FIRST SEMESTER

Course Code	Title of the Course
11311A	Part-I: Tamil Paper - I

நோக்கம் : மொழி அறிவு, இலக்கண அறிவை வளர்த்தல்

பிரிவு -1 : இசைப்பாடல்

கூறு 1

5. கண்ணதாசன் - ஸ்ரீ கிருஷ்ண கானம்

9. புல்லாங்குழல் கொடுத்த
10. குருவாயூருக்கு வாருங்கள்

கூறு 2

13. கோகுலத்து பசுக்கள்
14. கோகுலத்தில் ஒரு நாள் ராதை
15. ஆயர்பாடி மாளிகையில்

கூறு 3

பட்டுக்கோட்டை கல்யாண சுந்தரம்

9. நெஞ்சில் குடியிருக்கும்
10. செய்யும் தொழிலே தெய்வம்

கூறு 4

5. பாரதியார்

கண்ணன் என் விளையாட்டுப்பிள்ளை
பாரத மாதா திருப்பள்ளி எழுச்சி

பிரிவு - 2 : கவிதை, புதுக்கவிதை

கூறு 5

13. பாரதிதாசன் - உலகப்பன் பாட்டு (5)
14. நாமக்கல் கவிஞர் - நோயற்ற வாழ்வு 7 பாட்டு
15. பெ.தூரன் - நிலா பிஞ்சு

கூறு 6

13. வல்லிக் கண்ணன் - வெறும் புகழ்
14. கு.ப.இராஜகோபாலன் - எதற்காக?
15. மீரா - பதினைந்து

கூறு 7

9. சிற்பி - சர்ப்ப யாகம்1
10. ஞானக்கூத்தன் - தோழர் மோசிகீரனார்

கூறு 8

9. அப்துல் ரகுமான் - கண்ணும் எழுதேம்
10. சண்முக சுப்பையா - வயிறு

பிரிவு - 3 : காப்பியம்

கூறு 9

9. சிலப்பதிகாரம் - வழக்குரை காதை
10. கம்பராமாயணம் - அயோத்தியா காண்டம்

பிரிவு - 4 : காப்பியம்

கூறு 10

5. சீறாப்புராணம் - ஈத்தங்குலை வரவழைத்த படலம் (1)

கூறு 11

தேம்பாவணி - காட்சிப்படலம்

பாடல் எண் (ஒவ்வொரு பாடலின் முதல்வரி)

103. இன்னவாயில்

104. கொழுந்துறும்

105. பஞ்(ச) அரங்கில்

கூறு 12

தேம்பாவணி - காட்சிப்படலம்

பாடல் எண் (ஒவ்வொரு பாடலின் முதல்வரி)

106. எண்ணுளே

107. ஒண்தலங்கள்

108. இரவியேந்த கஞ்சக்

கூறு 13

தேம்பாவணி - காட்சிப்படலம்

பாடல் எண் (ஒவ்வொரு பாடலின் முதல்வரி)

109. கன்னியாயதாயும்

110. ஏந்தி ஓங்கு உளத்து

111. ஆவ தேமுனர்

112. கொல்லும் வேலொடும்

கூறு 14

தேம்பாவணி - காட்சிப்படலம்

பாடல் எண் (ஒவ்வொரு பாடலின் முதல்வரி)

113. என்ற வாசகம்

114. அம்பினால்

115. வேண்டும் ஓர் வினை

Course Code	Title of the Course
11311B	Part-I: Communication Skills - I

Objectives:

On completion of the course the students will be able to

- ❖ Make students to understand the basic skills of Communication.
- ❖ Acquaint students with the important features of Communication skills.

BLOCK I: COMMUNICATION: AN INTRODUCTION

Unit-1: Communication - Meaning - Types- Importance.

Unit-2: Barriers to Effective Communication - Principles - Principles of Effective Communication.

BLOCK II: ORAL COMMUNICATION

Unit-3: Oral Communication - Meaning - Importance - Forms of Oral Communication.

Unit-4: Intonation - Meaning - Function - Types Preparation of Speech- Steps Involved.

Unit-5: Principles of Effective Oral Communication.

BLOCK III: WRITTEN COMMUNICATION

Unit-6: Written Communication - Meaning - Steps - Importance - Advantages - Use of words and Phrases.

Unit-7: Sentence - Meaning - Sentence formation - Characteristics of an Effective Sentence.

Unit-8: Paragraph Writing - Essay Writing - Steps Involved - Outline-Layout - Contents -Drafting-Correction - Final Draft.

BLOCK IV: OFFICIAL COMMUNICATION

Unit-9: Application for Employment and Curriculum Vitae - Steps involved.

Unit-10: Non-Verbal Communication - Meaning - Types - Body Language - Postures -Gestures - Facial Expressions - Eye Contact.

Unit-11: Report Writing - Report - Types of Reports - Format of a Report.

Unit-12: Essentials of a Good Report - Preparation of Report - Procedure Involved.

Unit-13: Meetings - Purpose of the Meeting - Procedure.

Unit-14: Group Discussion - Quality of Content - Participation - Logical Presentation - Behavioural Skills.

References:

1. Krishna Mohan & Meera Banerjee, Developing Communication Skills, 2005.
2. Geetha Nagaraj, Write to Communicate, 2004.
3. Wren & Martin, English Grammar and Composition, 2002.
4. Dale Carnegie, How to Win Friends and Influence People, 1981.
5. Dale R Jordan, Language Skills and Use.
6. Gartside L. Bahld, Nagammiah and McComas, Satterwhite, Modern Business Correspondence.
7. Rajendra Pal and Kortahalli J S, Essentials of Business Communication.
8. Wallace, Michael J, Study Skills in English.
9. Editors of Readers Digest, Super Word Power.

Course Code	Title of the Course
11312	**PART-II : ENGLISH PAPER - I**

Learning objective:

1. To make the students master the different topics prescribed in the Prose, Grammar and Composition.

BLOCK I: PROSE I

Unit – I	Water-the Elixir of life	- C.V. Raman
Unit – II	Mrs. Packletide's Tiger	- SAKI
Unit – III	A Deed of Bravery	- Jim Carbett
Unit – IV	The Cat	- Catharine M.Willson
Unit – V	On Letter Writing	- Alpha of the Plough

BLOCK II: PROSE II

Unit – VI	Our Ancestors	- Carl Sagan
Unit – VII	Our Civilization	- C.E.Foad
Unit – VIII	A Hero on Probation	- B.R. Nanda
Unit – IX	Dangers of Drug Abuse	- Hardin B. Fones
Unit – X	Food	- J.B.S. Haldane

BLOCK III: DEVELOPING GRAMMATICAL SKILLS

Unit – XI - Articles-Gerunds-Participles-Infinitives-Modals-Proposition –Tenses.

Unit – XII - Direct and Indirect Speech-Transformation of sentences- Active and passive voice.

BLOCK IV: DEVELOPING WRITING SKILLS

Unit – XIII - Letter writing - Precis writing - Developing hints.

Unit – XIV - Dialogue writing - Paragraphwriting.

References:

1. Sebastian D K, *Prose for the Young Reader,* Macmillan.
2. *Active English Grammar*, Ed. by the Board of Editors, Macmillan.
3. Modern English – *A Book of Grammar Usage and Composition* by N.Krishnaswamy, Macmillan Publishers.

Course Code	Title of the Course
11313	PART-III : CLASSICAL ALGEBRA

Course Objectives:

The general objectives of the course is

1. To introduce the concepts-What is sequence?. Convergent, Divergent and Oscillating sequences.
2. To make the knowledge about Series of positive terms, D'Alembert test, Comparison test, Ratio test, Root test, Conditional convergence and Alternating series.
3. To introduce the concept of Binomial theorem for rational index, Binomial series, Exponential series, Logarithmic series and Summation of series using binomial, exponential and logarithmic series.
4. To understand the concept of Theory of equations, Relation between the roots and coefficients, Symmetric functions of the roots and Sum of the power of the roots of the equation, Removal of terms and Multiple roots.
5. To make the knowledge about Inequalities, Matrices and determinants, Adjoint of a square matrix, system of equations, Cramer's rule, Eigen values.

Course Description:

BLOCK I: SUMMATION OF SERIES AND THEORY OF EQUATIONS

UNIT- I

Introduction, Binomial theorem for rational index, other forms of Binomial Expansion, Summation of series using binomial theorem.

UNIT -II

Theory of equations - Introduction and basic theorems, Relation between the roots and coefficients, Symmetric functions of the roots.

UNIT -III

Sum of the powers of the roots of the equation, Transformation of equation by given quantity, formation of equations whose roots are diminished by h, formation of equations whose roots are equal in magnitude and opposite insign.

UNIT -IV

Multiple Roots – Nature and position of roots – Descarte's rule of Signs, Rolle's theorem – Sturm's functions – Problems.

BLOCK II: REMOVAL OF TERMS, INEQUALITIES AND DETERMINANTS

UNIT -V

Removal of terms – Introduction, Reciprocal roots, Newton's and Horner's methods.

UNIT -VI

Finding number and position of the real roots – Finding the nature and position of the roots (Cardans&Ferrar's method not included).

UNIT -VII

Inequalities – Arithmetic and geometric means, Weierstrass inequality.

UNIT -VIII

Determinants - Definition, Expansion of determinants, Properties of determinants

BLOCK III: MATRICES AND SYSTEM OF EQUATIONS

UNIT -IX

Matrices- Operation on matrices, adjoint of a square matrix- Problems.

UNIT -X

Singular and Non singular matirices-Inverse of a non-singular matrix.

UNIT -XI

System of equations - Cramer‘s rule, problems using Cramer‘s rule-Problems.

BLOCK IV: CONSISTENCY OF EQUATIONS, EIGEN VALUES AND EIGEN VECTORS

UNIT -XII

Rank of a matrix, Consistency of equations-related problems.

UNIT -XIII

Eigen values, Eigen vectors- Some problems

UNIT -XIV

Cayley Hamilton theorem – Statement, Verification of Cayley Hamilton theorem, finding inverse using Cayley Hamilton theorem.

