- games with mixed strategies - The graphical method- Dominance property- general solution of (mxn) rectangular games (LPP only)

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**Course Outcomes:** After completion of the course, students will be able to

- understand the various techniques to solve Linear Programming Problems.
- apply the Transportation and Assignment problem concepts in real life problems.
- solve the Network problems by using PERT & CPM Methods.
- deal industrial models and also prerequisite for studying advanced courses in Nonlinear Programming Problems, Inventory Control Problem and Queuing Theory etc.
- acquire the knowledge to write TNPSC Statistical , UG TRB, Polytechnic TRB exams.
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**Text Book:**

***Problems in operations Research, PK Gupta & Man Mohan***

*(Relevant portions only)*

Unit I	:	Chapters 0 to 3
Unit II	:	Chapters 4, 5,6,8,9
Unit III	:	Chapters 9 and 27
Unit IV	:	Chapters 15 and 16
Unit V	:	Chapters 20

**General Reference:**

*Operations Research: Kantiswarup, PK. Gupta and ManMohan.*

**General Reference Links:**

1. <https://web.stanford.edu/group/sisl/k12/optimization/#!/index.md>

[Stanford University]

[https://courses.rice.edu/courses/!SWKSCAT.cat?p\\_action=COURSE&p\\_term=201910&p\\_crn=14054](https://courses.rice.edu/courses/!SWKSCAT.cat?p_action=COURSE&p_term=201910&p_crn=14054) [Rice]

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No. of Credits
<b>VI</b>	<b>20U6MAC15</b>	<b>PROGRAMMING IN C</b>	<b>4</b>	<b>5</b>

**Objectives:**

- To teach programming skills using fundamentals and basics of C language.
- To teach advantages of user defined data type that provides flexibility for application development.
- To enrich the knowledge of execution of programs written in C language.

**Unit I**

**15 Hrs**

Constants, variables and Data Types- Operators and Expressions- Input and Output Operators.

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**Unit II**

**15 Hrs**

Decision Making and Branching- Decision Making and Looping.

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**Unit III**

**15 Hrs**

Arrays- Character Arrays and Strings.

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**Unit IV**

**15 Hrs**

User- Defined functions.

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**Unit V**

**(Self Study)**

**15 Hrs**

Structures and Unions.

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**Course Outcomes:** After completion of the course, students will be able to

- read, understand and trace the execution of programs written in C language.
- write the C code for a given algorithm.
- write programs that perform operations using derived data types.
- solve a linear system of equations using an appropriate numerical method.
- perform an error analysis for a given numerical method.

**Text Book:**

***Programming in Ansi C*** by E.Balagurusamy; *Second Edition, 1992, Tata McGraw-Hill Publishing Company Limited, New Delhi.*

Unit I	:	Chapters 2.1-2.14,,3.1-3.14 & 4.1-4.5.
Unit II	:	Chapter 5.1-5.9 & 6.1-6.6
Unit III	:	Chapter 7.1-7.7 & 8.1-8.
Unit IV	:	Chapter 9.1-.20
Unit V	:	Chapter 10.1-10.14

**General Reference Links:**

1. <https://web.stanford.edu/class/archive/cs/cs107/cs107.1174/syllabus.html>  
[Stanford University]  
<https://www.mccormick.northwestern.edu/computer-science/academics/courses/descriptions/211.html> [North Western]

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
<b>VI</b>	<b>20U6MACPL</b>	<b>PROGRAMMING IN C PRACTICAL</b>	<b>5</b>	<b>3</b>

**Objectives:**

- To impart effective usage of arrays, structures, functions and pointers.
- To teach appropriate numerical methods to solve a linear system of equations.
- To enrich the knowledge of execution of programs written in C language.

Programs for the following problems only

(For both theory and practical)

**Programs:**

1. Employee Pay bill calculation
2. Students Mark List
3. Ascending and Descending orders
4. Test the string palindrome.
5. Standard deviation for raw data.
6. Coefficient of correlation and Regression Equations.
7. Matrix multiplication with order 3 x 3.
8. Lagrange's Interpolation.
9. Range- Kutta method (IV Order).
10. Trapezoidal rule and Simpson rule.
11. Temperature conversion (Fahrenheit to Celsius and vice- versa)
12. Drawing a reliability graph.
13. Printing the Binomial co-efficient table.
14. Plotting of two functions.
15. Sorting of strings in alphabetical order.

