# CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)

**(Nationally Re-accredited (III cycle) with 'A' (CGPA 3.41 out of 4)**

**Grade by NAAC**

# PG AND RESEARCH DEPARTMENT OF MATHEMATICS

# B.Sc MATHEMATICS SYLLABUS

# 2020-2021 ONWARDS

# CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)

## PG AND RESEARCH DEPARTMENT OF MATHEMATICS

## B.Sc MATHEMATICS

## PROGRAMME OUTCOMES

| | |
|---|---|
| **PO1** | Demonstrate basic manipulative skills in algebra, geometry and trigonometry. |
| **PO2** | Communicate mathematical principles and ideas with clarity and coherence, both written and verbally, demonstrating communication skills to be used in any future career. |
| **PO3** | Demonstrate proficiency in linear algebra, real and complex analysis as well as areas of modern, proof-based Mathematics. |
| **PO4** | Compute limits and derivatives using their definitions, and use the fundamental theorem of calculus to compute definite and indefinite integrals. |
| **PO5** | Construct counter examples to mathematical statements and understand the importance of hypotheses into a viable career path. |

**CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)**

**PG AND RESEARCH DEPARTMENT OF MATHEMATICS**

**B.Sc MATHEMATICS COURSE STRUCTURE**

**(For the candidates admitted in the year 2020-2021)**

| Sem | Part | Course | Title | Subject Code | Ins. Hrs | Credit | Exam Hours | Marks Int | Marks Ext | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| I | I | Language Course – I (LC) – Tamil*/Other Languages +# | இக்கால இலக்கியம்<br>Story, Novel, History of Hindi Literature-I &Grammar – 1<br>History of Popular Tales Literature and Sanskrit Story<br>Communication in French –I | 19ULT1/ 19ULH1/ 19ULS1/ 19ULF1 | 6 | 3 | 3 | 25 | 75 | 100 |
| | II | English Language Course – I (ELC) | Functional Grammar for Effective Communication – I | 19UE1 | 6 | 3 | 3 | 25 | 75 | 100 |
| | III | Core Course – I (CC) | Differential Calculus and Trigonometry | 19UMA1CC1 | 5 | 5 | 3 | 25 | 75 | 100 |
| | | Core Course – II (CC) | Integral Calculus and Fourier Series | 19UMA1CC2 | 6 | 5 | 3 | 25 | 75 | 100 |
| | | First Allied Course – I (AC) | Mathematical Statistics – I | 19UMA1AC1 | 5 | 3 | 3 | 25 | 75 | 100 |
| | IV | UGC Jeevan Kaushal Life Skills | Universal Human Values | 20UGVE | 2 | 2 | 3 | 25 | 75 | 100 |
| | **TOTAL** | | | | **30** | **21** | **-** | **-** | **-** | **600** |

| Sem | Part | Course | Title | Subject Code | Ins. | Credit | Exam | Marks | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Int | Ext | |
| II | I | Language Course – II (LC) - Tamil*/Other Languages +# | இடைக்கால இலக்கியமும், புதினமும் / Prose, Drama, History of Hindi Literature –II & Grammar - 2 / Poetry, Textual Grammar and Alakara / Communication in French –II | 19ULT2/ 19ULH2/ 19ULS2/ 19ULF2 | 6 | 3 | 3 | 25 | 75 | 100 |
| | II | English Language Course – II (ELC) | Functional Grammar for Effective Communication –II | 19UE2 | 6 | 3 | 3 | 25 | 75 | 100 |
| | III | Core Course – III (CC) | Analytical Geometry and Vector Calculus | 20UMA2CC3 | 6 | 5 | 3 | 25 | 75 | 100 |
| | | First Allied Course – II (AP) | Mathematical Statistics- II (Practical) | 19UMA2AC1P | 5 | 3 | 3 | 25 | 75 | 100 |
| | | First Allied Course – III (AC) | Mathematical Statistics-III | 19UMA2AC2 | 5 | 3 | 3 | 25 | 75 | 100 |
| | IV | Environmental Studies | Environmental Studies | 19UGES | 2 | 2 | 3 | 25 | 75 | 100 |
| | **TOTAL** | | | | **30** | **19** | **-** | **-** | **-** | **600** |

| Sem | Part | Course | Title | Subject Code | Ins. Hrs | Credit | Exam Hours | Marks Int | Marks Ext | Tot |
|---|---|---|---|---|---|---|---|---|---|---|
| III | I | Language Course – III (LC) – Tamil*/Other Languages +# | காப்பியமும், நாடகமும் / Medieval, Modern Poem, Poetics & History of Hindi Literature – 3 / Prose, Textual Grammar and Vakyarachana / Communication in French –III | 19ULT3/ 19ULH3/ 19ULS3/ 19ULF3 | 6 | 3 | 3 | 25 | 75 | 100 |
| | II | English Language Course – III (ELC) | Reading and Writing For Effective Communication- I | 19UE3 | 6 | 3 | 3 | 25 | 75 | 100 |
| | III | Core Course – IV CC) | Differential Equations and Laplace Transforms | 19UMA3CC4 | 5 | 5 | 3 | 25 | 75 | 100 |
| | | Core Course – V (CC) | Classical Algebra and Theory of Equations | 19UMA3CC5 | 5 | 5 | 3 | 25 | 75 | 100 |
| | | Second Allied Course – I (AC) | Programming in C | 19UMA3AC3 | 4 | 3 | 3 | 25 | 75 | 100 |
| | | Second Allied Course – II (AP) | Programming in C LAB | 19UMA3AC2P | 2 | - | - | - | - | - |
| | IV | Non Major Elective I – for those who studied Tamil under Part I<br>a) Basic Tamil for other language students<br>b) Special Tamil for those who studied Tamil up to 10th, +2 but opt for other languages in degree programme | Mathematics for Competitive Examinations-I | 19UMA3NME1 | 2 | 2 | 3 | 25 | 75 | 100 |
| | | | Basic Tamil | 19ULC3BT1 | | | | | | |
| | | | Special Tamil | 19ULC3ST1 | | | | | | |
| | **V** | **Extra Credit Course** | **Swayam Online Course** | **To be fixed Later** | **As Per UGC Recommendations** | | | | | |
| | **TOTAL** | | | | **30** | **21** | **-** | **-** | **-** | **600** |

| Sem | Part | Course | Title | Subject Code | Ins. | Credit | Exam Hours | Marks | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Int | Ext | |
| IV | I | Language Course – IV(LC) - Tamil*/Other Languages +# | பண்டைய இலக்கியம்<br>Letter Writing, Precise Writing, General Essays, Technical Terms, Proverbs, Amplifications, Idioms & Phrases, History of Hindi Literature – 4<br>Drama, History of Drama Literature<br>Communication in French –IV | 19ULT4/ 19ULH4/ 19ULS4/ 19ULF4 | 6 | 3 | 3 | 25 | 75 | 100 |
| | II | English Language Course – IV(ELC) | Reading and Writing For Effective Communication- II | 19UE4 | 6 | 3 | 3 | 25 | 75 | 100 |
| | III | Core Course – VI (CC) | Sequences and Series | 19UMA4CC6 | 5 | 5 | 3 | 25 | 75 | 100 |
| | | Second Allied Course – II (AP) | Programming in C LAB | 19UMA3AC2P | 2 | 2 | 3 | 40 | 60 | 100 |
| | | Second Allied Course – III (AC) | Principles of Information Technology | 19UMA4AC4 | 5 | 4 | 3 | 25 | 75 | 100 |
| | | Major Based Elective-I | Discrete Mathematics | 19UMA4MBE1A | 4 | 4 | 3 | 25 | 75 | 100 |
| | | | Automata Theory | 19UMA4MBE1B | | | | | | |
| | IV | Non Major Elective II – for those who studied Tamil under Part I<br>a) Basic Tamil for other language students<br>b) Special Tamil for those who studied Tamil up to10th, +2 but opt for other languages in degree programme | Mathematics for Competitive Examinations-II | 19UMA4NME2 | 2 | 2 | 3 | 25 | 75 | 100 |
| | | | Basic Tamil | 19ULC4BT2 | | | | | | |
| | | | Special Tamil | 19ULC4ST2 | | | | | | |
| | **V** | **Extra Credit Course** | **Swayam Online Course** | **To be fixed Later** | **As Per UGC Recommendations** | | | | | |
| | **TOTAL** | | | | **30** | **23** | **-** | **-** | **-** | **700** |

| Sem | Part | Course | Title | Subject Code | Ins. Hrs | Credit | Exam Hours | Marks Int | Marks Ext. | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| V | III | Core Course – VII (CC) | Abstract Algebra | 19UMA5CC7 | 6 | 6 | 3 | 25 | 75 | 100 |
| | | Core Course – VIII (CC) | Real Analysis | 19UMA5CC8 | 6 | 6 | 3 | 25 | 75 | 100 |
| | | Core Course – IX (CC) | Statics | 19UMA5CC9 | 5 | 4 | 3 | 25 | 75 | 100 |
| | | Core Course – X (CC) | Methods in Numerical Analysis | 19UMA5CC10 | 5 | 4 | 3 | 25 | 75 | 100 |
| | | Core Practical – I (CP) | Numerical methods with MATLAB Programming (Practical) | 19UMA5CC1P | 2 | 2 | 3 | 40 | 60 | 100 |
| | IV | Skill Based Elective – I | Introduction to R | 19UMA5SBE1A | 2 | 2 | 3 | 25 | 75 | 100 |
| | | | Introduction to Statistical Tools and Techniques – SPSS | 19UMA5SBE1B | | | | | | |
| | | Skill Based Elective – II | Statistical Tools and Techniques – R Programming (Practical) | 19UMA5SBE2AP | 2 | 2 | 3 | 40 | 60 | 100 |
| | | | Statistical Tools and Techniques – SPSS (Practical) | 19UMA5SBE2BP | | | | | | |
| | | **UGC Jeevan Kaushal Life Skills** | **Professional Skills** | **19UGPS** | **2** | **2** | **3** | **25** | **75** | **100** |
| | **V** | **Extra credit course** | **Swayam Online Course** | **To be fixed Later** | **As per UGC Recommendations** | | | | | |
| | **TOTAL** | | | | **30** | **28** | **-** | **-** | **-** | **800** |

| Sem | Part | Course | Title | Subject Code | Ins. Hrs | Credit | Exam Hours | Marks Int | Marks Ext. | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| VI | III | Core Course – XI (CC) | Linear Algebra | 19UMA6CC11 | 5 | 5 | 3 | 25 | 75 | 100 |
| | | Core Course – XII (CC) | Complex Analysis | 19UMA6CC12 | 5 | 5 | 3 | 25 | 75 | 100 |
| | | Core Course – XIII (CC) | Dynamics | 19UMA6CC13 | 5 | 4 | 3 | 25 | 75 | 100 |
| | | Core Course – XIV (CC) | Operations Research | 19UMA6CC14 | 4 | 4 | 3 | 25 | 75 | 100 |
| | | Major Based Elective – II | Graph Theory | 19UMA6MBE2A | 4 | 3 | 3 | 25 | 75 | 100 |
| | | | Number Theory | 19UMA6MBE2B | | | | | | |
| | | Major Based Elective – III | Fuzzy Sets and Systems | 19UMA6MBE3A | 4 | 3 | 3 | 25 | 75 | 100 |
| | | | Astronomy | 19UMA6MBE3B | | | | | | |
| | IV | Skill Based Elective – III | LaTeX (Practical) | 19UMA6SBE3AP | 2 | 2 | 3 | 40 | 60 | 100 |
| | | | Python Programming (Practical) | 19UMA6SBE3BP | | | | | | |
| | V | Gender Studies | Gender Studies | 19UGGS | 1 | 1 | 3 | 25 | 75 | 100 |
| | | Extension Activities | Extension Activities | 19UGEA | - | 1 | - | - | - | - |
| | **TOTAL** | | | | **30** | **28** | **-** | **-** | **-** | **800** |
| | **GRAND TOTAL** | | | | **180** | **140** | **-** | **-** | **-** | **4100** |