REFERENCES:

1. Arumugam & Issac, Sequences and Series, New Gamma Publishing House, 2002 Edition.
2. Arumugam & Issac, Set Theory & Number System and Theory of Equations.
3. Venkataraman & Manorama, Algebra, National Publishing House, Chennai.
4. T.K.Manickavasagam Pillai & Others, Algebra Vol.I & Vol.II S.Viswanathan (Printers & Publishers) Pvt. Ltd, 1985-Revised Edition.

Learning Outcomes:

At the end of the module student should be able to...

1. Understand concept of sequences, series and its various types with examples.
2. Understand the types of tests with examples.
3. Understand Binomial theorem, binomial, logarithmic and exponential series and its applications in various fields.
4. Understand theory of equations, inequalities, matrices and determinants with examples and its uses in real world problems.

Course Code	Title of the Course
11314	PART-III : CALCULUS

Course Objectives:

The general objectives of the course is students will be able to:

1. To introduce the concept of Differentiation and Integration. Successive differentiation, Partial differentiation, Maxima and minima of functions of two variables.
2. To make the knowledge about Tangents, normal, curvature, envelope and evolute.
3. To understand the concept of Integration by parts: Definite integrals and their properties, Reduction formulae.
4. To know about Differential equations of homogeneous equations in x and y, First order linear equations, Linear equations of order 2 with constant coefficients.
5. To introduce the concepts of Laplace transform, Inverse Laplace transform, solving differential equations using Laplace transforms. Partial differential equations of first order, some standard forms and Charpit's method.

Course Description:

BLOCK I: DIFFERENTIATION, POLAR CO-ORDINATES AND ASYMPTOTES

UNIT- I

Differentiation – Introduction, Parametric differentiation, Logrithmic differentiation, differentiation of implicit functions.

UNIT –II

Successive differentiation – Introduction, n^{th} derivative of some standard functions, problems using higher order derivatives.

UNIT –III

Partial differentiation – Homogeneous functions, Euler's theorem, verification of Euler's theorem, Maxima and minima of functions of one variable and two variables.

UNIT –IV

Polar Coordinates – Radius of curvature in polar coordinates, p-r equation of a curve – Asymptotes – Method of finding asymptotes – problems

BLOCK II: ENVELOPES, EVOLUTES AND INTEGRATS

UNIT –V

Tangents and normal angle of intersection, curvature, Envelopes and Evolutes, working method to find envelope and involutes.

UNIT –VI

Integration – Substitution methods, $1/(x_2 – a_2)$, $1/(x_2 + a_2)$, $1/(a_2 – x_2)$, $1/(x_2 – a_2)½$, $(x_2 – a_2)½$, $(x_2 + a_2)½$, $(a_2 – x_2)½$.

UNIT –VII

Definite Integrals and their properties –problems – Integration by parts –– Reduction formulae – Bernoulli's formula.

UNIT -VIII

Double and triple integrals and their properties – Jacobian – Change of order of integration.

BLOCK III: BETA, GAMMA FUNCTIONS AND SOLUTION OF DIFFERENTIAL EQUATIONS

UNIT -IX

Beta and Gamma functions – properties – problems

UNIT -X

Differential equations – Solution of differential equations, variable separable methods.

UNIT -XI

Homogeneous equations in x and y-Methods and problems, First order linear equations.

BLOCK IV: VARIATION OF PARAMETERS, LAPLACE TRANSFORMS AND STANDARD FORMS OF PARTIAL DIFFERENTIAL EQUATIONS

UNIT -XII

Linear equations of order 2 with constant and variable coefficients, Variation of parameters.

UNIT -XIII

Laplace transform, Inverse Laplace transform, Solving differential equations using Laplace transforms.

UNIT -XIV

Partial differential equations – Forming differential equations by eliminating arbitrary constants and variables, First order partial order equations. Some standard forms – Charpit‘s method, Clairaut‘s form, Lagrange‘s multiplier method and problems.

REFERENCES:

1. Arumugam & Issac, Calculus, New Gamma Publishing House, 2005.
2. Arumugam & Issac, Differential Equations and Applications, New Gamma Publishing House, 2003.
3. A.K.Sharma, Text book of Differential Calculus, Discovery publishing house, New Delhi.
4. S.Narayanan & T.K. Manickavasagam Pillai, Differential Equations and its applications, S.Viswanathan(Printers & Publishers) Pvt. Ltd, 2009, Chennai.
5. Calculus and Fourier series by Dr. M.K.Venkataraman and Mrs. Manorama Sridhar, The National Publishing Company, Chennai.

Learning Outcomes:

At the end of the module student should be able to...

1. Understand concept of differentiation, partial differentiation, maxima and minima with examples.
2. Understand tangent, normal, curvature, envelope and evolute with examples.
3. Understand the concept of integration, reduction formulae, definte integral and its properties.
4. Understand Differential equations of homogeneous equations in x and y, First order linear equations, Linear equations of order 2 with constant coefficients.
5. Understand Laplace transform, Inverse Laplace transform, solving differential equations using Laplace transforms, Partial differential equations of first order, some standard forms and Charpit‘s method with its applications in various fields.

SECOND SEMESTER

Course Code	Title of the Course
11321A	Part-I: Tamil Paper - II

நோக்கம் : மொழி அறிவு, இலக்கண அறிவை வளர்த்தல்

பிரிவு 1: தேம்பாவணி

கூறு 1

தேம்பாவணி - காட்சிப்படலம்

பாடல் எண் (ஒவ்வொரு பாடலின் முதல்வரி)

116. சொல் தவிர்ந்த
117. அன்னை
118. அஞ்சுவார்
119. சொல்லக் கேட்டனள்
120. மற்செய்கை
121. மண்கனியப்
122. அழுது ஆர்ந்த

கூறு 2

தேம்பாவணி - காட்சிப்படலம்

பாடல் எண் (ஒவ்வொரு பாடலின் முதல்வரி)

123. பொய் பொதுளும்
124. இன்பு அருந்தி
125. வழுதாயின இன்பு
126. மறம் ஏவினர்

கூறு 3

தேம்பாவணி - காட்சிப்படலம்

பாடல் எண் (ஒவ்வொரு பாடலின் முதல்வரி)

127. மண்ணோர்கள்
128. பொய்யா விதியோய்
129. விடியா இருள்
130. அழுவார் எவரும்

பிரிவு 2: சிறுகதை, உரைநடை

கூறு 4

சிறுகதை - நீலபத்மநாபனின் "வான வீதியில்"

கூறு 5

உரைநடை - கம்பன் புறத்திணை - தி.சொக்கலிங்கம்

பிரிவு 3: இலக்கணம் - எழுத்தும் சொல்லும்

கூறு 6

11. முதலெழுத்துகள், சார்பெழுத்துகள்
12. மொழி முதலெழுத்துகள் , மொழி இறுதி எழுத்துகள்

கூறு 7

16. ஒற்றெழுத்து மிகலும் மிகாமையும்,
17. ஆகு பெயர் , அன்மொழித் தொகை.

18. வினா-விடை வகைகள்

கூறு 8

21. தமிழ்ச் சொல்லமைப்பின் சிறப்பு – பெயர் , வினை, இடை, உரி வடிவங்கள் ,
22. பிற மொழிச் சொற்களைத் தமிழில் ஆளும் முறைகள்

கூறு 9

23. அல் வழி, வேற்றுமைப் புணர்ச்சிகள்
24. திணை, பால் , எண் , இட இயைபு.

பிரிவு 4: தமிழ் இலக்கிய வரலாறு

கூறு 10

6. இக்கால இலக்கிய வகைகள்

அ) மரபுக் கவிதை

ஆ) புதுக் கவிதையின் தோற்றமும் வளர்ச்சியும்

கூறு 11

1. உரை நடை இலக்கியங்கள் - தோற்றமும் வளர்ச்சியும்

அ) கட்டுரை ஆ) சிறுகதை

இ) புதினம் ஈ) நாடகம்

கூறு 12

6. இக்கால இலக்கியக் களங்கள்

திரைப்படம் , தொலைக்காட்சி, வானொலி, இதழ்கள் தமிழுக்கு ஆற்றி வரும் பணிகள்

கூறு 13

1. **தமிழும் சமயங்களும் :**

அ) சைவம் ஆ)வைணவம் இ)சமணம் ஈ)பௌத்தம் உ)இசுலாம்

ஊ) கிறித்துவம்

கூறு 14

1. பிற்காலக் காப்பியங்கள் :

அ) கம்பராமாயணம் **ஆ)** பெரியபுராணம்

2. இணையம் - பற்றிய செய்திகள்

Course Code	Title of the Course
11321B	Part-I: Communication Skills - II

Objectives:

- ❖ To make students understand the basic skills of Communication.
- ❖ To acquaint students with the important features of Communication skills.

BLOCK I: INTRODUCTION TO COMMUNICATION SKILLS

Unit-1: Code and Content of Communication Skills.

Unit-2: Stimulus and Response of Communication Skills.

BLOCK II: SPEAKING SKILLS

Unit-3: Effective Speaking Guidelines.

Unit-4: Pronunciation Etiquette of Communication Skills.

Unit-5: Phonetics in Communication Skills.

BLOCK III: LANGUAGE SKILLS

Unit-6: A Self-Assessment of Communicating Soft Skills.

Unit-7: Language Skills - Ability - Skill Selected Need - Learner Centre activities.

Unit-8: Listening Skills - Importance - Types of Listening - Interview Skills.

Unit-9: Conversation Skills - Modes.

Unit-10: Presentation Skills - Preparing - Planning - Presentation.

BLOCK IV: WRITING SKILLS

Unit-11: Written Communication - Structure of Effective Sentences - Paragraph.

Unit-12: Technical Writing - Creative Writing - Editing and Publishing.

Unit-13: Corporate Communication Skills - Internal - Effective business writing -Letters, Proposals, Resume.

Unit-14: Corporal Communication Skills - External - Press release - Newsletters- Interviewing skills.