**Course Outcomes:** After completion of the course, students will be able to

- understand the syntax of the C program.
- write a C program for the given problem.
- understand easily any programming language as C is the basic of all OOPS.
- create C program for real life problems.
- write the C code for a given algorithm



Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
<b>VI</b>	<b>20U6MAEL3A</b>	<b>Major Elective – III FUZZY SETS AND ITS APPLICATIONS</b>	<b>5</b>	<b>4</b>

**Objectives:**

- To teach the concept of fuzzy sets and their properties.
- To teach the domain knowledge for Standard fuzzy operations and De Morgan's Laws in fuzzy sets.
- To teach the domain knowledge for the Representations of fuzzy sets.
- To teach fuzzy arithmetic, Linguistic variables and examine Fuzzy equations

**Unit I**

**18 Hrs**

**Fuzzy sets:** Basic Definitions – Basic set theoretic operations for Fuzzy sets – Extensions: Types of Fuzzy sets – algebraic operations - **Extension Principle:** operation for type 2 fuzzy sets – algebraic operations with fuzzy numbers – special extended operations – Extended operations for LR-representation of fuzzy sets.

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**Unit II**

**18 Hrs**

**Fuzzy relations and Fuzzy Graphs:** Fuzzy relations and fuzzy sets – Composition of Fuzzy relations – Min-max composition and its properties – Fuzzy graphs – Special fuzzy relation - Possibility Theory – Possibility of fuzzy events – Possibility Vs Probability.

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**Unit III**

**18 Hrs**

**Fuzzy Logic:** Classical logic: An overview – Multivalued logic – Fuzzy propositions – Fuzzy quantifiers – Linguistic hedges – Inference from conditional fuzzy propositions–**Approximate reasoning:** An overview of fuzzy expert system – Fuzzy implications and their selection – Multiconditional approximate reasoning – The role of fuzzy relation equation.

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**Unit IV**

**18 Hrs**

**Fuzzy Systems:** Fuzzy controllers: An overview – Fuzzy rule base. Fuzzy inference engine. Fuzzification. Defuzzification and the various Defuzzification methods (the centre of area, the centre of maxima and the mean of maxima methods) – Fuzzy controllers: An example – Fuzzy systems and Neural Networks – Automata – Dynamical Systems.

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**Unit V**

**(Self Study)**

**18 Hrs**

**Decision making in Fuzzy environment:** Individual decision making – Multiperson decision making – Multicriteria decision making – Multi stage decision making – Fuzzy ranking methods – Fuzzy linear programming – Applications in Civil Engineering, Mechanical Engineering, Industrial Engineering and Medicine.

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**Course Outcomes:** After completion of the course, students will be able to

- apply domain knowledge from classical sets to fuzzy sets with illustrations,
- determine fuzzy logic and fuzzy propositions and examine fuzzy Decision making problem
- learn the Fuzzy Linear programming problem, Classify fuzzy relations and properties of fuzzy relations.
- learn the measure in fuzzy and its real life applications.
- extend their knowledge to pursue research in this field.

**Text Books:**

1. *Fuzzy set theory and its applications Fourth edition*, H. J. Zimmermann. Springer, 2015.  
Unit – I: Chapters. 2, 3(Sec. 3.1 – 3.2.1), 5  
Unit – II: Chapters. 6, 8(Sec. 8.2 – 8.4)
2. *Fuzzy sets and Fuzzy Logic, Theory and Applications*, George J. Klir and Bo Yuan, PHI, 2013.  
Unit – III: Chapters. 8(Sec. 8.1 – 8.6), 11(Sec. 11.1 – 11.5)  
Unit – IV: Chapters. 12  
Unit – IV: Chapters. 15, 16(Sec. 16.2, 16.3), 17(Sec. 17.2)