**List of Allied Courses**

| **Group I (Any one)** | **Group II (Any one)** |
|---|---|
| 1. Physics | 1. Chemistry |
| 2. Mathematical Statistics | 2. Computer Science |
| 3. Financial Accounting | 3. Management Accounting |

| | | | |
|---|---|---|---|
| Language Part – I | - | 4 | |
| English Part –II | - | 4 | |
| Core Paper | - | 14 | |
| Core Practical | - | 1 | |
| Allied Paper | - | 4 | |
| Allied Practical | - | 2 | |
| Non-Major Elective | - | 2 | |
| Skill Based Elective | - | 3 | |
| Major Based Elective | - | 3 | |
| Environmental Studies | - | 1 | |
| Value Education | - | 1 | |
| Soft Skill Development | - | 1 | |
| Gender Studies | - | 1 | |
| Extension Activities | - | 1 | (Credit only) |

➢ For those who studied Tamil up to $10^{th}$, +2 (Regular Stream)

\+ Syllabus for other Languages should be on par with Tamil at degree level

\# those who studied Tamil up to $10^{th}$,+2 but opt for other languages in degree level under Part I should study special Tamil in Part IV

** Extension Activities shall be outside instruction hours

Non Major Elective I & II – for those who studied Tamil under Part I

a) Basic Tamil I & II for other language students
b) Special Tamil I & II for those who studied Tamil up to $10^{th}$ or +2 but opt for other languages in degree programme

**Note:**

| | **Internal Marks** | **External Marks** |
|---|---|---|
| 1. Theory | 25 | 75 |
| 2. Practical | 40 | 60 |

3. Separate passing minimum is prescribed for Internal and External marks

**FOR THEORY**

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]

The passing minimum for University Examinations shall be 40% out of 75 marks [ i.e. 30 marks]

**FOR PRACTICAL**

The passing minimum for CIA shall be 40% out of 40 marks [i.e. 16 marks]

The passing minimum for University Examinations shall be 40% out of 60 marks [ i.e. 24 marks]

# SEMESTER I

## CORE COURSE-I (CC)

## DIFFERENTIAL CALCULUS AND TRIGONOMETRY

**2019-2020 Onwards**

| Semester - I | DIFFERENTIAL CALCULUS AND TRIGONOMETRY | Hours/Week – 5 | |
|---|---|---|---|
| CORE COURSE-I | | Credits – 5 | |
| Course Code – 19UMA1CC1 | | Internal 25 | External 75 |

**Objectives:**

- To inculcate the basics of differentiation and their applications.
- To introduce the notion of curvature, Evolutes and Involutes in polar co-ordinates.
- To understand the basic concepts of Trigonometry.

**Course Outcome:**

On the Successful completion of the course the student would be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Explain the basic concepts of differentiation, extreme functions of two variables. | K3 |
| CO2 | Apply the concept of differentiation for explaining curvature. | K3 |
| CO3 | Distinguish the trigonometric functions, related problems. | K3 |
| CO4 | Associate various types of hyperbolic and inverse hyperbolic functions and Solve problems in summation of trigonometric series. | K4 |
| CO5 | Examine the conceptual understanding and fluency with trigonometric functions, techniques and manipulations necessary for success in calculus. | K4 |

**Mapping with Programme Outcomes:**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | S | M | S | S | S |
| CO2 | M | S | S | M | S |
| CO3 | S | S | M | M | S |
| CO4 | S | S | M | M | S |
| CO5 | M | M | S | S | M |

**S-Strong, M-Medium, L-Low**

**CORE COURSE-I (CC)**

**DIFFERENTIAL CALCULUS AND TRIGONOMETRY**

**SYLLABUS**

**UNIT I**

Successive Differentiation: The $n^{th}$ derivative – Standard results – Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz formula for the $n^{th}$ derivative of a product – A complete formal proof by induction.

Meaning of the Derivative: Geometrical interpretation – Meaning of the sign of the differential coefficient. Maxima and Minima of functions of two variables.

**UNIT II**

Curvature – Circle, radius and centre of curvature – Cartesian formula for the radius of curvature – The coordinates of the centre of curvature – Evolute and Involute - Radius of curvature when the curve is given in polar coordinates.

**UNIT III**

Expansions of cos nθ and sin nθ – Expansion of tan nθ in powers of tan θ – Expansion of tan( A + B + C + …) (omitting examples on formation of equations) - Powers of sines and cosines of θ in terms of functions of multiples of θ – Expansion of $\sin^n \theta$ and $\cos^n \theta$ when n is a positive integer– Expansions of sin θ and cos θ in a series of ascending powers of θ.

**UNIT IV**

Hyperbolic functions – Relation between hyperbolic functions – Inverse hyperbolic functions.

**UNIT V**

Logarithms of complex quantities - To find the logarithm of x + iy – General value of logarithm of x + iy – Summation of Trigonometrical Series – Method of differences – Some of series of n angles in arithmetic progression – Sum of cosines of n angles in arithmetic progression – Gregory's series.

**TEXT BOOKS:**

| S.No | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | S. Narayanan, T. K.Manicavachagom Pillay | Calculus, Volume I | S. Viswanathan (Printer & publishers), Pvt Ltd | 2015 |
| 2. | S. Narayanan, T. K.Manicavachagom Pillay | Trigonometry | S. Viswanathan (Printer & publishers), Pvt Ltd | 2013 |

**CHAPTERS AND SECTIONS:**

| UNIT | CHAPTER | SECTIONS |
|---|---|---|
| I | 3<br>4<br>8 | 1.1 – 1.6 [1]<br>2.1 & 2.2 [1]<br>4 & 4.1[1] |
| II | 10 | 2.1 - 2.6 [1] |
| III | 3 | 1, 2, 3, 4, 4.1, 5 & 5.1 [2] |
| IV | 4 | 1, 2, 2.1 - 2.3 [2] |
| V | 5<br>6 | 5, 5.1, 5.2 [2]<br>1, 2, 3.1 [2] |

**REFERENCE BOOKS:**

| S.No | Authors Name | Title of the book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | S. Arumugam and Issac | Calculus, Volume I | New Gamma Publishing House | 1991 |
| 2. | S. Narayanan, T.K. Manichavasagam Pillai | Trigonometry | S. Viswanathan Pvt Limited and Vijay Nicole Imprints Pvt Limited | 2004 |
| 3. | A.Singaravelu and R.Rama | Differential Calculus and Trigonometry | R publications, Nagapattinam | 2003 |

**Pedagogy:**

Power point presentation, Group Discussion, Seminar, Quiz, Assignment.

**CORE COURSE-II (CC)**

**INTEGRAL CALCULUS AND FOURIER SERIES**

**2019-2020 Onwards**

| **Semester - I** | | **Hours/Week – 6** | |
|---|---|---|---|
| **CORE COURSE-II** | **INTEGRAL CALCULUS AND FOURIER SERIES** | **Credits – 5** | |
| **Course Code – 19UMA1CC2** | | **Internal** | **External** |
| | | **25** | **75** |

**Objectives:**

- To inculcate the basics of Integration and their applications.
- To introduce the order of Integration, Triple Integrals, Beta and Gamma functions.
- To understand the basic concepts of Fourier series.

**Course Outcomes:**

On the successful completion of the course, students will be able to

| **CO Number** | **CO Statement** | **Knowledge Level** |
|---|---|---|
| **CO1** | Apply the concepts of double, triple integrals. | **K3** |
| **CO2** | Distinguish the concepts of Beta and Gamma functions. | **K3** |
| **CO3** | Apply the concepts of half range Fourier series for solving problems necessary for success in calculus. | **K3** |
| **CO4** | Associate various types of Fourier series for solving problems. | **K4** |
| **CO5** | Evaluate the types of integration**.** | **K5** |

**Mapping with Programme Outcomes:**

| **COs/POs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
|---|---|---|---|---|---|
| **CO1** | S | M | S | S | S |
| **CO2** | M | S | S | S | S |
| **CO3** | S | S | M | M | S |
| **CO4** | S | S | M | M | S |
| **CO5** | S | M | S | S | M |

**S - Strong, M - Medium, L - Low**

**CORE COURSE-II (CC)**

**INTEGRAL CALCULUS AND FOURIER SERIES**

**SYLLABUS**

**UNIT I**

Integration: Integration of rational algebraic functions $\int \frac{lx+m}{ax^2+bx+c}dx$ - Integration of Irrational functions $\int \frac{px+q}{\sqrt{ax^2+bx+c}}dx$ - Any expression of the form $\int \frac{dx}{(x-k)\sqrt{ax^2+bx+c}}$ - $\int \frac{dx}{a+b\cos x}$ (Integration of these types only)

**UNIT II**

Multiple Integrals: Definition of the double integral - Evaluation of the double Integral- Triple Integrals.

**UNIT III**

Improper Integrals: Beta and Gamma functions: Definitions - convergence of $\Gamma(n)$ - Recurrence formula of gamma functions - Properties of Beta functions - Relation between Beta and Gamma functions -Definite integrals using Gamma functions.

**UNIT IV**

Fourier Series- Definition - Fourier Series expansion of periodic functions with period $2\pi$ - Even and Odd functions.

**UNIT V**

Half-Range Fourier Series - Definition - Development in cosine series and sine series – Change of Interval - Combination of Series.