References:

12. Dutt. Kiranmai & Geeta Rajjevan. Basic Communication Skills. Rev.ed. Foundation Books Pvt.Ltd. Cambridge House, New Delhi 2006.
13. Bill R. Swetmon. Communication Skills for the 21st Century. Chennai: Eswar Press. First South Asian Edition 2006.
14. Glass. Lillian. Talk to Win. New York: Perigee Books,1987.
15. Pease. Alan. Signals: How to Use Body Language for Power, Success and Love, New York: Bantam Books, 1981.
16. Walters. Lilly. Secrets of Successful Speakers. New York: McGraw-Hill, Inc., 1993.
17. Mandal. S.K. How to Succeed in Group Discussions & Personal Interviews. Mumbai: JAICO Publishing House.
18. Rogoff. Leonard and Ballenger. Grady. Office Guide to Business Letters, Memos & Reports. New York: Macmillan, 1994.
19. Krishna Mohan & Meera Banerjee, Developing Communication Skills, 2005.
20. Geetha Nagaraj, Write to Communicate, 2004.
21. Wren & Martin, English Grammar and Composition, 2002.Rajendra Pal and Kortahalli J S, Essentials of Business Communication.

Course Code	Title of the Course
11322	**PART-II : ENGLISH PAPER - II**

Learning objective:

1. To make the students master the different topics prescribed in the Poetry and Language use Sections.

BLOCK I: POETRY - I

Unit – I	Sonnet	- William Shakespeare
Unit – II	Lines Composed upon Westminster Bridge	-William Wordsworth
Unit – III	Grecian Urn	- John Keats (1795-1827)
Unit – IV	Andrea Del Sarto	- Robert Browning (1812-1889)

BLOCK II: POETRY - II

Unit – V	The Road Not Taken	- Robert Frost (1874-1963)
Unit – VI	Strange Meeting	- Wilfred Owen (1813-1918)
Unit – VII	Gitanjali	- Rabindranath Tagore (1861-1946)
Unit – VIII	The Coromandel Fishers	- Sarojini Naidu
Unit – IX	The Express	- Stephen Spender

BLOCK III: DRAMA

Unit – X **Shakespeare :** The Merchant of Venice

BLOCK IV: DEVELOPING LANGUAGE SKILLS

Unit – XI Essay writing

Unit – XII Note Making

Unit – XIII Report writing

Unit – XIV Comprehension

References:

1. *The Golden Quill*, P.K. Seshadri, Macmillan.
2. *The Merchant of Venice,* Shakespeare. (Any overseas edition).
3. *Active English Grammar*, Ed. by the Board of Editors, Macmillan.
4. Modern English – *A Book of Grammar Usage and Composition* by N.Krishnaswamy, Macmillan Publishers.

Course Code	Title of the Course
11323	PART-III : ANALYTICAL GEOMETRY AND VECTOR CALCULUS

Course Objectives:

The general objectives of the course is students will be able to:

1. Understand and appropriately use the technical vocabulary of the topics covered such as vector, vector-valued function, tangent vector, space curve, tangential components, normal components, neighborhood in the plane, gradient, angle of inclination, iterated integral, double integral, triple integral, Lagrange multipliers, and Jacobian
2. Perform vector operations and interpret the results geometrically.
3. Use vectors to solve problems involving force, velocity, work, and real-life problems and analyze vectors in space
4. Find the angle between two vectors using the dot product
5. Find the direction cosines and cross product of two vectors in space
6. Use the triple scalar product of three vectors in space
7. Find the distance between points, planes, and lines inspace
8. Recognize and write equations for different surfaces
9. Use cylindrical and spherical coordinates to represent surfaces in space, analyze and sketch a space curve given by a vector-valued function
10. Differentiate and integrate a vector-valued function.
11. Understand Divergent, Curl, Vector integration, Line integral, Problems using Greens' theorem, Stokes' theorem and Guasstheorem.

Course Description:

BLOCK I: STRAIGHT LINES, SYSTEM OF CIRCLES AND DIRECTION COEFFICIENTS

UNIT -I

Two dimension analytical geometry – Pair of straight lines, angle between pair of lines-Problems.

UNIT -II

Circle, System of circles, Radical axis– co axal system of circles.

UNIT -III

Polar coordinates-Equation of line in polar co-ordinates - Pole and polar conics.

UNIT -IV

Three dimension analytical geometry – Introduction, Direction ratios and direction coefficients – angle between the lines

BLOCK II: PLANES AND CONES

UNIT -V

Plane – Plane equation – Angle between two planes – Length of the perpendicular –

Distance between two planes

UNIT -VI

Straight lines- Equation of a straight line in various forms – problems – Image of a point, Image of a line about a plane.

UNIT -VII

Plane and straight lines – Coplanar lines-Problems.

UNIT -VIII

Cone – Definition – Equation of the Cone in various forms – Equation of a right circular Cone-problems

BLOCK III: CYLINDER AND SPHERE

UNIT -IX

Cylinder – Definition – Equation of a right circular cylinder – simple problems.

UNIT -X

Skew lines – Shortest distance between two skew lines – Problems

UNIT -XI

Sphere – Equation of a sphere, Tangent plane – Problems

BLOCK IV: VECTOR DIFFERENTIATION, LINE AND SURFACE INTEGRALS

UNIT -XII

Equation of a circle on a sphere – Intersection of two spheres.

UNIT -XIII

Vector Calculus – Vector Differentiation– Vector Algebra – Differentiation of vectors - Gradient – Divergence and Curl – Solenoidal – irrotational – Harmonic Vector.

UNIT -XIV

Line and Surface Integrals – Line Integrals – Surface Integrals - Theorems of GREEN, GAUSS and STOKE'S(Statements only) problems.

REFERENCES:

1. Arumugam & Issac, Analytical Geometry 3D and Vector Calculus.
2. Analytical Geometry 3D and Vector Calculus by Dr. M.K.Venkataraman and Mrs. Manorama Sridhar, National Publishing Company, Chennai,2001..
3. T.K. Manickavasagam Pillai & T.Natarajan, A text book of Analytical Geometry Part II-3D, S.Viswanathan(Printers & Publishers) Pvt. Ltd., 2001.
4. S.Narayanan & T.K. Manickavasagam Pillai, Vector Algebra & Analysis, S.Viswanathan(Printers & Publishers) Pvt. Ltd. 1995.

Learning Outcomes:

After the completion of the course the student will be able to:

1. Understand the distance between points, the distance from a point to a line, and the distance from a point to a plane in the three-dimensional coordinate system.
2. Sketch and describe regions in space and perform algebraic operations with vectors in two and three dimensions.
3. Find the length of a vector and compute dot and cross product of vectors.
4. Find scalar and vector projections of a vector onto another and the angle between two vectors.
5. Determine if vectors are parallel and orthogonal and determine if a vector field is conservative and find a potential function if conservative.
6. Evaluate line integrals in the plane and in space, including line integrals of vector fields.
7. Use the Fundamental Theorem of Line Integrals and determine if a line integral is independent of path.
8. Use Green's, Stoke's and Gauss theorem and compute the curl and divergence of a vector field.

Course Code	Title of the Course
11324	**PART-III : SEQUENCES AND SERIES**

Course Objectives:

The general objectives of the course is
students will be able to:

1. Define sequences and identify the different kinds of sequences.
2. Find the nth term or the general term of a sequence for which some initial terms are given.
3. Find the types of sequence and series with suitable examples.
4. Find the common ratio of a geometric sequence.
5. Find arithmetic means, harmonic means and geometric means.
6. Find the sum of a finite arithmetic series, harmonic series and geometric series.
7. Find the sum of an infinite geometric series.
8. Find the tests such as Comparison test, Kummer's test, Root test, Cauchy's condensation Test, Cauchy's root test.

Course Description:

BLOCK I: CONVERGENT AND DIVERGENT OF SEQUENCES AND ALGEBRA OF LIMITS

UNIT -I

Sequences – bounded sequences – Monotonic sequences.

UNIT -II

Convergent sequences – Cauchy's general principle of convergence - Cauchy's first theorem on Limits.

UNIT -III

Divergent and Oscillating sequences – Some problems.

UNIT -IV

The algebra of limits- Limit superior and Limit inferior.

BLOCK II: MONOTONE AND CAUCHY SEQUENCES AND SERIES OF POSITIVE TERMS

UNIT -V

Behaviour of monotonic sequences – Some Theorems on limits

UNIT -VI

Subsequences – limit points –Some problems.

UNIT -VII

Cauchy sequences – The upper and lower limits of a sequence.

UNIT -VIII

Series of positive terms –infinite series – Some related problems.

BLOCK III: TYPES OF TESTS AND ALTERNATING SERIES

UNIT -IX

Comparison test – Kummer's test – Root test – Simple problems

UNIT -X

Cauchy's condensation Test, Cauchy's root test and their simple problems – Integral test – Problems.

UNIT -XI

Series of arbitrary terms – Alternating series – Problems.

BLOCK IV: TEST FOR CONVERGENCE AND SUMMATION OF SERIES

UNIT -XII

Absolute convergence – Tests for convergence of series of arbitrary terms

UNIT -XIII

Rearrangement (Derangement) of Series – Multiplication of series.

UNIT -XIV

General summation of series including successive difference and recurring series.

REFERENCES:

1. Sequences and Series by Dr. S.Arumugam and Prof. A.ThangapandiIssac, New Gamma Publishing House, Palayamkottai, December 2015.
2. M.K.Singal & Asha Rani Singal, A first course in Real Analysis, R. Chand & Co. 1999.
3. Dr.S.Arumugam, Sequences & Series, New Gamma Publishers, 1999.