**General Reference Links:**

1. [http://www.tezu.ernet.in/dmaths/programme/PhD-MathSc-syllabus\\_2013.pdf](http://www.tezu.ernet.in/dmaths/programme/PhD-MathSc-syllabus_2013.pdf)  
[Cambridge University]
2. <http://www.imperial.ac.uk/civil-engineering/prospective-students/postgraduate-taught-admissions/environmental-engineering-cluster/syllabus/cive97035/>  
[Imperial College London]

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No.of Credits
<b>VI</b>	<b>20U6MAEL3B</b>	<b>Major Elective – III FORMAL LANGUAGES AND AUTOMATA THEORY</b>	<b>5</b>	<b>4</b>

**Objectives:**

- To introduce concepts in automata theory and theory of computation
- To teach different formal language classes and their relationships
- To teach grammars and recognizers for different formal languages
- To prove or disprove theorems in automata theory using its properties
- To impart the decidability and intractability of computational problems

**Unit I**

**18 Hrs**

The theory of Automata- Definition of an Automaton- Description of a finite Automaton- Transition system- properties of transition functions- Acceptability of a string by a finite automaton- Non deterministic finite state Machine- The Equivalence of DFA and NDFA- Mealy and Moore Models- Minimisation of finite Automata.

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**Unit II**

**18 Hrs**

Formal Language- Basic definition and examples- Chomsky classification of Languages- Language and their relation- Recursive and Recursively Enumerable sets- operations on Languages- Languages and Automata.

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**Unit III**

**18 Hrs**

Regular Sets and Regular Grammars- Regular expression- Finite automaton and regular expressions- Pumping Lemma for Regular Sets- Application of Pumping Lemma.

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**Unit IV**

**18 Hrs**

Context- free Languages- Context- free languages and derivation Trees- Ambiguity in context- free grammars- Simplification of context- free grammars- Normal forms for context- free Grammars.

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**Unit V**

**(Self Study)**

**18 Hrs**

Push down Automata- Basic definitions- Acceptance by Pda- Push Down automata and context- free Languages- Parsing and Pushdown Automata.

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**Course Outcomes:** After completion of the course, students will be able to

- explore the theoretical foundations of computer science from the perspective of formal languages and classify machines by their power to recognize languages.
- differentiate regular, context-free and recursively enumerable languages.
- gain the knowledge of basic kinds of finite automata and their capabilities.
- know different formal language classes and their relationships
- gain the knowledge of describe and change language to regular expressions and grammars and construct the Turing machine for Recursive languages.

**Text Book:**

***“Theory of Computer Science” (Automata, Languages and Computation) K.L.P***

*Mishra and N. Chandrasekaran -Prentice Hall of India Private Limited- New Delhi.*

Unit I	:	Chapter 2: (2.1 to 2.9)
Unit II	:	Chapter 3: (Section 3.1 to 3.6)
Unit III	:	Chapter 4: (Section 4.1 to 4.4)
Unit IV	:	Chapter 5: (Section 5.1 to 5.4)
Unit V	:	Chapter 6: (Section 6.1 to 6.4)

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
<b>VI</b>	<b>20U6MAEL4A</b>	<b>Major Elective – IV ASTRONOMY</b>	<b>5</b>	<b>4</b>

**Objectives:**

- To introduce the exciting world of astronomy to students.
- To help the students to know about the celestial objects.
- To teach about astronomical concepts through mandatory Astronomical tour to Planetarium and Science Museums.

**Unit I** **18 Hrs**

Celestial sphere – Diurnal motion

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**Unit II** **18 Hrs**

**The Earth:** Zones of Earth – Terrestrial latitudes and longitudes – Radius of earth – Rotation of earth – Dip of horizon

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**Unit III** **18 Hrs**

Twilight – Refraction

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**Unit IV** **18 Hrs**

Kepler's Laws

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**Unit V** **18 Hrs**

**(Self Study)**

**Time:** Equation of time – seasons – calendar.

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**Course Outcomes:** After completion of the course, students will be able to

- acquire the knowledge of the Physical universe and its evolution.
- define and use fundamental principles and techniques of astronomy and astrophysics.
- understand and apply basic physics and computational techniques.
- know about the celestial objects and astronomical concepts.
- solve problems in astrophysics and interpret the results.