**TEXT BOOKS:**

| S.No | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | S. Narayanan, T.K.Manicavachagam Pillai. | Calculus Vol II | S. Viswanathan (Printer & publishers), Pvt Ltd | 2015 |
| 2. | S. Narayanan, T.K.Manicavachagam Pillai. | Calculus Vol III | S. Viswanathan (Printer & publishers), Pvt Ltd | 2014 |

**CHAPTERS AND SECTIONS:**

| UNIT | CHAPTER | SECTIONS |
|---|---|---|
| I | 7<br>8<br>9 | 7.3 (Type II)[1]<br>Case II and case V[1]<br>Full [1] |
| II | 5 | 2.1, 2.2 & 4 [1] |
| III | 7 | 2.1-2.3, 3 to 5 [1] |
| IV | 6 | 1, 2, 3 [2] |
| V | 6 | 4, 5.1, 5.2, 6, 7 [2] |

**REFERENCE BOOKS:**

| S.No | Authors Name | Title of the book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | Shanti Narayan | Integral Calculus | S.Chand & Company Ltd | 2002 |
| 2. | Shanti Narayan & P.K.Mittal | Integral Calculus | S.Chand & Company Ltd | 2008 |
| 3. | U.P.Singh, R.J.Srivastava & N.H.Siddiqui | Integral Calculus | Wistom Press | 2011 |
| 4. | J.K.Goyal & K.P.Gupta | Laplace and Fourier Transforms | Pragati Prakashan | 2009 |

**Pedagogy:**

Power point presentation, Group Discussion, Seminar, Quiz, Assignment.

**FIRST ALLIED COURSE-I (AC)**

**MATHEMATICAL STATISTICS – I**

**2019-2020 Onwards**

| **Semester – I** | | **Hours/Week – 5** | |
|---|---|---|---|
| **FIRST ALLIED COURSE-I** | **MATHEMATICAL STATISTICS – I** | **Credits – 3** | |
| **Course Code – 19UMA1AC1** | | **Internal** | **External** |
| | | **25** | **75** |

**Objectives:**

- To learn the basic concepts of statistics.
- To learn the basic ideas of statistical tools.

**Course Outcomes:**

On the successful completion of the course, students will be able to

| **CO Number** | **CO Statement** | **Knowledge Level** |
|---|---|---|
| **CO1** | Describe the concept of probability theory and identify applications in real situations. | **K2** |
| **CO2** | Explain the derivation of moment generating function, characteristic function, probability generating function and the proof of Chebychev's inequality with its applications. | **K2** |
| **CO3** | Compute the index numbers by different types of methods. | **K3** |
| **CO4** | Define and Classify the two dimensional random variables. | **K3** |
| **CO5** | Interpret the various properties of expectation, variance and The concept of covariance. | **K3** |
| **CO6** | Distinguish between a discrete and a continuous random variable. | **K4** |

**Mapping with Programme Outcomes:**

| **COs/ POs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
|---|---|---|---|---|---|
| **CO1** | S | S | S | S | S |
| **CO2** | S | S | S | S | S |
| **CO3** | S | S | M | S | S |
| **CO4** | S | S | S | S | S |
| **CO5** | S | S | S | S | S |
| **CO6** | S | S | S | S | S |

**S- Strong; M-Medium; L-Low**

**FIRST ALLIED COURSE-I (AC)**

**MATHEMATICAL STATISTICS – I**

**SYLLABUS**

**UNIT I**

Theory of probability : Introduction – Short History – Definitions of Various Terms – Mathematical or Classical or 'a Priori' Probability – Statistical or Empirical Probability – Mathematical Tools: Preliminary Notion of sets – Sets and Elements of Sets – Operations on Sets – Algebra of Sets - Axiomatic approach to Probability – Random Experiment (Sample Space) – Event – Some Illustrations – Algebra of Events – Probability : Mathematical Notion – Probability Function – Laws of Addition of Probabilities – Extension of General Law of Addition of Probabilities – Law of Multiplication or Theorem of Compound Probability – Extension of Multiplication Law of Probability – Independent Events – Pair wise Independent Events – Mutually Independent Events – Baye's theorem.

**UNIT-II**

Random Variables and Distribution Functions : Random Variable – Distribution Functions – Properties of Distribution Function – Discrete Random Variable – Probability Mass Function – Discrete Distribution Function – Continuous Random Variable – Probability Density Function – Various Measures of Central Tendency, Dispersion, Skewness and Kurtosis for Continuous Probability Distribution Function – Continuous Distribution Function – Joint Probability Mass Function and Marginal and Conditional Probability Function – Joint Probability Distribution Function – Joint Density Function, Marginal Density Function - Independent Random Variables – The Conditional Distribution Function and Conditional Probability Density Function.

**UNIT-III**

Mathematical Expectation – Addition Theorem of Expectation – Multiplication Theorem of Expectation – Co-variance – Expectation of a Linear Combination of Random Variables – Variance of a Linear Combination of Random Variables – Expectation of a Continuous random variable – Conditional Expectation and Conditional Variance.

**UNIT-IV**

Moment Generating Function – Theorems on moment Generating Functions– Cumulants– Additive Property of Cumulants – Effect of Change of Origin and Scale of

Cumulants – Characteristic Function – Properties of Characteristic Functions – Uniqueness Theorem of Characteristic Functions – Chebychev's Inequality – Weak Law of Large Numbers– Bernoulli's Law of Large Numbers.

**UNIT-V**

Index numbers : Introduction – Meaning – Definition – Characteristics – Uses – Types of Index Numbers – Problems in the Construction of Index Numbers – Choice of Formula – Notations – Unweighted Index Numbers – Weighted Index Numbers – Quantity Index Numbers – Test of Consistency of Index numbers – Chain Base Method – Conversion of Chain Index into Fixed Index – Base Shifting – Splicing two Index Number Series – Deflating Index Numbers – Consumer Price Index – Meaning and Need – Uses – Construction of Consumer Price Index – Method of Constructing Consumer Price Index numbers – Aggregate Expenditure method – Family Budget method – Limitations of Index Numbers.

**TEXT BOOKS:**

| S.No | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | S.C.Gupta & V.K.Kapoor | Elements Of Mathematical Statistics | Sultan Chand & Sons, New Delhi | 2004 |
| 2. | R.S.N.Pillai & Bhagavathi | Statistics, Theory And Practice | S.Chand & Sons, New Delhi | 2008 |

**CHAPTERS AND SECTIONS:**

| UNIT | CHAPTER | SECTIONS |
|---|---|---|
| I | 4 | 4.1 to 4.8 [1] |
| II | 5 | 5.1 to 5.5.5 [1] |
| III | 6 | 6.1 to 6.8 [1] |
| IV | 6 | 6.9 to 6.13.1 [1] |
| V | 14 | Full [2] |

**REFERENCE BOOKS:**

| S.No | Authors Name | Title of the book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | S.C.Gupta & V.K.Kapoor | Fundamentals Of Mathematical Statistics | Sultan Chand & Sons. | 2015 |
| 2. | T.Veerarajan | Probability, Statistics And Random Processes | Tata McGraw Hill education Private Limited | 2010 |
| 3. | G.S.S.Bhisma Rao | Probability And Statistics | Scitech Publications (India) Pvt. Ltd | 2011 |

**Pedagogy:**

Power point presentation, Group Discussion, Seminar, Quiz, Assignment.

# SEMESTER II

## CORE COURSE-III (CC)

## ANALYTICAL GEOMETRY AND VECTOR CALCULUS

**2020-2021 Onwards**

| Semester - II | ANALYTICAL GEOMETRY AND VECTOR CALCULUS | Hours/Week – 6 | |
|---|---|---|---|
| CORE COURSE-III | | Credits – 5 | |
| Course Code – 20UMA2CC3 | | Internal 25 | External 75 |

**Objectives:**

- To understand the concepts and properties of analytical geometry.
- To understand the concepts of plane, straight line and sphere.
- To familiarize the students with the principles and practices of vector calculus.
- To familiarize the students with vector integration.

**Course Outcome:**

On the Successful completion of the course the student would be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| **CO1** | Explain the coordinates in space, equation of a plane. | **K3** |
| **CO2** | Describe the concepts of straight lines and coplanar lines. | **K3** |
| **CO3** | Classify the equation of a sphere and tangent planes. | **K3** |
| **CO4** | Solve the problems of Gauss Divergence Theorem, Stokes Theorem- Green's Theorem. | **K3** |
| **CO5** | Examine the concepts of vector integration for finding scalar potential. | **K4** |

**Mapping with Programme Outcomes:**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | S | M | S | S | S |
| **CO2** | M | S | S | S | S |
| **CO3** | S | S | M | M | S |
| **CO4** | S | S | M | M | M |
| **CO5** | S | S | S | S | M |

**S-Strong, M-Medium, L-Low**

## CORE COURSE-III (CC)

## ANALYTICAL GEOMETRY AND VECTOR CALCULUS

## SYLLABUS

**UNIT I:**

Coordinate System: Introduction-Rectangular Cartesian Coordinates-Distance between two Points-Direction Cosines.

Planes: Equation of a Plane – Angle Between two Planes – Angle Bisectors of two Planes.

**UNIT II:**

Straight Lines: Equation of a Straight Line – A Plane and a Line – Equations of Two Skew Lines in a Simple form.

The Sphere: Introduction – Equation of a Sphere – Tangent Line and Tangent Plane – Section of a Sphere.

**UNIT III:**

Vector Differentiation: Introduction – Vector Algebra- Differentiation of Vectors – Gradient - Divergence and Curl.

**UNIT IV:**

Vector Integration - Line integrals-Normal Surface Integral $\int_S \vec{F}.\hat{n}dS$ -Flux across a Surface-Volume Integral $\int_V F.dv$

**UNIT V:**

Gauss's Divergence Theorem $\int_S \vec{F}.\hat{n}dS = \int_V div\,\vec{F}dv$ -Stoke's theorem $\int_C \vec{F}.\hat{n}d\vec{r} = \int_S curl\,\vec{F}.\,\hat{n}dS$ -Green's theorem-Stoke's theorem in space- Stoke's theorem in Cartesian form.

**TEXT BOOKS:**

| S.No | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | S. Arumugam and A. Thangapandi Isaac | Analytical Geometry 3D & Vector Calculus | New Gamma Publishing House, 2011 | 2011 |
| 2. | M.L.Khanna | Vector Calculus | Jai Prakash Nath and Co., | 2002 |

**CHAPTERS AND SECTIONS:**

| UNIT | CHAPTER | SECTIONS |
|---|---|---|
| I | I | 1.0 - 1.3 [1] |
| | II | 2.1 - 2.3[1] |
| II | III | 3.1 - 3.3 [1] |
| | IV | 4.0 - 4.3 [1] |
| III | V | 5.0 - 5.4 [1] |
| IV | III | 1 – 4 [2] |
| V | III | 5 – 8 [2] |

**REFERENCE BOOKS:**

| S.No | Authors Name | Title of the book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | P.Duraipandiyan, Lakshmi Duraipandian and D.Muhilan | Analytical Geometry Three dimensionsal | Emerald Publishers | 1984 |
| 2. | H.D.Pandey, M.Q.Khan and B.N.Gupta | A Text Book of Analytical Geometry and Vector Analysis | Wisdom Press | 2011 |
| 3. | P.Duraipandiyan and Lakshmi Duraipandian | Vector Analysis | Emerald Publishers | 1986 |

**Pedagogy:**

Power point presentation, Group Discussion, Seminar, Quiz, Assignment.