Learning Outcomes:

At the end of the module student should be able to...

a. Work within an axiomatic framework.
b. Understand how Cauchy's criterion for the convergence of real and complex sequences and series follow from the completeness.
c. Understand concept of sequences, series and its various types with examples.
d. Understand the types of tests with examples.
e. Understand how the elementary functions can be defined by power series, with an ability to deduce some of their easier properties.
f. Understand behavior of monotone sequences and its applications in various fields.
g. Understand theory of equations, inequalities, matrices and determinants with examples and its uses in real worldproblems

THIRD SEMESTER

Course Code	Title of the Course
11331A	Part-I: Tamil Paper - III

நோக்கம் : மொழி அறிவு, இலக்கண அறிவை வளர்த்தல்

பிரிவு 1: இலக்கியம் - 1

கூறு 1: பத்துப்பாட்டு – முல்லைப்பாட்டு

கூறு 2: எட்டுத்தொகை – ஐங்குறுநூறு

கூறு 3: கபிலர் - குறிஞ்சித்திணை

கூறு 4: மஞ்ஞைப்பத்து – முதல் மூன்று பாடல்கள்

கூறு 5: குறுந்தொகை – பரணர் பாடல்கள் பா. எண். 19, 24, 36, 128, 399

பிரிவு 2: இலக்கியம் - 2

கூறு 6: நற்றிணை – பெருங்குன்றூர்கிழார் - பா. எண். 5
பெருவழுதியார் - பா. எண். 55
பெருங்கௌசிகனார் - பா. எண். 139

கூறு 7: நற்றிணை – கருவூர்க்கோசிகனார் - பா. எண். 214
உலோச்சனார் - பா. எண் 249

கூறு 8: அகநானூறு – சேந்தம்பூதனார் பாடல்கள் பா.எண். 84, 207

கூறு 9: புறநானூறு – மறோக்கத்து நப்பசலையார் பாடல்கள்
பா. எண். 37, 39, 126, 226, 280

பிரிவு 3: பதினெண்கீழ்க்கணக்கு

கூறு 10: பதினெண் கீழ்க்கணக்கு – திருக்குறள் - வாழ்க்கைத் துணை நலம் (6), அறிவுடைமை (43), பிரிவாற்றாமை (116)

கூறு 11: நான்மணிக்கடிகை – எள்ளற்க (3), பறைபடவாழா (4),

கூறு 12: நான்மணிக்கடிகை - மண்ணயறிப (5),கள்ளிவயிற்றில் (6), கல்லிற்பிறக்கும்(7)

பிரிவு 4: நாடகம் - புதினம்

கூறு 13: நாடகம் - இராசராசசோழன் - அரு. இராமநாதன்

கூறு 14: நாவல் - சுவடுகள் - இரா. பாலசுப்பிரமணியன், சத்யா வெளியீடு, மதுரை.

Course Code	Title of the Course
11331B	Part-I: Human Skills Development - I

Objectives:

- ❖ To Make the Students develop human skills.

BLOCK I: HUMAN SKILLS AND HABITS

Unit-1: Human Skills - Developing skills - Types.

Unit-2: Mind-Levels of functions - Habits - Meaning - Types - Merits of good habits - Interpersonal Relationship - Features - Interpersonal Behaviour.

BLOCK II: PERSONALITY AND SELF CONCEPT

Unit-3: Thinking ahead - Significance of thinking ahead.

Unit-4: Developing Personality - Meaning - Need - Factors influencing personality, Ways of developing personality - Building positive personality.

Unit-5: Self-concept - Self-esteem - Meaning-Importance - Self-efficacy - Self-acceptance -Meaning-Importance - Etiquette - Meaning - Etiquettes in using mobile, telephones - Dais Etiquette.

BLOCK III: TYPES OF SKILLS

Unit-6: Goal - setting Skills - Meaning - Types - Importance.

Unit-7: Decision-making skills - Meaning - Types - Steps in decision-making

Unit-8: Negotiating Skills - Styles - Structure - Creating negotiation - Competitive Negotiation.

BLOCK IV: HUMAN RELATIONS

Unit-9: Attitudes - Meaning - Types - Importance - Developing positive attitudes.

Unit-10: Coping with Change - Meaning - Characteristics - Importance of change Resistance to change - Dealing with change.

Unit-11: Leadership - Meaning - Importance - Characteristics - Styles.

Unit-12: Human Relations Skill - Need - Canons of good human relations.

Unit-13: Counselling - Meaning - Importance - Forms - Conflicts - Meaning - Types - Causes - Effects - Managements of conflicts

Unit-14: Stress-Meaning - Types - Causes - Effects - Managing the stress - Anger - Meaning - Causes - Consequences - Anger Management.

References:

1. Les Giblin, Skill with People, 1995.
2. Shiv Khera, You Can Win, 2002.
3. Christian H Godefroy, Mind Power.
4. Dale Carnegie, How to Enjoy Your Life and Your Job, 1985.
5. Natalie H Rogers, How to Speak without Fear, 1982.
6. Dale Carnegie, How to Develop Self-Confidence and Influence People by Public Speaking.

Course Code	Title of the Course
11332	**PART-II : ENGLISH PAPER - III**

Learning objective:

1. To make the students master the different topics prescribed in the Short Stories, One Act Plays, Grammar and Composition.

BLOCK I: SHORT STORIES

Unit – I A Hero - R.K. Narayanan

Unit – II The Diamond Necklace - Guy de Maupassant

Unit – III The Verger - Somerset Maugham

Unit – IV The Postmaster - Rabindranath Tagore

BLOCK II: ONE ACT PLAYS - I

Unit – V The Proposal - Anton Chekhou

Unit – VI The Boy Comes Home - A.A. Milne

Unit – VII The Silver Idol - James R. Waugh

Unit – VIII Progress - St. John Ervine

BLOCK III: ONE ACT PLAYS - II

Unit – IX The Pie andthe Tart - Huge Chesterman

Unit – X Reunion - W.st. Joh Tayleur

Unit – XI A kind of Justice - Margaret Wood

Unit – XII The Refugee - Asif Currimbhoy

BLOCK IV: GRAMMAR AND COMPOSITION

Unit – XIII Parts of speech-Noun- Pronoun- Adjective

Degrees of Comparison- Verb- Adverb

Unit – XIV Agenda- Minutes- Notice- Descriptive Writing

REFERENCES:

1. *Aroma,* Ed. by the Board of Editors, Publishers- New Century Book House, Chennai.
2. *Six Short Stories*, Ed. by the Board of Editors, Harrows Publications, Chennai.
2. *One Act Plays*, Ed. by the Board of Editors, Harrows Publications, Chennai.
3. Modern English – *A Book of Grammar Usage and Composition* by N.Krishnaswamy, Macmillan Publishers.
4. *English for Communication*, Ed. by the Board of Editors, Harrows Publications, Chennai.

Course Code	Title of the Course
11333	PART-III : DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS

Course Objectives:

The general objectives of the course is students will be able to:

1. Identify an ordinary differential equation and its order
2. Verify whether a given function is a solution of a given differential equation (as well as verifying initial conditions when applicable)
3. Classify ordinary differential equations into linear and nonlinear equations
4. Solve first order linear differential equations
5. Find solutions of separable differential equations
6. Model population dynamics using first order autonomous equations 8. Apply first order equations to problems in elementary dynamics
7. Find solutions of exact equations 10. Find the general solution of second order linear homogeneous equations with constant coefficients
8. Understand the notion of linear independence and the notion of a fundamental set of solutions
9. Use the method of reduction of order to find a second linearly independent solution of a second order, linear homogeneous equation when one solution is given
10. Use the method of undetermined coefficients to solve second order, linear homogeneous equations with constant coefficients
11. Use the method of variation of parameters to find particular solutions of second order, linear homogeneous equations
12. Use second order linear equations with constant coefficients to model mechanical vibrations

Course Description:

BLOCK I: EXACT, HOMOGENEOUS AND LINEAR DIFFERENTIAL EQUATIONS

UNIT - I

Exact Differential Equations – Conditions for equation to be exact –Working rule for solving it – problems

UNIT - II

Equations of the first order but of higher degree – Equations solvable for p, x, y, clairaut‘s form-Equations that do not contain (i) x explicitly (ii) y explicitly.

UNIT – III Equations homogenous in x and y - Linear Equation with constant coefficients- Problems**.**

UNIT- VI

Linear equations with variable coefficients – Equations reducible to the linear equations.

BLOCK II: SIMULTANEOUS AND TOTAL DIFFERENTIAL EQUATIONS

UNIT - V

Simultaneous Differential Equations – First order and first degree – Simultaneous linear Differential Equations.

UNIT – VI Linear equations of the second order – Complete Solution given a nown integral- Problems.

UNIT – VII Reduction to Normal form – Change of the independent variable-Problems.

UNIT – VIII Variation of parameters – Total Differential Equations – Problems.

BLOCK III: PARTIAL DIFFERENTIAL EQUATIONS

UNIT - IX

Necessary and Sufficient condition of integrability of Pdx + Qdy + Rdz = 0

-Rules - Problems.

UNIT - X

Partial Differential Equations of the First oder – classifications of integrals

UNIT - XI

Derivations of Partial Differential Equations – Special methods – Problems.

BLOCK IV: STANDARD FORMS OF PARTIAL DIFFERENTIAL EQUATIONS AND TRAJECTORIES

UNIT – XII:

Standard forms of partial differential equations – charpit's method-problems

UNIT - XIII

Flow of water from an Orifice – Falling bodies and other rate problems – Brachistochrone Problem

UNIT- XIV

Tautochronous property of the Cycloid – Trajectories-Problems.

REFERENCE BOOKS:

1. Differential Equations and its Applications by S.Narayanan&T.K.ManickavachagomPillay, S.Viswanathan (Printers& Publishers) Pvt. Ltd., 2015.
2. Differential Equations and its Applications by Dr. S.Arumugam and Mr. A.Thangapandi Issac, New Gamma Publishing House, Palayamkottai, Edition, 2014.

Course Code	Title of the Course
11334	PART-III : MECHANICS

Course Objectives:

The general objectives of the course is
students will be able to:

1. Draw complete and correctly labeled Free Body Diagrams of rigid bodies or systems of rigid bodies in static equilibrium, ability to compute the resultant of any number of concurrent forces in 2- or 3- dimensions.
2. Compute the dot product and cross product of two vectors, and demonstrate, understanding of the meaning of the results.
3. Solve particle equilibrium problems in 2- or 3- dimensions, ability to compute the moment generated by a force about any point in 2-D space and ability to find support reactions for truss and frame/machine problems.
4. Reduce a system of forces acting on a rigid body to a single equivalent force and compute its point of application.
5. Solve rigid body equilibrium problems in 2- or 3-dimensions for statically determinate systems, ability to compute frictional forces for sliding motion and for belts/pulleys.
6. Solve the tip/slip problem, ability to compute the centroid and the area moment of inertia of 2-D bodies using the method of composite areas.
7. Construct shear force and bending moment diagrams for systems of concentrated forces and/or distributed loads acting on statically determinate beams.
8. Solve for the internal forces acting on any member of a pin-jointed truss structure or a frame/machine component.
9. Find the centroid and area moment of inertia for 2-D shapes by the method of integration and ability to compute the moment about any axis in 3-D space generated by a force or a system of forces.
10. Find friction, coefficient of friction, angle of friction, cone of friction, path of projectiles is a parabola, range of a particle projected on a incline plane, Impact, Impulses, Impact in a fixed plane, direct and oblique impact.
11. Find equation of motion, composition of S.H.M's Central orbits, components of velocity and acceleration along and perpendicular to the radius vector and differential equation of a central-pedal equation.