**Text Book**

*“Astronomy” by S.Kumaravelu and SusheelaKumaravelu, Agasthiyar Publication, 2013.*

Unit I	:	Chapter II, Article 39 – 79
Unit II	:	Chapter III (Sec: 3.1 – 3.5), Article 87 – 110
Unit III	:	Chapter III (sec: 3.6), Chapter IV, Article 111 – 134
Unit IV	:	Chapter VI, Article 146 – 165
Unit V	:	Chapter VII, Article 166 – 179

**General References:**

- 1.Astronomy by Dr.S.M. Sirajudeen*
- 2.Astronomy by G.V.Ramachandran.*
- 3.Textbook on Astronomy H.SubramaniAiyar 1970.*

**General Reference Links:**

1. <http://bulletin.columbia.edu/columbia-college/departments-instruction/astronomy/#coursestext> [Columbia University ]
2. <https://www.physics.utoronto.ca/~jharlow/Teaching/Astron03/Fullnotes/> [University Of Toronto]

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
<b>VI</b>	<b>20U6MAEL4B</b>	<b>Major Elective – IV STOCHASTIC PROCESSES</b>	<b>5</b>	<b>4</b>

**Objectives:**

- To teach sequences of events governed by probabilistic laws and many applications of stochastic processes.
- To explain stochastic concepts uses in physics, Engineering, biology, medicine and other disciplines.
- To bridge the gap between an elementary probability course and the many excellent advanced works on stochastic processes.

**Unit I**

**18 Hrs**

Elements of Stochastic Processes-Two simple examples of Stochastic processes-Classification of general Stochastic processes – Markov Chains- Definitions – Examples of Markov Chain-Transition probability matrices of a Markov chain - classification of states of a Markov chain-Recurrence;

**Unit-II**

**18 Hrs**

The basic limit theorem of Markov chains and applications-Discrete renewal equation-proof of theorem-Absorption probabilities - criteria for recurrence- A queuing Example.

**Unit III**

**18 Hrs**

Classical Examples of continuous time Markov chains-General pure birth processes and Poisson processes-more about Poisson processes- A counter model-birth and death processes-Differential equations of birth and death processes-Examples of birth and death processes.

**Unit IV**

**18 Hrs**

Renewal processes - Definition of Renewal process and related concepts – Some examples of Renewal Processes – More on some special Renewal processes – Renewal equations and elementary Renewal theorem - The Renewal Theorem – Applications of Renewal theorem.

**Unit V**

**(Self Study)**

**18Hrs**

Martingales - Preliminary definitions and examples – Super martingales and Sub martingales-The optional sampling theorem.

**Course Outcomes:** After completion of the course, students will be able to

- classify a stochastic process in a real-life situation.
- apply Markov chain in real life problems.
- acquire more detailed knowledge about Markov processes with a discrete state space, including Markov chains, Poisson processes, birth and death process.
- formulate simple stochastic process models in the time domain and provide qualitative and quantitative analyses of such models.
- extend their knowledge to pursue research in this field.

**Text Book:**

**A First course in Stochastic Processes - Second Edition** by Samuel karlin and M.Taylor, Academic Press New York.

Unit I : Chapter (1.2 to 1.3)

Unit II : Chapter (2.1 to 2.5)

Unit III : Chapter (3.1 to 3.5)

Unit IV : Chapter (4.1 to 4.6)

Unit V : Chapter (6.1 to 6.3)

**General References:**

1. "Stochastic Processes" S.K.Srinivasan and K.M.Mehata, Tata Mcgraw - Hill Publishing Company Ltd., New Delhi.
2. "Stochastic Processes " Mehdi, Second Edition Wiley Eastern Ltd., New Delhi.



Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
-	-	<b>Core Optional – FUZZY MATHEMATICS - I</b>	<b>5</b>	<b>5</b>

**Objectives:**

- To give a solid grounding of fundamental concepts of fuzzy set and its applications.
- To teach the difference between the crisp set and fuzzy set.
- To provide an emphasis on the differences and similarities between fuzzy sets and classical sets theories.