**FIRST ALLIED COURSE – II (AC)**

**MATHEMATICAL STATISTICS – II (PRACTICAL)**

**2019-2020 Onwards**

| **Semester - II** | **MATHEMATICAL STATISTICS – II (PRACTICAL)** | **Hours/Week – 5** | |
|---|---|---|---|
| **FIRST ALLIED COURSE-II** | | **Credits – 3** | |
| **Course Code – 19UMA2AC1P** | | **Internal 25** | **External 75** |

**Objectives:**

- To analyze the statistical problems.
- To provide the knowledge to interpret and solve the statistical problems.
- To ensure with the ideas of statistical tools.

**Course Outcome:**

On the Successful completion of the course the student would be able to

| **CO Number** | **CO Statement** | **Knowledge Level** |
|---|---|---|
| **CO1** | Identify the discrete and continuous data and find average through the Measures of Central Tendency and Measures of Dispersion. | **K1** |
| **CO2** | Solve the problems in joint, Marginal and Conditional Probability distributions involving two random variables. | **K2** |
| **CO3** | Explain the various methods of finding Correlation and Regression co-efficient between two data sets and their applications. | **K2** |
| **CO4** | Describe and illustrate the concepts of fitting probability distributions. | **K2** |
| **CO5** | Analyze the concepts of testing of hypothesis and apply the test to the real life problems. | **K3** |

**Mapping with Programme Outcomes:**

| **COs/POs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
|---|---|---|---|---|---|
| **CO1** | M | S | S | S | S |
| **CO2** | M | S | M | S | S |
| **CO3** | S | S | S | S | S |
| **CO4** | S | S | S | S | S |
| **CO5** | S | S | S | S | S |

**S-Strong, M-Medium, L-Low**

**FIRST ALLIED COURSE – II (AC)**

**MATHEMATICAL STATISTICS – II (PRACTICAL)**

**SYLLABUS**

**UNIT I**

Measures of central tendency: Arithmetic Mean – Median – Quartiles – Deciles – Percentiles – Mode – Geometric Mean – Harmonic Mean – Measures of Dispersion: Range and Quartile Deviation – Mean Deviation – Standard Deviation –Co-efficient of variation – Skewness – Moments – Kurtosis.

**UNIT II**

Karl Pearson's Coefficient of Correlation – Rank correlation – Regression.

**UNIT III**

Theoretical Distributions: Binomial Distribution – Poisson Distribution – Normal Distribution.

**UNIT IV**

Two-dimensional Random Variables – Two-dimensional or Joint Probability Mass Function – Two-dimensional Distribution Function – Marginal Distribution Function – Joint Density Function, Marginal Density Function – The Conditional Distribution Function and Conditional Probability Density Function (Problems only).

**UNIT V**

Tests of Hypotheses: Test of Significance for Large Samples – Test of significance of the difference between sample proportion and population proportion – Test of significance of the difference between two sample proportions – Test of significance of the difference between sample mean and population mean – Test of significance of the difference between the mean two samples – Test of significance of the difference between sample S.D. and population S.D.– Test of significance of the difference between S.D.'s of two large samples – Test of Significance for small Samples : Tests of significance based on t-test for Mean – F-test for Variance - Chi-square test for goodness of fit and independence of attributes (Problems only).

**TEXT BOOKS:**

| S.No | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | R.S.N. Pillai and Bagavathi. | Practical Statistics | Sultan Chand & Sons. | 2008 |
| 2. | S.C.Gupta & V.K.Kapoor | Fundamentals Of Mathematical Statistics | Sultan Chand & Sons. | 2015 |
| 3. | T.Veerarajan | Probability, Statistics And Random Processes | Tata McGraw Hill education Private Limited | 2010 |

**CHAPTERS AND SECTIONS:**

| UNIT | CHAPTER | SECTIONS |
|---|---|---|
| I | 3 , 4 , 5 | FULL [1] |
| II | 6 , 7 | FULL [1] |
| III | 13 | FULL [1] |
| IV | 5 | 5.5, 5.5.1-5.5.5 [2] |
| V | 9 | FULL [3] |

**REFERENCE BOOKS:**

| S.No | Authors Name | Title of the book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | R.S.N.Pillai & Bhagavathi | Statistics, Theory And Practice | S.Chand & Sons | 2008 |
| 2. | V.Rajagopalan | Selected Statistical Tools | New Age International (P) Ltd Publishers | 2006 |
| 3. | G.S.S.Bhisma Rao | Probability and Statistics | Scitech Publications (India) Private Limited, New Delhi | 2011 |

**Pedagogy:**

Power point presentation, Group Discussion, Seminar, Quiz, Assignment.

**LIST OF PROGRAMS:**

1) Arithmetic Mean, Geometric Mean and Harmonic Mean.
2) Median and Mode.
3) Quartile Deviation and Mean Deviation.
4) Standard Deviation and Co-efficient of Variation.
5) Karl Pearson's Co-efficient of Skewness.
6) Bowley's Co-efficient of Skewness.
7) Moments and Kurtosis.
8) Karl Pearson's Co-efficient of correlation.
9) Rank Correlation.
10) Fit a regression line.
11) Fit a Binomial distribution.
12) Fit a Poisson distribution.
13) Fit a Normal distribution.
14) Marginal and conditional distribution for X and Y.
15) Mathematical Expectation for X and Y.
16) Test the hypothesis of the difference between two sample means.
17) Test the hypothesis for single proportion.
18) Test the significance of hypothesis using 't' test.
19) Test the significance of hypothesis using 'F' test.
20) Test the significance of hypothesis using chi-square test.

**FIRST ALLIED COURSE – III (AC)**

**MATHEMATICAL STATISTICS – III**

**2019-2020 Onwards**

| Semester - II | MATHEMATICAL STATISTICS – III | Hours/Week – 5 | |
|---|---|---|---|
| FIRST ALLIED COURSE-III | | Credits – 3 | |
| Course Code – 19UMA2AC2 | | Internal 25 | External 75 |

**Objectives:**

- To enable the students to learn the basic concepts of discrete distribution.
- To make the students analyze the concepts of continuous distribution.
- To ensure the students with the ideas of statistical tools.

**Course Outcome:**

On the Successful completion of the course the student would be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| **CO1** | Define the chi square Distribution and discuss the applications of chi square Distribution to conduct tests of goodness of fit and independence of attributes. | **K2** |
| **CO2** | Explain Student's t, Fisher's t and F statistics and derive their probability Distribution. | **K2** |
| **CO3** | Identify the concepts of a discrete probability Distribution and compute the moments, Cumulants, m.g.f and various constants of a discrete probability Distribution and its applications. | **K3** |
| **CO4** | Describe the concepts of a continuous probability Distribution and compute the moments, Cumulants, m.g.f and various constants of a continuous probability Distribution and its applications. | **K3** |
| **CO5** | Classify the various properties of the correlation and regression co-efficient and their applications. | **K3** |

**Mapping with Programme Outcomes:**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | S | S | S | S | S |
| **CO2** | S | S | M | S | S |
| **CO3** | S | S | S | S | S |
| **CO4** | S | S | S | S | S |
| **CO5** | S | S | S | S | S |

**S-Strong, M-Medium, L-Low**

**FIRST ALLIED COURSE – III**

**MATHEMATICAL STATISTICS – III**

**SYLLABUS**

**UNIT I**

Introduction – Discrete uniform Distribution – Bernoulli Distribution : Moments of Bernoulli Distribution - Binomial Distribution : Moments of Binomial Distribution – Recurrence Relation for the Moments of Binomial Distribution – Factorial Moments of Binomial Distribution –Mean Deviation about Mean of Binomial Distribution – Mode of Binomial Distribution – Moment Generating Function of Binomial Distribution – Additive Property of Binomial Distribution –Characteristic Function of Binomial Distribution – Cumulants of the Binomial Distribution –Poisson Distribution : The Poisson Process – Moments of the Poisson Distribution – Mode of the Poisson Distribution – Recurrence Relation for Moments of the Poisson Distribution – Moment Generating Function of the Poisson Distribution – Characteristic Function of the Poisson Distribution – Cumulants of the Poisson Distribution – Additive or Reproductive Property of Independent Poisson Variates – Probability Generating Function of Poisson Distribution.

**UNIT II**

Introduction – Normal Distribution : Normal Distribution as a Limiting Form of Binomial Distribution – Chief Characteristics of the Normal Distribution and Normal Probability curve – Mode of Normal Distribution – Median of Normal Distribution – M.G.F. of Normal Distribution – Cumulant Generating Function (c.g.f.) of Normal Distribution – Moments of Normal Distribution – A Linear Combination of Independent Normal Variates – Points of Inflexion of Normal Curves – Mean Deviation About the Mean for Normal Distribution – Area Property (Normal Probability Integral) – Error Function – Importance of Normal Distribution – Fitting of Normal Distribution – Rectangular (or Uniform) Distribution : Moments ofRectangular Distribution – M.G.F. of Rectangular Distribution – Characteristic Function of Rectangular Distribution – Mean Deviation (about mean) of Rectangular Distribution.

**UNIT III**

Gamma Distribution : M.G.F. of Gamma Distribution – Cumulants Generating Function of Gamma Distribution – Additive Property of Gamma Distribution – Beta Distributions of first kind : Constants of Beta Distributions of first kind – Beta Distributions of second kind : Constants of Beta Distributions of second kind – Exponential Distribution : Moment Generating Function of Exponential Distribution.

**UNIT IV**

Correlation : Introduction – Meaning of Correlation – Scatter Diagram – Karl Pearson's Co-efficient of Correlation : Limits for Correlation Co-efficient – Assumptions Underlying Karl Pearson's Correlation Co-efficient – Rank Correlation : Spearman's Rank Correlation Co-efficient – Repeated Ranks – Repeated Ranks (continued) – Linear Regression : Introduction – Linear Regression : Regression Co-efficient - Properties of Regression Co-efficient – Angle between two lines of Regression – Standard Error of Estimate or Residual Variance – Correlation Co-efficient between Observed and Estimated Values.

**UNIT V**

Chi-Square Distribution : Introduction – Derivation of the Chi-Square Distribution –M.G.F. of Chi-Square Distribution : Cumulant Generating Function of $\chi^2$ Distribution – Limiting Form of $\chi^2$ Distribution for large degree of Freedom –Characteristic Function of $\chi^2$ Distribution – Mode and Skewness of $\chi^2$ Distribution – Additive Property of $\chi^2$ Variates – Chi- Square Probability Curve – Students'' Distribution : Introduction – Derivation of the Students't' Distribution – Fisher's't' – Distribution of Fisher's't' – Constants of t-distribution – Limiting Form of 't' Distribution – Graph of 't' Distribution – Critical Values of t – F-Distribution : Derivation of Snedecor's F- Distribution – Constants of F– Distribution – Mode and Points of Inflexion of F- Distribution – Relation between t and F Distributions – Relation between F and $\chi^2$ Distributions.