Course Description:

BLOCK I: LOW OF FORCES AND RESULTANT OF FORCES

UNIT -I

Forces acting at a point – Resultant and Components – Definition – Simple cases of finding the resultant – Parallelogram law of forces – Analytical Expression for the resultant of two forces acting at a point

UNIT -II

Triangle of forces – Perpendicular Triangle of forces – Converse of Triangle of forces.

UNIT- III

The polygon of forces – Lami's Theorem – An Extended form of the parallelogram law of forces

UNIT -IV

Resolution of a force – Theorems on resolved parts – Resultant of any number of coplanar forces – Condition of equilibrium.

BLOCK II: PARALLEL FORCES, COUPLES AND FRICTIONS

UNIT -V

Forces acting on a rigid body: Parallel forces – Resultant of two like and unlike parallel forces – Moment of a force – Varigon's theorem

UNIT -VI

Couples– Equivalence of two couples- couples in parallel planes-Resultant of a couple and aplane.

UNIT -VII

Three forces acting on as rigid body –Three coplanar forces, conditions of equilibrium- two trigonometrical theorems and simple problems.

UNIT -VIII

Friction- Statical, dynamical and limiting friction-Laws of friction –Coefficient of friction – Angle of friction – Cone of friction – Problems.

BLOCK III: CATENARY, PROJECTILES AND IMPULSIVE FORCES

UNIT -IX

Uniform string under the action of gravity – Equation of the common catenary – axis, vertex, directrix, span and sag – Tension at any point – Important formulae – Geometrical properties of the Common Catenary

UNIT -X

Projectile – Definition – fundamental principles – path of the projectile – Characteristics of the motion of a projectile – Range on an inclined plane – greatest distance maximum range

UNIT -XI

Impulsive force – Impulse – Impact of two bodies – Loss of Kinetic energy in Impact – Collision of elastic bodies – Fundamental laws of Impact – Newton's experimental law – Impact of a smooth sphere on a fixed smooth plane,

BLOCK IV: IMPACT OF SPHERES, SIMPLE HORMOMIC MOTION AND CENTRAL ORBITS

UNIT -XII

Direct Impact of two smooth spheres – Loss of kinetic energy due to direct impact – Oblique impact of two smooth spheres – Loss of kinetic energy due to oblique impact.

UNIT -XIII

Motion under the action of Central forces – S.H.M – Equation of motion – Velocity and acceleration – Equation of motion in Polar Coordinates – Note on equiangular spiral – Motion under a central force

UNIT -XIV

Central Orbits - Differential Equation of Central Orbits – Perpendicular from the pole on the tangent. Formulae in Polar Coordinates – Pedal Equation of the central orbit – Pedal equation of some of the well known curves – Velocities in a central orbit – Two folded problems.

REFERENCE BOOKS:

1. Dr. M.K. Venkataraman, Statics, Agasthiar Publications, 17th Edition, 2014.
2. Dr. M.K. Venkataraman, Dynamics, Agasthiar Publications, 13th Edition,2009.
3. P. Duraipandian, Laxmi Duraipandian & Muthamizh Jayapragasam, Mechanics, S.Chand & Co. Pvt. Ltd, 2014.

FOURTH SEMESTER

Course Code	Title of the Course
11341A	Part-I: Tamil Paper - IV

நோக்கம் : மொழி அறிவு, இலக்கண அறிவை வளர்த்தல்

பிரிவு 1: செய்யுள் உறுப்புகள்

கூறு 1: செய்யுள் உறுப்புகள் - யாப்பு - எழுத்து, அசை, சீர்,

கூறு 2: செய்யுள் உறுப்புகள் - யாப்பு - தளை, அடி, தொடை

கூறு 3: வெண்பா, ஆசிரியப்பா, கலிப்பா, வஞ்சிப்பா,

கூறு 4: புதிய யாப்பு வடிவங்கள் - சிந்து, கண்ணி, கீர்த்தனை

கூறு 5: புதுக்கவிதையில் குறியீடு – படிமம்.

பிரிவு 2: அகப்பொருள் - புறப்பொருள்

கூறு 6: அகப்பொருள் - புறப்பொருள் - ஐந்திணை விளக்கம்

கூறு 7: அகப்பொருள் துறைகள் - வரைவு கடாதல், அறத்தொடு நிற்றல், உடன்போக்கு

கூறு 8: புறப்பொருள் துறைகள் - வஞ்சினக்காஞ்சி, கையறுநிலை, செவியறிவுறூஉ

பிரிவு 3: அணி

கூறு 9: அணி இலக்கணம் - உவமை, உருவகம், வேற்றுமை, பிறிது மொழிதல், தற்குறிப்பேற்றம், சிலேடை, பின்வருநிலை.

கூறு 10: நிறுத்தல் குறிகள்.

பிரிவு 4: காப்பியம் - சங்க இலக்கியம்

கூறு 11: தொல்காப்பியம் - சங்கஇலக்கியம் - எட்டுத்தொகை, பத்துப்பாட்டு,

கூறு 12: பதினெண்கீழ்க்கணக்கு.

கூறு 13: ஐம்பெருங்காப்பியங்கள் - பிற்காலக் காப்பியங்கள் - கம்பராமாயணம் - பெரியபுராணம்.

கூறு 14: இக்காலக் காப்பியங்கள் - பாரதியின் பாஞ்சாலி சபதம் - பாரதிதாசனின் பாண்டியன் பரிசு - கண்ணதாசனின் இயேசு காவியம் , சிற்பியின் - மௌன மயக்கங்கள்.

Course Code	Title of the Course
11341B	Part-I: Human Skills Development - II

Objective:

- To Make the Students develop human skills.

BLOCK I: GUIDENCE AND COUNSELLING

Unit – I Guidance & Counselling – Role of Counsellor - Importance and Techniques of counselling

Unit – II Managerial skill- Need – Importance

Unit – III Human relational skills-Communication-Attention

BLOCK II: TECHNICAL SKILLS

Unit – IV Conceptual skills-Meaning-Importance

Unit – V Technical skills-Techniques-Practices-Tools-Procedures

Unit – VI Presentation skills-Planning-Preparation-Delivery

Unit – VII Organization skills-Meaning-Nature-Importance-Types

Unit – VIII Multi-Tasking skills Responsibilities-Causes

Unit – IX Leader- Qualities of a good leader

BLOCK III: UNDERSTANDING SKILLS

Unit – X Understanding Skills -Human systems: Individual, Group, organization, and their major interactions

Unit – XI Understanding Skills -Human systems: Community and Society, and their major interactions

BLOCK IV: SOCIETY BASED SKILLS

Unit – XII Problem solving skills – Handling –Facing - Importance

Unit – XIII Cooperative Learning Skills

Unit – XIV Making Social Responsibilities-Causes

.**References:**

1. Les Giblin, Skill with People, 1995.
2. Shiv Khera, You Can Win, 2002.
3. Christian H Godefroy, Mind Power.
4. Dale Carnegie, How to Enjoy Your Life and Your Job, 1985.
5. Natalie H Rogers, How to Speak without Fear, 1982.
6. Dale Carnegie, How to Develop Self-Confidence and Influence People by Public Speaking.

Course Code	Title of the Course
11342	PART-II : ENGLISH PAPER - IV

Learning objective:

1. To make the students master the different topics prescribed in the Short Stories, Drama, Fiction, Tales from Shakespeare, Biographies, Grammar and Composition.

BLOCK I: SHORT STORIES

Unit – I Lalajee - Jim Corbelt

Unit – II A Day's Wait - Hemmingway

Unit – III Two old Men - Leo Tolstoy

Unit –IV Little Girls wiser than - Men Tolstoy

Unit – V Boy who wanted more Cheese - William Elliot Griffir

BLOCK II: DRAMA AND FICTION

Unit – VI Pygmalion - G.B. Shaw

Unit – VII Swami and Friends - R.K. Narayanan

BLOCK III: SHAKESPEARE

Unit – VIII - The Merchant of Venice

Unit – IX - Romeo and Juliet

Unit – X - The Winter's Tale

BLOCK IV: BIOGRAPHIES, GRAMMAR AND COMPOSITION

Unit – XI - Martin-Luther king - R.N. Roy

Unit – XII - Nehru - A.J. Toynbee

Unit – XIII - Concord- Phrases and Clauses-Question Tag

Unit – XIV - Expansion of Proverbs

- Group Discussion
- Conversation (Apologizing, Requesting, Thanking)

REFERENCES:

1. *Sizzlers*, by the Board of Editors, Publishers- :Manimekala Publishing House, Madurai.
2. *Pygmalion* – G.B. Shaw
3. *Swami and Friends* – R.K. Narayan
4. *Tales from Shakespeare* Ed. by the Board of Editors, Harrows Publications, Chennai.
5. Modern English – *A Book of Grammar Usage and Composition* by N.Krishnaswamy, Macmillan Publishers.

Course Code	Title of the Course
11343	PART-III : ANALYSIS

Course Objectives:

The general objectives of the course is
students will be able to:

1. Introduce the fundamentals of mathematical analysis and to reading and writing mathematical proofs.
2. Use results and techniques involving these concepts to solve a variety of problems, including types of problems that they have not seenpreviously.
3. Know how completeness, continuity, and other notions are generalized from the real line to metric spaces and appreciate the Contraction Principle in abstract metric space theory as a powerful tool to solve concrete problems.
4. Analyze the use the concept of convergence of sequences of functions and series of functions.
5. To attain a basic level of competency in developing their own mathematical arguments and communicating them to others in writing.

Course Description:

BLOCK I: SET, FUNCTIONS AND METRIC SPCES

UNIT -I

Introduction – Sets and functions – Countable and Uncountable sets – Inequalities of Holder and Minkowski.

UNIT -II

Metric spaces: Definition and examples – Limits in metric spaces – Continuous functions on metric spaces.