**Unit I**

**15 Hrs**

Idea of fuzzy set and membership function, Definition of a fuzzy set, membership function, representation of membership function, General definitions and properties of fuzzy sets, Support, height, equality of two fuzzy sets, containment, examples.

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**Unit II**

**15 Hrs**

Union and Intersection of two fuzzy sets, Complement of a fuzzy set, normal fuzzy set,  $\alpha$ -cut set of a fuzzy set, strong  $\alpha$ -cut, convex fuzzy set, a necessary and sufficient condition for convexity of a fuzzy set (Theorem 1), Decomposition of fuzzy sets, Degree of sub set hood, Level set of a fuzzy set, Cardinality, fuzzy cardinality, examples.

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**Unit III**

**15 Hrs**

Other important operations on fuzzy sets, Product of two fuzzy sets, Product of a fuzzy set with a crisp number, Power of a fuzzy set, Difference of two fuzzy sets, Disjunctive sum of two fuzzy sets, example.

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**Unit IV**

**15 Hrs**

General properties of operations on fuzzy sets, Commutativity, associativity, distributivity, Idempotent law, identities for operations, Transitivity, involution, Demorgans laws, proofs and examples, Some important theorems on fuzzy sets, set inclusion of fuzzy sets and corresponding  $\alpha$ -cuts and strong  $\alpha$ -cuts (Theorem 1).

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**Unit V**

**15 Hrs**

Comparison of  $\alpha$ -cut and strong  $\alpha$ -cut, Order relation of scalars  $\alpha$  is inversely preserved by set inclusion of corresponding  $\alpha$ -cuts and strong  $\alpha$ -cuts,  $\alpha$ -cut of union and intersection of two fuzzy sets,  $\alpha$ -cut of complement of a fuzzy set (Theorem 2), Examples,  $\alpha$ -cuts and strong  $\alpha$ -cuts of union and intersection of arbitrary collection of fuzzy sets.

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**Course Outcomes:** After completion of the course, students will be able to

- distinguish between the crisp set and fuzzy set concepts through the learned differences between the crisp set characteristic function and the fuzzy set membership function.
- Know the fundamental concepts of fuzzy sets and its applications.
- draw a parallelism between crisp set operations and fuzzy set operations through the use of characteristic and membership functions respectively.
- understand the comparison of  $\alpha$ -cut and strong  $\alpha$ -cut.
- become aware of the use of fuzzy inference systems in the design of intelligent or humanistic systems.

**Text Book:**

1. Fuzzy Sets and their Applications by Pundir and Pundir, Pragati Prakashan (PP30-76).

**Reference Books:**

1. Fuzzy sets and Fuzzy Logic by G.J. Klir and B. Yuan, Prentice Hall of India, New Delhi, 1995.
2. Fuzzy set Theory and its Applications by H.J. Zimmermann, Allied publishers Ltd, New Delhi 1991.

Semester	Subject Code	Title of the Paper	Hours of Teaching /Week	No.of Credits
-	-	<b>Core Optional - FUZZY MATHEMATICS - II</b>	<b>5</b>	<b>5</b>

**Objectives:**

- To provide a basic mathematical element of the theory of fuzzy sets.
- To provide an emphasis on the differences and similarities between fuzzy sets and classical sets theories.
- To determine fuzzy logic and fuzzy propositions and examine fuzzy Decision making problem

**Unit I**

**15 Hrs**

Fuzzy sets: Basic Definitions,  $\alpha$ -level sets, Convex fuzzy set, Basic operations on fuzzy sets, types of fuzzy sets, Extensions: Types of fuzzy sets, Further operations on fuzzy sets, Cartesian product, Algebraic products, Bounded sum and Difference, t-norm & t-conorm.

**Unit II**

**15 Hrs**

Extension principle and applications, Zadeh extension principle, image and inverse image of fuzzy sets, fuzzy numbers, algebraic operations with fuzzy numbers, extended operation and its properties, Special extended operation, addition, subtraction, product and division of fuzzy numbers.

**Unit III**

**15 Hrs**

Fuzzy relations on fuzzy sets, The union & intersection of fuzzy relations, Composition of fuzzy relations, max-\* and max-product compositions, min-max composition and its properties, reflexivity, symmetry, transitivity, and their examples, special fuzzy relations, similarity relation.