**TEXT BOOKS:**

| S.No | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | S.C.Gupta & V.K.Kapoor | Fundamentals Of Mathematical Statistics | Sultan Chand & Sons. | 2015 |

**CHAPTERS AND SECTIONS:**

| UNIT | CHAPTER | SECTIONS |
|---|---|---|
| I | 8 | 8.1 to 8.5.9 (omit 8.4.10 to 8.4.12 and 8.5.10) [1] |
| II | 9 | 9.1 to 9.3.4 (omit 9.2.15) [1] |
| III | 9 | 9.5 to 9.8.1 [1] |
| IV | 10<br>11 | 10.1 to 10.4.2 & 10.7, 10.7.1 to 10.7.3 [1]<br>11.1 to 11.2.5 [1] |
| V | 15<br>16 | 15.1 to 15.3.6 [1]<br>16.1 to 16.2.7, 16.5, 16.5.1 to 16.5.3, 16.7, 16.8 [1] |

**REFERENCE BOOKS:**

| S.No | Authors Name | Title of the book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | S.C.Gupta & V.K.Kapoor | Elements Of Mathematical Statistics | Sultan Chand & Sons | 2004 |
| 2. | R.S.N.Pillai & Bhagavathi | Statistics, Theory And Practice | S.Chand & Sons | 2008 |
| 3. | G.S.S.Bhishma Rao | Probability And Statistics | Scitech Publications (India) Pvt Ltd | 2011 |

**Pedagogy:**

Power point presentation, Group Discussion, Seminar, Quiz, Assignment.

# SEMESTER III

## CORE COURSE-IV (CC)

## DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS

**2019-2020 Onwards**

| Semester – III | DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS | Hours/Week – 5 | |
|---|---|---|---|
| CORE COURSE-IV | | Credits – 5 | |
| Course Code – 19UMA3CC4 | | Internal 25 | External 75 |

**Objectives:**

- To give an in-depth knowledge of solving Ordinary differential equations including separable, homogeneous, exact, and linear.
- To acquire the knowledge of solving problems using partial differential equations.
- To know the concepts of Laplace transforms and the Inverse Laplace transforms with applications.

**Course Outcome:**

On the Successful completion of the course the student would be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| **CO1** | Define Laplace transform & its inverse. | **K1** |
| **CO2** | Illustrate the notion of order & degree of the ordinary differential equations. | **K2** |
| **CO3** | Rephrase the partial differential equations by eliminating constants and arbitrary functions. | **K2** |
| **CO4** | Apply the method of variation of parameters for finding the solutions of second order ordinary differential equations. | **K3** |
| **CO5** | Compute general, singular & particular integrals for standard forms. | **K3** |
| **CO6** | Solve the ordinary differential equations by Laplace Transforms and inverse Laplace transforms. | **K3** |

**Mapping with Programme Outcomes:**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | S | M | S | S | S |
| **CO2** | M | M | M | M | S |
| **CO3** | S | S | S | S | M |
| **CO4** | S | S | S | S | M |
| **CO5** | S | S | S | S | M |
| **CO6** | S | S | S | S | M |

**S-Strong, M-Medium, L-Low**

**CORE COURSE-IV (CC)**

**DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS**

**SYLLABUS**

**UNIT – I:**

**Equations of the first order but of higher degree:**

Equations solvable for dy/dx – Equations solvable for y – Equations solvable for x – Clairaut's form – Extended form of Clairaut's form – Exact differential equations – Conditions of integrability of $M\,dx + N\,dy = 0$ – Practical rule for solving an exact differential equation – Rules for finding integrating factors – simple problems.

**UNIT –II:**

**Linear equations with constant coefficients:**

Definition – The operator D – Complementary function of a linear equation with constant coefficients – Particular integral – General method of finding P.I. – Special methods for finding P.I. of the forms $e^{ax}$, $\cos ax$ or $\sin ax$, $e^{ax}V$, $x^m$ – Linear equations with variable coefficients – Methods of finding particular integrals – Special method of evaluating the P.I. when X is of the form $x^m$ – Method of Variation of Parameters (Omit third & higher order equations).

**UNIT –III:**

**Partial differential equations of the first order:**

Classification of Integrals – Derivation of partial differential equations – By elimination of constants – By elimination of an arbitrary function – Lagrange's method of solving the linear equation – Special methods for some standard forms $F(p,q) = 0, F(x,p,q) = 0, F(y,p,q) = 0, F(z,p,q) = 0, f_1(x,p) = f_2(y,q)$ – Clairant's form – Equations reducible to the standard forms – Charpit's method – Solving of few standard forms from Charpit's method.

**UNIT – IV:**

**Partial differential equations of higher order:**

Introduction – Homogeneous differential equation – Methods of finding C.F. – Methods of finding P.I. of the forms $e^{ax+by}$, $x^r y^s$, $\sin(ax+by)$ or $\cos(ax+by)$, $e^{ax+by}\phi(x,y)$, $\sin ax \sin by$ or $\cos ax \cos by$.

**UNIT – V:**

**Laplace transforms & inverse laplace transforms:**

Definition – Piecewise continuity – Sufficient conditions for the existence of the Laplace Transforms – Basic results – Laplace Transform of periodic functions – Some general

theorems & simple applications – Evaluation of certain integrals using Laplace Transform – The Inverse Laplace Transforms –Modification of results in Laplace Transform to get the inverse Laplace Transform – Use of Laplace Transforms in solving ODE with constant coefficients.

**TEXT BOOKS:**

| S.No | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | S.Narayanan & T.K.Manicavachagom Pillay | Differential Equations And Its Applications | S.Viswanathan Publishers Pvt. Ltd | 2016 |
| 2. | Dr.S.Arumugam & Mr.A.Thangapandi Isaac | Differential Equations And Applications | New Gamma publishing House | 2014 |

**CHAPTERS AND SECTIONS:**

| UNIT | CHAPTER | SECTIONS |
|---|---|---|
| I | 4 | 1-3 [1] |
| | 2 | 6 [1] |
| II | 5 | 1-5 [1] |
| | 8 | 4 [1] |
| III | 12 | 1-6 [1] |
| IV | 5 | 1-2 [2] |
| V | 9 | 1-8 [1] |

**REFERENCE BOOKS:**

| S.No | Authors Name | Title of the book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | M.D.Raisinghania | Ordinary and Partial Differential Equations | S.Chand & Company | 2008 |

**Pedagogy:**

Power point presentation, Group Discussion, Seminar, Quiz, Assignment.

**CORE COURSE-V (CC)**

**CLASSICAL ALGEBRA AND THEORY OF EQUATIONS**

**2019-2020 Onwards**

| Semester - III | CLASSICAL ALGEBRA AND THEORY OF EQUATIONS | Hours/Week – 5 | |
|---|---|---|---|
| CORE COURSE-V | | Credits – 5 | |
| Course Code – 19UMA3CC5 | | Internal 25 | External 75 |

**Objectives:**

- To establish a sound knowledge on theory of equations.
- To inculcate the students in applicable algebra.

**Course Outcome:**

On the Successful completion of the course the student would be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Explain relation between roots and co-efficients of Polynomial equations. | K2 |
| CO2 | Apply symmetric functions in solving equations and find sum of $r^{th}$ power of roots. | K3 |
| CO3 | Compute transformation of equations and solve Reciprocal equations. | K3 |
| CO4 | Interpret the quotient and remainder, Find removal of terms and form an equation whose roots are any power. | K2 |
| CO5 | Describe transformation in general with Descarte's rule of signs. | K2 |
| CO6 | Classify inequalities in all manners. | K3 |
| CO7 | Explain theory of numbers with its applications. | K2 |

**Mapping with Programme Outcomes:**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | S | S | S | S | S |
| CO2 | S | S | S | S | S |
| CO3 | S | S | M | S | M |
| CO4 | S | M | S | S | S |
| CO5 | S | S | M | S | M |
| CO6 | S | S | S | S | S |
| CO7 | S | S | S | S | S |

**S-Strong, M-Medium, L-Low**

**CORE COURSE-V (CC)**

**CLASSICAL ALGEBRA AND THEORY OF EQUATIONS**

**SYLLABUS**

**UNIT I**

Relation between the roots and coefficients of Equations – Symmetric function of the roots – Sum of the powers of the roots of an equation

**UNIT II**

Newton's theorem on the sum of the power of the roots-Transformations of Equations– Reciprocal equations – To increase or decrease the roots of a given equation by a given quantity.

## UNIT III

Form of the quotient and remainder when a polynomial is divided by a binomial – Removal of terms – To form of an equation whose roots are any power of the roots of a given equation – Transformation in general – Descarte's rule of signs.

## UNIT IV

Inequalities – Elementary principles – Geometric & Arithmetic means – Weirstrass inequalities – Cauchy inequality – Applications to Maxima & Minima.

## UNIT V

Theory of Numbers – Prime & Composite numbers – divisors of a given number N – Euler'sFunction (N) and its value –Integral part of a real number – The highest Power of a prime P contained in n! – Congruences –Fermat's, Wilson's & Lagrange's Theorems.

**TEXT BOOKS:**

| S.No | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | T.K.Manickavasagam Pillai & others | Algebra, Volume I | S.V. publications | 1985 |
| 2. | T.K.Manickavasagam Pillai & others | Algebra, Volume I | S.V. publications | 1985 |

**CHAPTERS AND SECTIONS:**

| UNIT | CHAPTER | SECTIONS |
|---|---|---|
| I | 6 | 11-13 [1] |
| II | 6 | 14-17 [1] |
| III | 6 | 18-21 & 24[1] |
| IV | 4 | 1-13 [2] |
| V | 5 | 1-18 [2] |

**REFERENCE BOOKS:**

| S.No | Authors Name | Title of the book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | H.S.Hall & S.R.Knight | Higher Algebra | Prentice Hall of India, New Delhi | 1948 |
| 2. | Barnard S & Child | Higher Algebra | J.M.Publication | 1936 |

**Pedagogy:**

Power point presentation, Group Discussion, Seminar, Quiz, Assignment.

**SECOND ALLIED COURSE-I (AC)**

**PROGRAMMING IN C**

**2019-2020 Onwards**

| **Semester - III** | **PROGRAMMING IN C** | **Hours/Week – 4** | |
|---|---|---|---|
| **Second Allied Course-I** | | **Credits – 3** | |
| **Course Code – 19UMA3AC3** | | **Internal 25** | **External 75** |

**Objectives:**

- To Train the students to the basic concepts of programming language.
- To provide exposure to problem solving through programming.
- To inculcate complex programming language skills.