UNIT -III

Functions continuous at a point in the real line – Reformulation -Bounded sets in Metric space- Problems.

UNIT -IV

Subspace – Interior of a set – Open sets- Closed sets – Closure – limit point – Dense sets –Problems

BLOCK II: CONTINUITY AND POWER SERIES

UNIT –V Complete Metric spaces: Introduction- Completeness - Baire‘s Category theorem.

UNIT –VI Continuity – Homeomorphism – Uniform continuity.

UNIT- VII

Differentiability of a function –Derivability & Continuity –Algebra of derivatives – Inverse Function Theorem – Daurboux‘s Theorem on derivatives.

UNIT -VIII

Rolle‘s Theorem –Mean Value Theorems on derivatives- Taylor‘s Theorem with remainder- Power series expansion .

BLOCK III: INTEGRAL FUNCTIONS AND CONTRACTION MAPPING THEOREM

UNIT - IX

Riemann integration –definition – Daurboux‘s theorem –conditions for integrability – Integrability of continuous & monotonic functions.

UNIT - X

Integral functions –Properties of Integrable functions - Continuity & derivability of integral functions –The First Mean Value Theorem and the Fundamental theorem of Calculus.

UNIT -XI

Contraction mapping - Definitions and Examples - Contraction mapping theorem- Applications.

BLOCK IV: CONNECTED AND COMPACT METRIC SPACES

UNIT - XII

Connectedness: Introduction - Connectedness definition and examples- Connected subsets of R- Connectedness and Continuity.

UNIT - XIII

Compactness: Introduction- Compact metric spaces – Continuous functions on compact metric spaces – Continuity of the inverse function – Uniform continuity.

UNIT - XIV

Sequence of functions and Series of functions- Pointwise convergent-Cauchy criterion for uniform convergence.

REFERENCE BOOKS:

1. Arumugam & Issac, Modern Analysis, New Gamma Publishing House, Palayamkottai, 2010.
2. Richard R. Goldberg, Methods of Real Analysis, Oxford & IBH Publishing Company, New Delhi.
3. D.Somasundaram & B.Choudhary, A first course in Mathematical Analysis, Narosa Publishing House, Chennai.
4. M.K,Singhal & Asha Rani Singhal , A First Course in Real Analysis, R.Chand & Co., June 1997 Edition.
5. Shanthi Narayan, A Course of Mathematical Analysis, S. Chand & Co., 1995

Course Code	Title of the Course
11344	**PART-III : STATISTICS**

Course Objectives:

The general objectives of the course is students will be able to:

1. Organize, present and interpret statistical data, both numerically and graphically use various methods to compute the probabilities of events.
2. Analyze and interpret statistical data using curve fitting.
3. Construct correlation and regression table for finding missing datas.
4. Organize and interpret Index numbers in various applications.
5. Perform parameter testing techniques, including single and multi-sample tests for means, standard deviations and proportions.
6. Perform a time series analysis using time series components.

Course Description:

BLOCK I: MEAN, MEASURES OF DISPERSION AND MOMENTS

UNIT- I

Central Tendencies – Introduction – Arithmetic Mean – Partition Values – Median-Mode

UNIT- II

Geometric Mean and Harmonic Mean – Related problems

UNIT- III

Measures of Dispersion-Problems.

UNIT- IV

Moments – Skewness and Kurtosis

BLOCK II: CURVE FITTING, CORRELATION AND REGRESSION

UNIT-V

Curve fitting – Goodness of fit-Problems

UNIT-VI

Principle of least squares.

UNIT- VII

Correlation – Rank correlation–Related problems

UNIT- VIII

Regression – Problems

BLOCK III: CORRELATION COEFFICIENT, INTERPOLATION AND ATTRIBUTES

UNIT-IX

Correlation Coefficient for a Bivariate Frequency Distribution.

UNIT-X

Interpolation – Finite Differences – Newton‘s Formula – Lagrange‘s Formula-Problems

UNIT-XI

Attributes – Consistency of Data – Independence and Association of Data –Problems

BLOCK IV: INDEX NUMBERS AND TIME SERIES

UNIT-XII Index Numbers – Consumer Price Index Numbers – Problems.

UNIT –XIII Analysis of Time series – Time series– Components of a Time series

UNIT- XIV Measurement of Trends-Related problems.

REFERENCE BOOKS:

1. Arumugam & Issac, Statistics, New Gamma Publishing House, 2007.
2. S.P.Gupta, Statistical Methods, Sultan Chand & Sons, 37th Edition, 2008.
3. Statistics by Dr. S. Arumugam and Mr. A.ThangapandiIssac, New Gamma Publishing House, Palayamkottai, June 2015.

Learning Outcomes:

After completion of this course the students will:

1. Recognize the role of statistics in the applications of many different fields.
2. Define and illustrate the concepts of mean, median and mode compute the Harmonic and Geometric mean.
3. Define, illustrate and apply the concepts of curve fitting and principles of least square.
4. Define, illustrate and apply finite difference methods using Newton‘s and Lagrange‘s formulae.
5. Illustrate and apply attributes, consistency of data and Independence and Association of Data.
6. Define and examine Index numbers, Time series and measurement of trends.

SEMESTER – V

Course Code	Title of the Course
11351	PART-III : MODERN ALGEBRA

Course Objectives:

The general objectives of the course is students will be able to:

1. Formulate a rigorous mathematical proof.
2. Analyze the concept of sets, groups, subgroups, cosets, homomorphism and isomorphism theorems.
3. Analyze the concept of permutations an order of an element, relations, partial orders and binary operations.
4. Determine whether a subset of a ring is an ideal, prime ideal, or maximal ideal.
5. Perform operations with ring homomorphism.
6. Compute with polynomials and determine their reducibility.
7. Demonstrate understanding of key concepts with integral domains.
8. Demonstrate understanding of (abstract) vector spaces, determine whether a subset is a subspace, and determine whether a set of vectors is linearly independent.
9. Analyze the similarities and differences between finite fields and characteristic zero fields.

Course Description:

BLOCK I: GROUP AND AUBGROUPS

UNIT- I

Set theory- Sets and mappings- concept of a set – Set inclusion- union, intersection of sets- Difference of sets- Complement of a set- Symmetric difference of two sets – Cartesian product ofsets

UNIT- II

Relations – Equivalence relations – Partial order relations – Functions - Binary operations

UNIT- III

Group theory: Definition and examples – Properties – Permutation groups, Examples and problems

UNIT- IV

Subgroups – Cyclic groups – Order of an element-Problems.

BLOCK II: GROUP ISOMORPHISM AND RINGS

UNIT- V

Cosets – Lagrange‘s theorem – Index of a subgroup- Euler‘s theorem- Fermat‘s theorem-Problems

UNIT-VI

Normal subgroups and Quotient groups - Homomorphism – Fundamental theorem of homomorphism

UNIT -VII

Isomorphism-Cayley‘s theorem- Automorphism-Problems.

UNIT -VIII

Ring theory: Definition and examples – Properties of rings– Isomorphism – Types of rings.

BLOCK III: FIELDS, QUOTIENT, RINGS AND IDEALS

UNIT -IX

Integral domains – Fields – Characteristic of a ring – Subrings.

UNIT- X

Quotient Ring– Maximal and prime ideals –Ring homomorphism-Fundamental theorem of Ring homomorphism

UNIT- XI

Quotient field – Euclidean ring – Properties – Polynomial rings- Gauss lemma-Eisenstein‘ criterion.

BLOCK IV: VECTOR SPACES

UNIT -XII

Vector spaces: Definition and examples – Properties of vector space-Problems.

UNIT- XIII

Subspaces – Linear independence – Span of a set – Basis and dimension – Rank and nullity of a linear transformation

UNIT -XIV

Inner product spaces: Definition and examples– Orthogonality –Orthogonal complement.

REFERENCES:

1. Arumugam & Issac, Modern Algebra, Scitech Publications(India) Pvt. Ltd. , 2008.
2. A.R. Vasistha, Modern Algebra, Krishna Prakashan Mandir, Meerut, 1994-95.
3. T.K.Manickavasagam Pillai, T.Nagarajan & K.S.Ganapathy, Algebra Vol.I, S.Viswanathan(Printers & Publishers) Pvt. Ltd., 2012.

Course Code	Title of the Course
11352	PART-III : OPERATIONS RESEARCH

Course Objectives: The general objectives of the course is students will be able to:

1. Formulate and model a linear programming problem from a word problem and solve them graphically in 2 and 3 dimensions, while employing some convex analysis.
2. Place a Primal linear programming problem into standard form and use the Simplex Method or Revised Simplex Method to solve it.
3. Find the dual, and identify and interpret the solution of the Dual Problem from the final tableau of the Primal problem.
4. Modify a Primal Problem, and use the Fundamental Insight of Linear Programming to identify the new solution, or use the Dual Simplex Method to restore feasibility.
5. Interpret the dual variables and perform sensitivity analysis in the context of economics problems as shadow prices, imputed values, marginal values, or replacement values.
6. Explain the concept of complementary slackness and its role in solving primal/dual problem pairs.
7. Classify and formulate integer programming problems and solve them with cutting plane methods, or branch and bound methods.
8. Formulate and solve a number of problems in game theory using various methods.

Course Description:

BLOCK I: SIMPLEX, BIG M AND TWO PHASE METHODS IN LPP

UNIT -I

Introduction – Origin and Development of O.R – Nature and features of O.R. – Scientific Methods in O.R. – Modeling in O.R. – Advantages and Limitations of Models – General solution methods of O.R. models – Applications of Operations Research

UNIT -II

Linear Programming problem – Mathematical formulation of the problem – Illustration on Mathematical formulation of linear programming problems – Graphical solution method – Some exceptional cases.

UNIT- III

General linear programming problem – Canonical and Standard forms of L.P.P – Simplex method.

UNIT- IV

Linear programming using artificial variables- Big M method – Two Phase method- Problems

BLOCK II: DUALITY AND INTEGER PROGRAMMING

UNIT -V

Duality in linear programming – General primal and dual pair – Formulating a Dual problem – Primal – Dual pair in matrix form – Duality Theorems – Complementary Slackness Theorem.

UNIT -VI

Integer Programming – Cutting plane technique, Dual simplex method.