**Unit IV**

**15 Hrs**

Fuzzy graphs: Definition and Examples, Fuzzy sub-graph, Spanning sub-graph, path in a fuzzy graph, strength and length of a path, -length and -distances, connected nodes, fuzzy forest, fuzzy tree, Examples, Fuzzy Analysis: Fuzzy functions on fuzzy sets, classical function, fuzzy function, Examples.

**Unit V**

**15 Hrs**

Fuzzy Logic; classical logic an overview, multi-valued logic, Fuzzy proposition unconditional and un qualified proposition, unconditional and qualified propositions conditional and unqualified proposition, conditional and qualified proposition, Fuzzy qualifiers, Linguistic hedges An overview of classical logic, Its connectives, Tautologies, Contradiction, Fuzzy .

**Course Outcomes:** After completion of the course, students will be able to

- discuss the concept of fuzzy graphs and their properties with examples, examine Triangle and Parallelogram laws, demonstrate the concept of Fuzzy independent set and fuzzy bipartite graph with algorithm,
- classify the Dominating set and fuzzy independence set, transcribe the idea of fuzzy graphs and metric in fuzzy graphs.
- establish thorough background knowledge on evolutionary algorithms and enable them to pursue individual research in solving real world optimization problems like Constrained, Multimodal, Multi objective and Combinatorial Optimizations.
- pursue individual research in solving real world optimization problems like Constrained, Multimodal, Multi objective and Combinatorial Optimizations.
- extend their knowledge to pursue research in this field.

**Text Book:**

1. Fuzzy set theory and its Applications by H.J. Zimmermann, Allied Publishers Ltd., New Delhi, 1991 (For Units I to IV).
2. Fuzzy sets and Fuzzy Logic Theory & Application by G.J. Klir and B. Yuan, Prentice Hall of India, New Delhi, (2000) (For Unit V).

**Reference Books:**

1. Fuzzy Logic with Engineering Applications by T.J. Ross, John Wiley & Sons, IInd Ed., 2005

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No.of Credits
-	-	<b>Core Optional</b> <b>FINANCIAL MATHEMATICS</b>	<b>5</b>	<b>5</b>

**Objectives:**

- To provide thorough training in aspects of both financial matters and the relevant mathematics.
- To teach more about how the stock markets work.
- To impart accountancy skills.

**Unit I**

**15 Hrs**

Probability – Probabilities and Events – Conditional probability – Random Variables and Expected Values – Covariance and correlation – Continuous Random variables – Normal Random Variables – Properties of Normal Random Variables – The central limit Theorem – Simple Problems.

**Unit II**

**15 Hrs**

Geometric Brownian Motion – G.B.M. as a limit of simple models – Brownian Motion – Simple problems - Interest rates – Present value analysis – Rate of return – Continuation of varying interest rates – An example of option pricing – other examples of pricing via arbitrage.

**Unit III**

**15 Hrs**

The Arbitrage theorem – The multi period Binomial model – proof of the Arbitrage theorem - Black Scholes formula – properties of the Black Scholes option cost – Derivation of Black Scholes formula – simple problems.

**Unit IV**

**15 Hrs**

Additional results on options – Call options on Dividend paying Securities – Pricing American put options – Adding Jumps to Geometric Brownian Motion – Estimating the Volatility Parameter – Simple problems .

**Unit V**

**15 Hrs**

Valuing by Expected Utility – Limitation of Arbitrage pricing – valuing Investments by Expected utility – The portfolio selection problem – Value at risk and conditional value at risk The capital assets pricing model – Mean variance analysis of risk – Neutral priced Call options – Rates of return – Single period and Geometric Brownian Motion – simple problems .

**Course Outcomes:** After completion of the course, students will be able to

- relies on mathematics and expertise in analytical thinking and problem solving.
- enter employment in roles such as:
  - Actuarial Analyst, Capital Life and Pensions
  - Actuarial Analyst, KPMG
  - Actuarial Trainee, Ages Insurance Ltd
  - Credit Risk Analyst, Lloyds Banking Group
  - Financial Analyst, Cummins Inc
  - Junior Management Accountant, Virgin Media.