**Course Outcomes:**

On the successful completion of the course, students will be able to

| **CO Number** | **CO Statement** | **Knowledge Level** |
|---|---|---|
| **CO1** | Recall the basic operation in computer system and Identify the fundamentals of C programming. | **K1** |
| **CO2** | Understand the concepts of operators and arrays. | **K2** |
| **CO3** | Apply the role of Structure and Pointers. | **K3** |

**Mapping With Programme Outcomes*:***

| **Cos/Pos** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
|---|---|---|---|---|---|
| **CO1** | **S** | **S** | **M** | **S** | **M** |
| **CO2** | **S** | **S** | **S** | **M** | **M** |
| **CO3** | **S** | **S** | **S** | **S** | **M** |

**S – Strong; M – Medium; L – Low**

**SECOND ALLIED COURSE-I (AC)**

**PROGRAMMING IN C**

**SYLLABUS**

**UNIT I (12 HOURS)**

Introduction to C: Character set - C tokens - Keywords and identifiers- Constants-variables - Data types - Declaration of variables –Assigning values to the variables –Defining symbolic constants. Operators and Expressions: Arithmetic operators - Relational operators-Logical operators-Assignment operators - Increment and decrement operator-Conditional operator-Bitwise and special operators - Arithmetic expression- Evaluation of expression – Precedence of arithmetic operators-Type conversion in expressions- Operator precedence and Associativity.

**UNIT II (12 HOURS)**

Managing Input and Output: Reading & writing a character - Formatted input and output. Decision Making and Branching: Simple If statement, The if- else, The Switch statement – The ?: operator - The GOTO statement.

**UNIT III(12 HOURS)**

Decision Making and Looping: The while statement – The do statement – The for statement – Jumps in Loops. Array: One Dimensional array- Two dimensional Array-Initializing one and two- dimensional Array - Multidimensional arrays- Dynamic Arrays.

**UNIT IV (12 HOURS)**

User Defined Function: Elements of User Defined Function – Definition of function – Return values and their types – Function calls – Function declaration – Categories of functions. Structure and Union: Defining, Declaring, Accessing, Copying and Comparing Structure Variables – Structure initialization – Arrays of Structures – Arrays within Structures – Structure within Structures.

**UNIT V (12 HOURS)**

Pointers: Understanding Pointers-Accessing the address of a variable- Declaring and Initializing Pointers - Accessing a variable through its pointer - Chain of pointers -Pointer expressions – Pointer increments and Scale factor - Pointers and Arrays.

**TEXT BOOKS:**

| S. No | Authors | Title of the Book | Publishers/Edition | Year of Publication |
|---|---|---|---|---|
| 1. | E. Balagurusamy | Programming In ANSI C | Tata Mc Graw Hill, 7th Edition. | 2017 |

**REFERENCE BOOKS:**

| S. No | Authors | Title of the Book | Publishers/ Edition | Year of Publication |
|---|---|---|---|---|
| 1. | Byran Gottfried | Programming with C | Tata McGraw Hill, 3rd Edition. | 2013 |
| 2 | V.Rajaraman | Computer Programming in C | Prentice Hall of India Pvt Ltd, 1st Edition. | 2004 |

**Web Links:**

1. **http://www.tutorialspoint.com/cprogramming/index.htm**
2. **http://www.cprogramming.com/tutorial/c-tutorial.html**
3. **http://www.w3schools.in/c**
4. **http://fresh2refresh.com/c-tutorial-for-beginners**

**Pedagogy:**

Chalk and Talk, PPT, Discussion and Quiz

**NON-MAJOR ELECTIVE COURSE – I (NME)**

**MATHEMATICS FOR COMPETITIVE EXAMINATION-I**

**2019-2020 Onwards**

<table>
<tr><td>Semester - III</td><td rowspan="3">MATHEMATICS FOR COMPETITIVE EXAMINATION-I</td><td colspan="2">Hours/Week – 2</td></tr>
<tr><td>NON-MAJOR ELECTIVE COURSE – I</td><td colspan="2">Credits – 2</td></tr>
<tr><td>Course Code – 19UMA3NME1</td><td>Internal<br>25</td><td>External<br>75</td></tr>
</table>

**Objectives:**

- To provide the knowledge to analyze, interpret and solve the Mathematical problems.
- To develop the thinking capacity to solve the problems.
- To study many short tricks to solve the mathematical problems easily.

**Course Outcomes:**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| **CO1** | Solve the Problems on Numbers and Problems on Ages. | **K2** |
| **CO2** | Explain the concept of time and distance, Calendar and Clock. | **K2** |
| **CO3** | Apply the concept of Data Interpretation in various types of Graphs. | **K3** |
| **CO4** | Distinguish the concept of Series Codes, Relationships, Analogy and Classification. | **K3** |
| **CO5** | Explain the concept of Logical Reasoning. | **K3** |

**Mapping With Programme Outcomes:**

| Cos/Pos | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | S | M | S | S | S |
| **CO2** | M | S | S | S | S |
| **CO3** | S | S | M | M | S |
| **CO4** | S | S | M | M | M |
| **CO5** | S | S | S | S | M |

**S – Strong; M – Medium; L – Low**

## NON-MAJOR ELECTIVE COURSE – I (NME)

## MATHEMATICS FOR COMPETITIVE EXAMINATION-I

## SYLLABUS

**UNIT I**

Problems on Numbers – Problems on Ages.

**UNIT II**

Time and Distance – Calendar – Clocks.

**UNIT III**

Data Interpretation: Tabulation – Bar Graphs – Pie Charts – Line Graphs.

**UNIT IV**

Reasoning (Including Mathematical): Series – Codes – Relationship – Analogy – Classification.

**UNIT V**

Logical Reasoning.

**Text Books:**

| S. No | Authors | Title of the Book | Publishers/Edition | Year of Publication |
|---|---|---|---|---|
| 1. | R. S.Aggarwal | Quantitative Aptitude – For Competitive Examinations (Fully Solved) | S.Chand & Company Pvt.Ltd, | Reprint 2015 |
| 2. | Dr. K.Kautilya | UGC NET/JRF/SET Teaching & Research Aptitude (General Paper - I) | UPKAR PRAKASHAN, AGRA – 2, Sixth Edition | 2017 |

**CHAPTERS AND SECTIONS:**

| UNIT | CHAPTER | SECTIONS |
|---|---|---|
| I | 7, 8 | 161 – 194 [1] |
| II | 17 | 384 – 404 [1] |
| | 27,28 | 593 – 604 [1] |
| III | 36,37,38,39 | 659 – 726 [1] |
| IV | 5 | 132 – 161 [2] |
| V | 6 | 162 – 190 [2] |

**REFERENCE BOOKS:**

| S. No | Authors | Title of the Book | Publishers/ Edition | Year of Publication |
|---|---|---|---|---|
| 1. | Edgar Thorpe | Test of Reasoning for Competitive Examinations | Tata McGraw-Hill Publishing Company Limited, New Delhi, 2nd Edition, | 3rd Re-Print 2000. |
| 2 | T.K. Sinha | 80+ Practice Sets of Quantitative Aptitude for Bank PO Exams | Arihant Publication (India) limited | 2002. |

**Pedagogy:**

Chalk and Talk, PPT, Discussion and Quiz

# SEMESTER IV

## CORE COURSE VI – (CC)

## SEQUENCES AND SERIES

## 2019-2020 Onwards

| Semester - IV | SEQUENCES AND SERIES | Hours/Week – 5 | |
|---|---|---|---|
| Core Course – VI | | Credits – 5 | |
| Course Code – 19UMA4CC6 | | Internal 25 | External 75 |

**Objectives:**

- To lay a good foundation for classical analysis.
- To study the behavior of sequences and series.
- To acquire the knowledge of solving problems in Binomial, Logarithm & Exponential Series.

**Course Outcomes:**

On the Successful completion of the course, students will be able to

| CO No. | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Explain the concepts of convergent sequences, divergent sequences and series. | K2 |
| CO2 | Apply the ideas of sequences in Algebra of limits. | K3 |
| CO3 | Compute the behavior of monotonic functions. | K3 |
| CO4 | Apply the theory of Cauchy's condensation test and Cauchy's root test on series. | K3 |
| CO5 | Solve the problems based on binomial, logarithmic and exponential series. | K3 |
| CO6 | Examine infinite series using D' Alembert's ratio test. | K4 |

**Mapping with Programme Outcome:**

| COS/POS | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | S | S | S | M | S |
| CO2 | S | S | S | S | S |
| CO3 | S | S | S | M | M |
| CO4 | S | S | S | M | M |
| CO5 | S | M | S | S | S |
| CO6 | S | S | S | S | M |

**S-Strong, M-Medium, L-Low**

**CORE COURSE VI – (CC)**

**SEQUENCES AND SERIES**

**SYLLABUS**

**UNIT – I** **(15 Hours)**

Introduction – Sequences – Bounded Sequences – Monotonic Sequences – Convergent Sequences – Divergent and Oscillating Sequences – The Algebra of Limits.

**UNIT –II** **(15 Hours)**

Behavior of Monotonic sequences – Some theorems on limits –Subsequences.

**UNIT –III** **(15 Hours)**

Infinite Series – Definition of Convergence, Divergence & Oscillate – Convergence of Geometric series – Some general theorems concerning infinite series – Series of positive terms – Comparison tests- convergence of $\sum \frac{1}{n^k}$ – D' Alembert's Ratio test.

**UNIT – IV** **(10 Hours)**

Cauchy's Condensation test – Cauchy's Root test and simple problems – Absolute Convergence – Conditional Convergence – Alternative Series.

**UNIT – V** **(20 Hours)**

Binomial theorem for a rational index – Some important particular case of the Binomial expansion – Sign of terms in binomial expansion – Numerically greatest term expansions – Method of splitting functions into partial fractions – Application of the Binomial theorem to the summation of series – Approximate values – Exponential limit – The Exponential theorem – Summation – The Logarithmic series – Modification of the logarithmic series – Summation of series– Euler's constant – Series which can be summed up by the logarithmic series – Calculation of logarithms by means of the logarithmic series.

**TEXT BOOKS:**

| S. No. | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | Dr.S.Arumugam & Prof.A.Thangapandi Isaac | Sequences and Series | New Gamma Publishing House | 2015 |
| 2. | T.K.Manicavachagom Pillay, T.Natarajan & K.S.Ganapathy | Algebra, Volume I | S.Viswanathan Pvt Limited | 2015 |

**CHAPTERS AND SECTIONS:**

| UNIT | CHAPTER | SECTIONS |
|---|---|---|
| I | 3 | 3.0-3.6 [1] |
| II | 3 | 3.7-3.9 [1] |
| III | 2 | 8-14, 16 [2] |
| IV | 2 | 15, 17, 21-24 [2] |
| V | 3 | 5-10, 14 [2] |
| | 4 | 1-3, 5-10 [2] |

**REFERENCE BOOKS:**

| S.No. | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | M.K.Singal & Asha Rani Singal | A First Course in Real Analysis | R. Chand &co | 2018 |
| 2. | N.P.Bali | Golden Maths series -Real Analysis | Laxmi Publication | 2019 |

**Web links:**

1. **https://youtu.be/JKiwztS6e_s**
2. **https://youtu.be/A02NqndQan0**
3. **https://youtu.be/9sLsX9DV5Fs**
4. **https://youtu.be/Q3_IGStTGVQ**
5. **https://youtu.be/BydVprh9NgQ**

**Pedagogy:**

Power point presentation, Group Discussion, Seminar, Assignment.