UNIT -VII

Introduction – L.P. formulation of T.P. – Existence of solution in T.P. – The Transportation table – Loops in T.P. – Solution of a Transportation problem – Finding an initial basic – feasible solution (NWCM – LCM – VAM).

UNIT -VIII

Degeneracy in TP – Transportation Algorithm (MODI Method) – Unbalanced T.P – Maximization T.P.

BLOCK III: ASSIGNMENT AND SEQUENCING PROBLEM

UNIT- IX

Assignment problem – Introduction – Mathematical formulation of the problem – Test for optimality by using Hungarian method – Maximization case in Assignment problem

UNIT- X

Sequencing problem – Introduction – problem of sequencing – Basic terms used in Sequencing– n jobs to be operated on two machines – problems - n jobs to be operated on K machines–problems–Two jobs to be operated on K machines (Graphical method)–problems.

UNIT -XI

Game Theory – Two person Zero – Sum Games – Basic terms – Maximin – Minimax Principle.

BLOCK IV: DOMINANCE IN GAMES AND NETWORK ANALYSIS

UNIT -XII

Games without saddle points – Mixed strategies – Graphical solution of 2× n and m × 2 games

UNIT -XIII

Dominance Property – General solution of m×n rectangular games-Problems.

UNIT -XIV

Network Scheduling by PERT / CPM – Network Basic components – Drawing network – Critical path Analysis – PERT Analysis – Distinction between PERT and CPM.

REFERENCES:

1. R.S.Arumugam, Operations Research, New Gamma Publications, 2006.
2. V.Sundaresan, K.S.Ganapathy & K.Ganesan, Resource Management Techniques(Operations Research), A.R.Publications.
3. Kanti Swarup, P.K. Gupta & Man Mohan, Sultan Chand & Sons, 13th Edition,2007.

Course Code	Title of the Course
11353	PART-III : NUMERICAL ANALYSIS

Course Objectives:

The general objectives of the course is students will be able to:

1. Find numerical approximations to the roots of an equation by Newton method, Bisection Method, Secant Method, etc.
2. Find numerical solution to a system of linear equations by Gaussian Elimination and Gauss-Siedel methods.
3. Apply several methods of numerical integration, including Rombergintegration.
4. Apply Taylor and Maclaurin Series to numerical problems.
5. Find the Lagrange Interpolation Polynomial for any given set of points.
6. Find numerical solution of a differential equation by Euler's, Modified Euler's, Predictor Corrector and Runge-Kutta Methods.
7. Use finite differences for interpolation, differentiation, etc.

Course Description:

BLOCK I: POLYNOMINALM EQUATIONS AND SYSTEM OF LINEAR EQUATION

UNIT -I

Algebraic & Transcendental and polynomial equations: Bisection method, Iteration method, Method of false position, Newton-Raphson method.

UNIT -II

System of linear equations: Matrix inversion method, Cramer‘s rule, Guass elimination method, Guass-Jordan elimination method, Triangularisation method.

UNIT- III

Solutions to Linear Systems –Jacobi & Gauss Siedal iterative methods – Theory & problems.

UNIT -IV

Interpolation: Graphic method- Finite differences – Forward and Backward differences – Central differences- Fundamental theorem of finite differences.

BLOCK II: INTERPOLATIONS

UNIT- V

Interpolating Polynomials using finite differences- Other difference operators.

UNIT -VI

Lagrange and Newton interpolations-Applications.

UNIT -VII

Divided differences and their properties – Application of Newton‘s General Interpolating formula.

UNIT -VIII

Central differences Interpolation formulae - Guass formulae, Stirlings formula, Bessel‘s formula, Everett‘s formula, Hermite‘s formula.

BLOCK III: NUMERICAL DIFFERENCIATION AND INTEGRATION

UNIT -IX

Numerical differentiation - Methods based on interpolation-Problems.

UNIT -X

Numerical differentiation - Methods based on finite differences-Problems.

UNIT -XI

Numerical integration, Trapezodial rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Weddle's rule, Cote's method.

BLOCK IV: NUMERICAL SOLUTIONS OF ODE

UNIT -XII

Numerical solutions of ordinary differential equations: Taylor's series method, Picard's method, Euler's method, Runge-Kutta method

UNIT -XIII

Numerical solutions of ordinary differential equations using Runge Kutta 2nd and 4th order methods (Derivation of the formula not needed) - Theory & problems

UNIT- XIV

Predictor-Corrector methods-Milne's Predictor Corrector Methods-Adam's Predictor Corrector Method

REFERENCES:

1. Arumugam, Issac & Somasundaram, Numerical Methods, Scitech Publications(India) Pvt. Ltd., 2nd Edition, 2010.
2. P.P.Gupta & G.S.Malik, Calculus of finite differences and Numerical Analysis, Krishnaprakasham Mandhir, Meerut.
3. Dr.M.K.Venkatraman, Numerical Methods in Science and Engineering.

Course Code	Title of the Course
11354	PART-III : TRANSFORM TECHNIQUES

Course Objectives:

The general objectives of the course is students will be able to:

1. Find the Laplace Transforms, Fourier series and Z-Transforms using various examples.
2. Understand a solid mathematical foundation in complex variables and common engineering transforms, including intuition in their use, and tools and techniques for applying them to a variety of problems.

Course Description:

BLOCK I: LAPLACE TRANSFORMS

UNIT- I

Laplace Transform –Definition – Laplace Transform of Standard functions – Elementary Theorems.

UNIT- II

Laplace Transform of periodic functions – problems.

UNIT- III

Inverse Laplace Transforms – Standard formulae – Basic Theorems –Problems.

BLOCK II: SOLUTION OF ODE AND FOURIER SERIES

UNIT- IV

Solving Ordinary Differential Equations with constant coefficients using Laplace Transform- Problems.

UNIT- V

Solving Ordinary Differential Equations variable coefficients -using Laplace Transform-Problems.

UNIT- VI

Solving Simultaneous linear equations using Laplace Transform-Problems.

UNIT- VII

Fourier Series – Definition – To find the Fourier coefficients of Periodic functions of period 2 □ .

UNIT- VIII

Even and odd functions in Fourier series – Half range Fourier series – problems.

BLOCK III: FOURIER TRANSFORMS

UNIT- IX

Fourier Transforms – Complex form of Fourier Integral Formula – Fourier Integral theorem.

UNIT- X

Properties of Fourier Transform – Fourier sine and cosine Transforms – Properties.

UNIT- XI

Parsival‘s Identity In Fourier Transforms- Problems.

BLOCK IV: Z - TRANSFORMS

UNIT- XII

Z Transforms – Definition – Proprieties – Z Transforms of some basic functions –

Problems.

UNIT- XIII

Inverse Z Transforms – Methods to find the inverse Z Transform – Use of Z Transforms.

UNIT- XIV Transforms to solve finite Difference Equations – problems.

REFERENCES:

1. Calculus Volume III by S.Narayanan and T.K.ManicavachagomPillay, S.Viswanathan (Printers & Publishers) Pvt. Ltd., 2014.
2. Engineering Mathematics 3rd Edition by T.Veerarajan, Tata McGraw Hill Publishing Company Limited, New Delhi.

SEMESTER – VI

Course Code	Title of the Course
11361	PART-III : DISCRETE MATHEMATICS

Course Objectives: The general objectives of the course is students will be able to:

1. Simplify and evaluate basic logic statements including compound statements, implications, inverses, converses, and contrapositives using truth tables and the properties of logic.
2. Express a logic sentence in terms of predicates, quantifiers, and logical connectives.
3. Apply the operations of sets and use Venn diagrams to solve applied problems.
4. Solve problems using the principle of inclusion, exclusion.
5. Apply rules of inference, tests for validity, and methods of proof including direct and indirect proof forms, proof by contradiction, proof by cases, and mathematical induction and write proofs using symbolic logic and Boolean Algebra.
6. Identify the base step and the recursive or inductive step in applied problems and give a recursive and a non -recursive definition for an iterative algorithm.
7. Solve problems using recurrence relations and recursion to analyze algorithms and programs such as finding Fibonacci numbers, the Ackerman function and Tower of Hanoi problems.
8. Determine if a given graph is simple or a multigraph, directed or undirected, cyclic or acyclic, and determine the connectivity of agraph.
9. Represent a graph using an adjacency list and an adjacency matrix and apply graph theory to application problems such as computer networks.
10. Determine if a graph has an Euler or a Hamilton path or circuit.
11. Determine if a graph is a binary tree, N -ary tree, or not a tree; use the properties of trees to classify trees, identify ancestors, descendants, parents, children, and siblings; determine the level of a node, the height of a tree or subtree and apply counting theorems to the edges and vertices of a tree.
12. Perform tree traversals using preorder, inorder, and postorder traversals and apply these traversals to application problems; use binary search trees or decision trees to solve problems.

13. Evaluate Boolean functions and simplify expression using the properties of Boolean algebra.
14. Apply Boolean algebra to circuits and gating networks.
15. Use finite-state machines to model computer operations

Course Description:

BLOCK I: LOGIC, TAUTOLOGY AND THEORY OF INFERENCE

UNIT –I Logic introduction – Connectives – Atomic and compound statements – Truth table – Problems.

UNIT- II

Tautology – Tautological implications and equivalence of formulae – Replacement Process- Law of duality- Tautological implications.

UNIT –III Normal forms – Principal normal forms-Problems.

UNIT- IV Theory of inference- Rules of inference-Open statements –Problems

BLOCK II: QUANTIFIERS, LATTICES AND CODING THEORY

UNIT- V Quantifiers – bound and free variables -Theory of inference for predicate calculus.

UNIT-VI Relations – Representation of a relation – Operations on relations – Equivalence relation.

UNIT -VII

Lattices – Some properties of Lattices, New Lattices – Modular and Distributive Lattices -Boolean Algebra, Boolean Polynomials.

UNIT -VIII

Coding theory – Introduction – Hamming Distance – Encoding a message – Group codes – Procedure for Generating Group codes – Decoding and Error correction.

BLOCK III: MATRIX OF A GRAPH AND CHROMATIC NUMBERS

UNIT -IX

Definition of a Graph – finite & infinite graphs – incidence, degree isolated & pendent vertices – isomorphisms –sub graphs – walks , paths & circuits –Connected & disconnected graphs.