**Text Book:**

“An Elementary Introduction to Mathematical Finance”, 2nd Edition, Sheldon .M.Ross, Cambridge University press, 2005

**Reference Books:**

1. A first course in probability, S.M.Ross, Englewood cliffs Prentice Hall-NJ, 2002.
2. Options Market, J.Cox and M.Rubinstein, Englewood cliffs Prentice Hall-NJ, 1985.
3. Theory of financial decision making, J.E.Ingersill, Lanjarn MD Rowerman of Little fields, 1987.

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
-	-	<b>Core Optional – LATTICE THEORY</b>	<b>5</b>	<b>5</b>

**Objectives:**

- To impart skills and knowledge of standard concepts in complete lattices, distributive lattices, Boolean algebra and Boolean ring.
- To impart partially ordered sets and Jordan Dedekind chain conditions.
- To teach the relationship between posets and lattices

**Unit I**

**15 Hrs**

Partially ordered sets, Diagrams, Special subsets of a partially ordered set, Length, Lower and upper bounds, The minimum and maximum condition, The Jordan-Dedekind Chain condition and dimension functions.

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**Unit II**

**15 Hrs**

Lattices, The lattice theoretical duality principle, Semi lattices, Lattices as partially ordered sets, Diagrams of lattices, Sublattices, Ideals, Bound elements of a lattice, Atoms and dual atoms.

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**Unit III**

**15 Hrs**

Complements, Relative complements, Semi complements, Irreducible and prime elements of a lattice, The lattice homomorphism, Complete lattices, Compact elements, Compactly generated lattice, Sub algebra lattice of an algebra, Closure operations, Galois connections and Dedekind cuts.

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**Unit IV**

**15 Hrs**

Distributive lattices, Infinitely distributive and completely distributive lattice, Modular lattices, Characterization of modular and distributive lattices by their sublattices, Distributive sub lattices of modular lattices, The isomorphism theorem of modular lattices, Covering conditions, Meet representations in modular and distributive lattices

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**Unit V**

**15 Hrs**

Boolean algebras, De Morgan formulae, Complete Boolean algebras, Boolean algebras and Boolean rings, The algebra of relations, The lattice of propositions and valuations of Boolean algebras.

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**Course Outcomes:** After completion of the course, students will be able to

- analyze the relationship between posets and lattices, acquire knowledge of fundamental notions from lattice theory.
- define and understand basic properties of complete lattices and conditionally complete lattices, closure operations and their applications.
- characterize modular and distributive lattices using the Birkhoff and Dedekind criterions.
- understand Boolean algebras, Boolean rings.
- extend their knowledge to pursue research in this field.

**Text Book:**

“Introduction to Lattice Theory” by G. Szasy, Academic Press, New York, 1963.

**Reference Books:**

1. B.A.Dallery and H.A.Pristley, “Introduction to lattices and order”, Second edition, Cambridge University Press, 2002.
2. G. Gratzner, “General Lattice Theory”, Academic Press, New York.



Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No. of Credits
-	-	<b>Core Optional - PROGRAMMING IN C++</b>	<b>6</b>	<b>5</b>

**Objectives:**

- To teach modern language that combines the power, elegance and flexibility of C and the features of object oriented programming.
- To enrich the knowledge of C++ classes.
- To teach object-oriented capabilities such as data abstraction, inheritance and Polymorphism which offers significant software engineering benefits over C.

**Unit I**

**18 Hrs**

**Beginning with C++:** Applications of C++ - Simple C++ program - Structure of C++ program - Creating the source file - compiling and linking - **Tokens, Expressions and controls structures:** Tokens - keywords - Identifiers - **Basic data types:** User defined data types -Derived data types - symbolic constant - type compatibility - declaration of variables - Initialization of variables - reference variables.

**Unit II**

**18 Hrs**

**Operators in C++:** Scope resolution operator - member differencing operator - memory management operator - Manipulators - Type cast Operator - Expressions, special assignment expressions - implicit conversions - operator overloading - Operator precedence - control structures. **Functions in C++:** Introduction - main function - Functions prototyping call by reference - inline function, default arguments - constant arguments - return by reference-function overloading-Friend- and virtual functions.