**MAJOR BASED ELECTIVE COURSE (MBE) - I**

**DISCRETE MATHEMATICS**

**2019-2020 Onwards**

| **Semester - IV** | **DISCRETE MATHEMATICS** | **Hours/Week – 4** | |
|---|---|---|---|
| **Major Based Elective Course (MBE) - I** | | **Credits – 4** | |
| **Course Code – 19UMA4MBE1A** | | **Internal 25** | **External 75** |

**Objectives:**

- To make the students understand the basics of discrete mathematics.
- Applying the method of logical reasoning to solve a variety of problems.
- To introduce the concepts of Lattices and Boolean Algebras.

**Course Outcome:**

On the Successful completion of the course the student would be able to

| **CO No.** | **CO Statement** | **Knowledge Level** |
|---|---|---|
| **CO1** | Illustrate the concepts on statements and truth tables. | **K2** |
| **CO2** | Describe the properties of lattices and some special lattices. | **K2** |
| **CO3** | Apply the ideas of tautology in statements. | **K3** |
| **CO4** | Relate the notion of normal forms and its types. | **K3** |
| **CO5** | Apply the theory of Boolean Algebra and its functions. | **K3** |
| **CO6** | Compute the inference theory of predicate calculus and its characteristics. | **K3** |

**Mapping with Programme Outcomes:**

| **COS\POS** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
|---|---|---|---|---|---|
| **CO1** | S | S | S | S | S |
| **CO2** | S | M | S | S | S |
| **CO3** | S | S | S | S | S |
| **CO4** | S | S | S | M | S |
| **CO5** | M | S | S | S | S |
| **CO6** | S | S | S | S | S |

**S-Strong, M-Medium, L-Low**

**MAJOR BASED ELECTIVE COURSE (MBE) - I**

**DISCRETE MATHEMATICS**

**SYLLABUS**

**Unit I** **(12 Hours)**

Statements and Notation – Connectives: Negation – Conjunction – Disjunction – Statement formulas and Truth Tables – Conditional and Biconditional – Well-Formed Formulas– Tautologies – Equivalence of formulas – Duality Law –Tautological Implications –Formulas with Distinct Truth Tables.

**Unit II** **(12 Hours)**

Normal Forms : Disjunctive Normal Forms – Conjunctive Normal Forms – Principal Disjunctive Normal Forms – Principal Conjunctive Normal Forms – Ordering and Uniqueness of Normal Forms.

**Unit III** **(12 Hours)**

The Predicate Calculus: Predicates – The Statement Function, Variables and Quantifiers– Predicate Formulas – Free and Bound Variables – The Universe of Discourse –Inference Theory of the Predicate Calculus – Valid Formulas and Equivalences – Some Valid Formulas over Finite Universe – Special Valid Formulas Involving Quantifiers – Theory of Inference for the Predicate Calculus – Formulas Involving More Than One Quantifier – Binary and n-ary Operations – Characteristic Function of a Set – Hashing Functions**.**

**Unit IV** **(12 Hours)**

Lattices as Partially Ordered Sets : Definition and Examples – Some Properties of Lattices – Lattices as Algebraic Systems – Sub Lattices , Direct Product and Homomorphism – Some Special Lattices.

**Unit V** **(12 Hours)**

Boolean Algebra : Definition and Examples – Sub Algebra, Direct Product and Homomorphism – Boolean Functions : Boolean Forms and Free Boolean Algebras – Values of Boolean Expressions and Boolean Functions – Representation and Minimization of Boolean Functions :Representation of Boolean Functions – Minimization of Boolean Functions.

**TEXT BOOKS:**

| S.No | Authors | Title | Publishers | Year of publication |
|---|---|---|---|---|
| 1. | J.P. Tremblay & R. Manohar | Discrete Mathematical Structures with Applications to Computer Science | Tata McGraw Hill | 2011 |

**CHAPTERS AND SECTIONS:**

| UNIT | CHAPTER | SECTIONS |
|---|---|---|
| I | 1 | 1-1 |
| | 1 | 1-2.1 to 1-2.4, 1-2.6 to 1-2.12 |
| II | 1 | 1-3.1 to 1-3.5 |
| III | 1 | 1-5.1 to 1-5.5, 1-6.1 to 1-6.5 |
| | 2 | 2-4.4 to 2-4.6 |
| IV | 4 | 4-1.1 to 4-1.5 |
| V | 4 | 4-2.1, 4-2.2, 4-3.1, 4-3.2, 4-4.1, 4-4.2 |

**REFERENCE BOOKS:**

| S.No | Authors | Title | Publishers | Year of publication |
|---|---|---|---|---|
| 1. | Rakesh Dube, Adesh Pandey and Ritu Gupta | Discrete Structures and Automata Theory | Narosa Publishing House. | 2000 |
| 2. | John E. Hopcroft Jeffery D. Ullman | Introduction to Automata Theory | Languages and Computation. | 1995 |

**Web links :**

1. **https://youtu.be/i3m0hV157Ro**
2. **https://youtu.be/5cyocztOtq4**
3. **https://youtu.be/w9DyAVrU8j0**
4. **https://youtu.be/qPtGlrb_sXg**
5. **https://youtu.be/MH2uTVgG1bo**

**Pedagogy**

Power point presentation, Group Discussion, Seminar, Assignment.

**MAJOR BASED ELECTIVE (MBE) - I**

**AUTOMATA THEORY**

**2019-2020 Onwards**

| **Semester - IV** | **AUTOMATA THEORY** | **Hours/Week – 4** | |
|---|---|---|---|
| **Major Based Elective Course (MBE) - I** | | **Credits – 4** | |
| **Course Code – 19UMA4MBE1B** | | **Internal 25** | **External 75** |

**Objectives:**

- To introduce the definition of Automaton.
- To enable thorough knowledge in constructing the Regular Expressions.
- To study the Pumping lemma for regular sets.

**Course Outcome:**

On the Successful completion of the course the student would be able to

| **CO Number** | **CO Statement** | **Knowledge Level** |
|---|---|---|
| **CO1** | Study Deterministic and Nondeterministic Finite state automata. | **K1** |
| **CO2** | Outline the Chomsky classification of languages. | **K1** |
| **CO3** | Understand the concepts of Regular Expressions. | **K2** |
| **CO4** | Impart knowledge in Pumping lemma for Regular sets. | **K3** |
| **CO5** | Apply the simplification of context free grammars. | **K3** |

**Mapping with Programme Outcomes:**

| **Cos/Pos** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
|---|---|---|---|---|---|
| **CO1** | M | S | S | S | S |
| **CO2** | M | S | M | S | S |
| **CO3** | S | M | S | S | S |
| **CO4** | S | S | S | M | S |
| **CO5** | S | S | S | S | M |

**S-Strong, M-Medium, L-Low**

**MAJOR BASED ELECTIVE - I**

**AUTOMATA THEORY**

**SYLLABUS**

**UNIT I**

**THE THEORY OF AUTOMATA (6 Hours)**

Definition of an Automaton –Description of a Finite Automaton –Transition Systems – Properties of Transition Functions –Acceptability of a string by a Finite Automaton– Nondeterministic Finite State Machines –The equivalence of DFA and NDFA.

**UNIT II**

**FORMAL LANGUAGES (6 Hours)**

Basic Definitions and Examples: Definition of a Grammar – Derivations and the Language Generated by a Grammar. Chomsky Classification of Languages – Languages and their Relation–Recursive and Recursively Enumerable sets – Operations on Languages.

**UNIT III**

**REGULAR SETS AND REGULAR GRAMMARS (6 Hours)**

Regular Expressions: Identities for Regular Expressions. Finite Automata and Regular expressions: Transition System Containing $\lambda$-moves – NDFAs with $\lambda$-moves and Regular Expressions– Conversion of Nondeterministic Systems to Deterministic Systems– Algebraic Methods Using Arden's Theorem- Construction of a finite Automata Equivalent to a Regular Expressions– Equivalence of Two Finite Automata – Equivalence of Two Regular Expressions.

**UNIT IV**

**REGULAR SETS AND REGULAR GRAMMARS (4 Hours)**

Pumping Lemma for Regular Sets – Applications of Pumping Lemma – Closure Properties of Regular Sets –Regular Sets and Regular Grammars.

**UNIT V**

**CONTEXT FREE LANGUAGES ( 2 Hours)**

Context-free Languages and Derivation Trees: Derivation Trees –Ambiguity in Context Free Grammars.

**TEXT BOOKS:**

| S. No. | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | K. L. P. Mishra and N. Chandrasekaran | Theory of Computer Science: Automata, Languages and Computation- Third Edition | Prentice Hall of India Private Limited | 2008 |

**CHAPTERS AND SECTIONS:**

| Unit | Chapter | Sections |
|---|---|---|
| I | 3 | 3.1 to 3.7 |
| II | 4 | 4.1: 4.1.1, 4.1.2, 4.2 to 4.5 |
| III | 5 | 5.1: 5.1.1, 5.2: 5.2.1 to 5.2.7 |
| IV | 5 | 5.3 to 5.6 |
| V | 6 | 6.1: 6.1.1, 6.2 |

**REFERENCE BOOKS:**

| S. No. | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman | Introduction to Automata theory, Languages and Computations, Third Edition | Pearson Education. | 2009 |
| 2. | Alfred V. Aho and Jeffrey D. Ullman, | Principles of Compiler Design | Narosa Publishing House Pvt., | 2002 |

**Web links:**

1. **https://youtu.be/Y9PwXM6KN34**
2. **https://youtu.be/6YH9wsLM-8o**
3. **https://youtu.be/xEvC-t_QI3o**
4. **https://youtu.be/WrzaPNj9OZ4**
5. **https://youtu.be/6aRJQNYYz4s**

**Pedagogy:**

Power point presentation, Group Discussion, Seminar, Assignment.