UNIT -X

Matrix representation of a graph – Incidence matrix –Circuit Matrix - Fundamental Circuit Matrix and rank of the circuit matrix – Cut set matrix – adjacency matrix.

UNIT- XI Chromatic Number - Chromatic partitioning – Chromatic polynomial-Problems.

BLOCK IV: TREES AND CUT SETS

UNIT –XII Trees –properties of trees –pendent vertices in a tree – distances & centres in a tree – Rooted & binary trees.

UNIT -XIII

Spanning trees –Fundamental circuits – Finding all spanning trees of a Graph – Spanning trees in a weighted graph.

UNIT -XIV

Cut sets – Properties of a Cut set – all Cut sets in a graph – Fundamental circuits & Cut sets – Connectivity & separability - Eulerian and Hamiltonian graphs –Problems.

REFERENCES:

1. Venkatraman, Sridharan and Chandrasekaran, Discrete Mathematics, National Publishing House, Chennai, 2003.
2. J.P. Trembley and R.P. Manohar, Discrete Mathematics Structures with applications to Computer Science, Mc.Graw Hill Interamericana,, 1975.
3. S.Arumugam & S.Ramachandran, Scitech Publications, Chennai, 2001.
4. V.K.Balakrishnan, Introductory Discrete Mathematics, Dover Publications, INC. Newyork.
5. A First course in Graph Theory by S.A. Choudum, Macmillan India Ltd. New Delhi, 1987.

Course Code	Title of the Course
11362	**PART-III : FUZZY ALGEBRA**

Course Objectives: The general objectives of the course is students will be able to:

1. Understand the basic mathematical elements of the theory of fuzzy sets.
2. Find the differences and similarities between fuzzy sets and classical setstheories.
3. Find the relations in fuzzy sets.
4. Find the types of measures and operations in fuzzy sets.
5. Understand the meaning of uncertainty in practical situations.

Course Description:

BLOCK I: FUZZY SETS AND OPERATIONS ON FUZZY SETS

UNIT-I

Fuzzy sets – Basic types – Basic concepts - □ - cuts – Additional prosperities of □ -cuts – Extension principle for Fuzzy sets.

UNIT- II Operations on Fuzzy sets – Types of operations – Fuzzy complements – Fuzzy Union and intersections.

UNIT- III Combinations of operations – Fuzzy Arithmetic – Fuzzy numbers

UNIT- IV Arithmetic operations on intervals – Arithmetic operations on Fuzzy numbers.

BLOCK II: FUZZY RELATIONS AND FUZZY MEASURES

UNIT- V

Fuzzy relations – Binary fuzzy relations – Fuzzy equivalence and similarity relations – Fuzzy compatibility relations.

UNIT- VI Fuzzy ordering relations – fuzzy morphisms.

UNIT- VII Fuzzy measures-Belief and Plausibility measures- Probability measures- Problems.

UNIT- VIII Possibility measures- Necessity measures- Relationship among classesof fuzzy measures.

BLOCK III: UNCERTAINITY AND MEASURES OF DISSONANCE

UNIT- IX Types of uncertainity- Measures of fuzziness-Problems.

UNIT- X Classical measures of uncertainity-Hartley information-Shannon Entropy-Boltzmann Entropy.

UNIT- XI Measures of Dissonance- Body of evidence-Consonant body of evidence-Problems.

BLOCK IV: MEASURE OF CONFUSION, UNCERTAINITY AND INFORMATION

UNIT- XII Measures of confusion-entropy like measures-Problems.

UNIT- XIII Measures of nonspecificity - U- uncertainity –Problems.

UNIT- XIV Uncertain and Information- syntactic, semantic, pragmatic-Problems.

REFERENCES:

1. George J.Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic, Theory and Applications, Prentice Hall Inc., New Jersey. 1995.
2. George J.Klir and Tina A. Folger, Fuzzy sets, Uncertainity and Information, Prentice Hall of India, New Delhi, 2007.
3. H.J.Zimmermann, Fuzzy Set Theory and its Applications, Allied Publishers Limited, New Delhi, 1991.

Course Code	Title of the Course
11363	PART-III : COMPLEX ANALYSIS

Course Objectives:

The general objectives of the course is students will be able to:

1. Understand how complex numbers provide a satisfying extension of the real numbers;
2. Appreciate how throwing problems into a more general context may enlighten one about a specific context (e.g. solving real integrals by doing complex integration; Taylor series of a complex variable illuminating the relationship between real function that seem unrelated -- e.g. exponentials and trig functions);
3. Learn techniques of complex analysis that make practical problems easy (e.g. graphical rotation and scaling as an example of complex multiplication);
4. Continue to develop proof techniques;
5. Appreciate how mathematics is used in design (e.g. conformal mapping);
6. Unlearn (if ever learned) the notion that mathematics is all about getting "the right answer";
7. Hone the ability to do reality checks on calculations;
8. Hone the ability to communicate mathematics.

Course Description:

BLOCK I: COMPLEX NUMBERS AND POWER SERIES

UNIT- I

The geometric representation of a complex number – the spherical representation and stereographic projection.

UNIT- II

Definitions of complex analytic function-Complex differentiation. - The Cauchy- Riemann equations.

UNIT-III

Orthogonal trajectories and harmonic functions- Harmonic and Conjucate harmonic – To find an analytic function f(z)=u+iv if a harmonic function u is given – Milne Thomson method–Problems.

UNIT- IV

Power series – radius of convergence – Abel's limit theorem-Examples.

BLOCK II: CONFORMAL MAPPING AND BILINEAR TRANSFORMATIONS

UNIT- V

Generating functions - Fibonacci numbers - An application of power series.

UNIT- VI

Conformal mappings – Bilinear transformations – Fixed point of bilinear transformations – Cross ratio.

UNIT- VII

General bilinear transformations which transforms unit disk onto the unit disk; half plane Im(z)□ onto the unit disk.

BLOCK III: COMPLEX INTEGRATION, ZEROS AND POLES

UNIT -VIII

Complex integration – Cauchy's theorem for a rectangle and for a disk – The index of a point with respect to a closed curve – Cauchy's integral formula-Problems.

UNIT- IX

Higher derivatives in complex integration– Taylor‘s theorem – Problems.

UNIT- X

Zeros and poles– The local mapping theorem – The maximum principle – Schwarz‘s lemma – Morera‘s theorem – Cauchy‘s estimate – Liouville‘s theorem.

UNIT- XI

The minimum- maximum theorem, Fundamental theorem of algebra.

BLOCK IV: SERIES OF EXPANSION, SINGULARITIES AND EVALUATION OF DEFINITE INTEGRALS

UNIT -XII

Series expansions – Taylor‘s Series , Laurent series – Laurent‘s theorem- Problems.

UNIT- XIII

Singularities – Cauchy‘s residue theorem – The argument principle – Rouche‘s theorem –Problems.

UNIT- XIV

Evaluation of definite integrals for unit circles, Poles lie in the upper half of the plane and realaxis.

REFERENCES:

1. Arumugam, Issac & Somasundaram, Complex Analysis, Scitech Publications(India) Pvt. Ltd., 2004.
2. T.K.Manickavasagam Pillai & others, S.Viswanathan(Printers & Publishers) Pvt. Ltd., Chennai, 1997.
3. P.Duraipandian & others, Complex Analysis, Emarald Publishers, Chennai.
4. V.Karunakaran, Complex Analysis, Alpha Science International Ltd., Harrow, U.K, Second Edition, 2005.
5. P.P Gupta – Kedarnath & Ramnath, Complex Variables, Meerut-Delhi
6. J.N. Sharma, Functions of a Complex variable, Krishna Prakasan Media (P) Ltd, 13th Edition, 1996-97.

Course Code	Title of the Course
11364	**PART-III : COMBINATORICS**

Course Objectives: The general objectives of the course is students will be able to:

1. Familiar with fundamental combinatorial structures that naturally appear in various other fields of mathematics and computer science.
2. Understand the concept of Recurrence relations, Binary operations on Permutation groups.
3. Understand the concept of Inclusion and Exclusion principle
4. Learn how to use these structures to represent mathematical and applied questions, and they will become comfortable with the combinatorial tools commonly used to analyze such structures.
5. Learn how to prove the existence or non-existence of the object, compute the number of such objects, and understand their underlying structure.

Course Description:

BLOCK I: COMBINATION OF NUMBERS AND GENERATING FUNCTIONS

UNIT-I

Basic Combinatorial Numbers – Stirling Numbers of the First kind – Stirling Numbers

UNIT-II

Recurrence Formula for S_n^m – Recurrence formula for P_n^m.

UNIT-III

Patterns of Distributions-Problems.

UNIT-IV

Generating Functions – The Algebra of Formal Power Series – Generating functions for Permutations – Generating functions for Partitions.

BLOCK II: RECURRENCE RELATIONS AND SYMMETRIC FUNCTIONS

UNIT-V Inventory of Maps – Recurrence Relations.

UNIT-VI

Symmetric functions – The Monomial Symmetric functions $K_{\square}$ – The complete Homogeneous Symmetric Functions $h_{\square}$.

UNIT-VII The Elementary Symmetric Functions $a_{\square}$ – The Power sum Symmetric Function $s_{\square}$**.**

UNIT-VIII Multinomials- Basic concepts- Problems.

BLOCK III: PRINCIPLES, PERMULATIONS AND POLYA THEORY

UNIT-IX Inclusion and Exclusion Principle –Theorems and Problems.

UNIT-X Permutations with Forbidden Positions – The Menage problem

UNIT-XI Problem of Fibonacci – Polya Theory – Problems

BLOCK IV: PERMUTATION GROUPS

UNIT-XII Necklace problem and Burnside's Lemma – Cyclic Index of a Permutation Group.

UNIT-XIII Polya's Theorems and their Immediate Applications – Related problems.

UNIT-XIV Binary operations on Permutation Groups.

REFERENCES:

1. Combinatorics Theory and Applications by V.Krishnamurthy, Affliated East-West Press Private Limited, New Delhi, 1985.
2. A First Course in Combinatorial Mathematics by IanAnderson, Oxford Applied Mathematics and Computing Science Series, U.K., 1974
3. Combinatorics by V.K.Balakrishnan, Schuam Series, 1996