**Unit III**

**18 Hrs**

**Class and object:** Specifying a class - defining member functions - C structures revisited- A C++ program with class-Arrays with in a class- static member function- Arrays of objects- Returning objects- constant Member functions-pointers to members

**Unit IV**

**18 Hrs**

**Constructors and Destructors:** Introduction - constructors - parameterized constructors - Multiple constructors in a class - Copy constructors-dynamic constructor - constructing Two-dimensional arrays-Destructors-Defining operator over loading-manipulation strings using operations - type conversions.

**Unit V**

**(Self Study)**

**18 Hrs**

**Inheritance:** Extending classes-Introduction-Defining derived classes-Single inheritance-making a private member inheritance-Multiple, multilevel, hierarichal, hybrid inheritance- virtual base classes - Abstract classes - constructors in derived classes - Member classes: nesting of classes.

**Course Outcomes:** After completion of the course, students will be able to

- know about class structure, member functions & data members, inheritance types and example problems.
- understand how C++ improves C with object-oriented features.
- develop programming skills.
- make use of objects and classes for developing programs.
- build C++ classes.

**Text Book:**

**Object Oriented Programming with C++** by *E.Balagurusamy, Tata Mcgraw Hill Publishing Company Ltd., New Delhi (1995).*

Unit I	:	Chapter 2 (2.1-2.3, 2.6 – 2.8) and Chapter 3 (3.1-3.12)
Unit II	:	Chapter 3 (3.13-3.21) and Chapter 4 (4.1-4.10)
Unit III	:	Chapter 5 (5.1-5.5, 5.9, 5.12, 5.13 – 5.18)
Unit IV	:	Chapter 6 (6.1-6.4,6.7–6.9,6.11), Chapter 7 (7.2, 7.6, 7.8)
Unit V	:	Chapter 8 (8.1-8.12)

**General References:**

*The C language trainers with C graphics and C++ J.Jayasri-willey eastern Ltd Madras 1993.*

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No.of Credits
-	-	<b>Core Optional – DIFFERENCE EQUATIONS</b>	<b>6</b>	<b>5</b>

**Objectives:**

- To impart skills for the implementation of mathematical knowledge and expertise.
- To impart with further complicated topics such as optimal control theory and like.
- To teach the basic concepts of difference equation and differential equations

**Unit I** **18 Hrs**

**Difference Calculus:** Difference operator - Summation – Generating function and Approximate Summation.

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**Unit II** **18 Hrs**

**Linear Difference Equations:** First order equations - General results for linear equations - Solving Linear Equations.

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**Unit III** **18 Hrs**

**Linear Difference Equations (Contd.):** Equations with Variable Coefficients – The z -Transform.

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**Unit IV** **18 Hrs**

**Stability Theory:** Initial value problems for linear systems – Stability of linear systems.

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**Unit V** **18 Hrs**

**Asymptotic Methods:** Introduction- Asymptotic analysis of sums - Linear equations.

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**Course Outcomes:** After completion of the course, students will be able to

- apply the knowledge of the differential and difference equations which will enable them to analyze dynamics of the processes.
- understand basic concepts of the differential and difference equations.
- find extreme values, regions of monotonicity and concavity, asymptotes of a function of one variable.
- solve linear equations with the constant coefficients as well as the systems of such equations.
- extend their knowledge to pursue research in this field.

**Text Book:**

W.G. Kelley and A.C. Peterson, Difference Equations, 2nd edition Academic Press, New York, 1991.

Unit – I : Sections 2.1 to 2.3

Unit – II : Sections 3.1 to 3.3

Unit – III : Sections 3.5 and 3.7

Unit – IV : Sections 4.1 and 4.2

Unit – V : Sections 5.1 to 5.3

**Reference Books:**

1. S.N. Elaydi, An Introduction to Difference Equations, Springer - Verlag, New York, 1995.
2. R. Mickens, Difference Equations, Van Nostrand Reinhold, New York, 1990.
3. R.P. Agarwal, Difference Equations and Inequalities, Marcel Dekker, New York, 1992.