**NON-MAJOR ELECTIVE (NME)– II**

**MATHEMATICS FOR COMPETITIVE EXAMINATIONS - II**

**2019-2020 Onwards**

| **Semester - IV** | **MATHEMATICS FOR COMPETITIVE EXAMINATIONS - II** | **Hours/Week – 2** | |
|---|---|---|---|
| **Non-Major Elective-II** | | **Credits – 2** | |
| **Course Code – 19UMA4NME2** | | **Internal 25** | **External 75** |

**Objective**s:

- To provide the knowledge to analyze, interpret and solve the Mathematical problems.
- To develop the thinking capacity to solve the problems.
- To study many short tricks to solve the mathematical problems easily

**Course Outcomes:**

On the successful completion of the course, students will be able to

| **CO Number** | **CO Statement** | **Knowledge Level** |
|---|---|---|
| **CO1** | Solve decimal fractions and simplification. | **K2** |
| **CO2** | Explain the concept of square roots, cube roots, Average, profit .and loss | **K2** |
| **CO3** | Apply the concept of Ratio & Proportion and Problems on Trains. | **K3** |
| **CO4** | Distinguish the concept of Simple Interest and Compound Interest. | **K3** |
| **CO5** | Apply the concept of Permutations &Combinations, Odd Man Out & Series. | **K3** |

**Mapping with Programme Outcomes:**

| **COs/POs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
|---|---|---|---|---|---|
| **CO1** | S | M | S | S | S |
| **CO2** | M | S | S | S | S |
| **CO3** | S | S | M | M | S |
| **CO4** | S | S | M | M | M |
| **CO5** | S | S | S | S | M |

**S - Strong, M - Medium, L - Low**

**NON-MAJOR ELECTIVE – II (NME)**

**MATHEMATICS FOR COMPETITIVE EXAMINATIONS - II**

**SYLLABUS**

**UNIT I** **(6 Hours)**

Decimal Fractions – Simplification

**UNIT II** **(6 Hours)**

Square Roots & Cube Roots - Average - Profit & Loss

**UNIT III** **(6 Hours)**

Ratio & Proportion - Problems on Trains

**UNIT IV** **(6 Hours)**

Simple Interest - Compound Interest

**UNIT V** **(6 Hours)**

Permutations & Combinations – Odd Man Out & Series

**TEXT BOOKS:**

| S. No. | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | R.S.Aggarwal | Quantitative Aptitude | S. Chand & Company Ltd, | 2007 |

**CHAPTERS AND SECTIONS:**

| Unit | Chapter | Pages |
|---|---|---|
| I | 3 & 4 | 46 – 116 |
| II | 5, 6 & 11 | 117 - 160 and 251 - 293 |
| III | 12 & 18 | 294 – 310 and 405 - 424 |
| IV | 21 & 22 | 445 – 486 |
| V | 30 & 35 | 613 – 620 and 649 - 657 |

**REFERENCE BOOKS:**

| S. No. | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | T.K.Sinha | 80+ Practice Sets of Quantitative Aptitude for Bank PO Exams | Arihant Publication (India) limited | 2002 |
| 2. | Abhijit Guha | Quantitative Aptitude for Competitive Examinations | McGraw-Hill Publishing Company Limited, New Delhi, 5th Edition | 2014 |

**Web links:**

1. **https://youtu.be/8BeJUzLqOTE**
2. **https://youtu.be/pShzc9AQMos**
3. **https://youtu.be/JP5J-rzoATg**
4. **https://youtu.be/ZnpEoROH1Vc**
5. **https://youtu.be/VIsyYMEAagc**

**Pedagogy:**

Group Discussion, Seminar, Assignment.

# SEMESTER V

## CORE COURSE-VII (CC)
## ABSTRACT ALGEBRA
## 2019-2020 Onwards

| Semester - V | ABSTRACT ALGEBRA | Hours/Week – 6 | |
|---|---|---|---|
| CORE COURSE-VII | | Credits – 6 | |
| Course Code – 19UMA5CC7 | | Internal 25 | External 75 |

**Objectives:**

- To prepare students to understand the concepts and properties of algebra and their application.
- To provide the principles and practices of algebra.
- To Construct a legitimate proof involves different skills and expertise problem solving.

**Course Outcome:**

On the Successful completion of the course the student would be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Explain the basic concept of Abstract Algebra and give examples. | K2 |
| CO2 | Describe the concept of cyclic subgroups. | K2 |
| CO3 | Apply properties of normal subgroups and quotient groups, finite groups and Cayley tables. | K3 |
| CO4 | Compose clear and accurate points using the concept of rings. | K5 |
| CO5 | Assess the impact of unique factorization domain, Euclidean domain. | K6 |

**Mapping with Programme Outcomes:**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|---|---|---|---|---|---|---|
| CO1 | S | S | S | S | S | M |
| CO2 | S | S | S | S | S | M |
| CO3 | S | S | S | S | M | M |
| CO4 | S | S | S | S | S | M |
| CO5 | S | S | S | S | M | M |

**S-Strong, M-Medium, L-Low**

**CORE COURSE-VII (CC)**

**ABSTRACT ALGEBRA**

**SYLLABUS**

**UNIT I** **(18 hours)**

Definition of a Group- Some Examples of Groups- Some Preliminary Lemmas- Subgroups.

**UNIT II** **(18 hours)**

A Counting Principle – Normal Subgroups and Quotient Groups – Homomorphisms.

**UNIT III** **(18 hours)**

Automorphisms- Cayley's Theorem - Permutation Groups.

**UNIT IV** **(18 hours)**

Definition and Examples of Rings – Some Special Classes of Rings – Homomorphisms – Ideals and Quotient Rings.

**UNIT V** **(18 hours)**

More Ideals and Quotient Rings – The Field of Quotient of an Integral Domain - Euclidean Rings – A Particular Euclidean Ring.

**TEXT BOOKS:**

| S.No | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | I.N.Herstein | Topics in Algebra | John Wiley & Sons | 2013 |

**CHAPTERS AND SECTIONS:**

| UNIT | CHAPTER | SECTIONS |
|---|---|---|
| I | 2 | 2.1-2.4 |
| II | 2 | 2.5-2.7 |
| III | 2 | 2.8-2.10 |
| IV | 3 | 3.1-3.4 |
| V | 3 | 3.5-3.8 |

**REFERENCE BOOKS:**

| S.No | Authors Name | Title of the book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | S.Arumugam & A.Thangapandi Isaac | Modern Algebra | Scitech Publications India (Pvt)Ltd | May 2017 |
| 2. | T.K.Manicavachagam Pillai, T.Natarajan, K.S.Ganapathy | Algebra | S.Viswanathan Pvt Limited, Chennai | 2004 |
| 3. | Joseph Rotman | Galois Theory, 2nd Edition | Springer Verlag | 1990 |

**Web links:**

1. **https://youtu.be/CJpZJLYKk0I**
2. **https://youtu.be/mcX0sMnYyMU**
3. **https://youtu.be/lrQMV4zGF44**
4. **https://youtu.be/7LtpPI46O0Q**
5. **https://youtu.be/K1iuXqHFWRw**

**Pedagogy:**

Power point presentation, Group Discussion, Seminar, Quiz, Assignment.

# CORE COURSE – VIII (CC)

# REAL ANALYSIS

# 2019 – 2020 Onwards

| | | | |
|---|---|---|---|
| **Semester – V** | **REAL ANALYSIS** | **Hours/Week – 6** | |
| **Core Course – VIII** | | **Credits – 6** | |
| **Course Code - 19UMA5CC8** | | **Internal 25** | **External 75** |

**Objectives:**

- To enable the students to understand the basic concepts of Analysis.
- To impart knowledge in concepts of solving various problems regarding field axioms.
- To Construct a proof that involves different problem solving ideas and expertise in them.

**Course Outcomes:**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| **CO1** | Describe the fundamental properties of real numbers that lead to the formal development of real analysis. | **K2** |
| **CO2** | Understand the concept of limit of a function on the real line R and metric space. | **K2** |
| **CO3** | Describe the continuous and discontinuous functions on metric spaces. | **K2** |
| **CO4** | Explain the concept of connectedness, completeness and compactness. | **K2** |
| **CO5** | Classify the basic concepts of Riemann integration. | **K3** |

**Mapping with Programme Outcomes:**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | S | S | S | S | S |
| **CO2** | S | S | S | S | S |
| **CO3** | S | S | S | S | S |
| **CO4** | S | S | S | S | S |
| **CO5** | S | S | S | S | S |

**S- Strong; M-Medium; L-Low**

## CORE COURSE – VIII (CC)

## REAL ANALYSIS

## SYLLABUS

**Unit I** **(18 Hours)**

**Sets and functions**

Sets and elements – Operations on sets – Functions – Real-valued functions – Equivalence, Countability – Real numbers - Least upper bounds.

**Unit II** **(18 Hours)**

**Limits and metric spaces**

Limits of a function on the real line – Metric spaces – Limits in metric spaces.

**Unit III** **(18 Hours)**

**Continuous functions on metric spaces**

Functions continuous at a point on the real line – Reformulation – Functions continuous on a metric space – Open sets – Closed sets – Discontinuous functions on $R^1$ – The distance from a point to a set.

**Unit IV** **(18 Hours)**

**Connectedness, completeness and compactness**

More about open sets – Connected sets – Bounded sets and totally bounded sets – Complete metric spaces – Compact metric spaces – Continuous functions on compact metric spaces – continuity of the inverse function – uniform continuity.

**Unit V** **(18 Hours)**

**Calculus**

Sets of measure zero – Definition of the Riemann integral –Existence of the Riemann integral –Properties of the Riemann integral – Derivatives – Rolle's Theorem – The law of the mean - Fundamental theorems of calculus.

**TEXT BOOK**:

| S.No | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | Richard R. Goldberg | Methods of Real Analysis | Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi | Reprint 2019 |

**CHAPTERS AND SECTIONS**:

| UNIT | CHAPTER | SECTIONS |
|---|---|---|
| I | 1 | 1.1-1.7 |
| II | 4 | 4.1-4.3 |
| III | 5 | 5.1-5.6 |
| IV | 6 | 6.1 -6.8 |
| V | 7 | 7.1-7.8 |

**REFERENCE BOOKS:**

| S.NO. | AUTHORS | TITLE OF THE BOOK | PUBLISHERS | YEAR OF PUBLICATION |
|---|---|---|---|---|
| 1. | Tom M. Apostol | Mathematical Analysis | Addison-Wesley Publishing Company | Fifth Printing 1981 |
| 2. | Robert G. Bartle and Donald R. Sherbert | Introduction to Real Analysis | John Wiley & Sons Private Ltd., | 3rd Edition, 2007 |
| 3. | M. K. Singal, Asha Rani Singal | A First Course in Real Analysis | R. Chand & Co | 2007 |

**Web links:**

1. **https://youtu.be/XjiT88Czx5c?t=15**
2. **https://youtu.be/1diSwLMJpvs?t=626**
3. **https://youtu.be/YEG18ISnThE?t=4**
4. **https://youtu.be/4TzGkHFnn7g?t=3**
5. **https://youtu.be/y5tni8My-VY?t=4**

**Pedagogy:**

Assignment, Seminar, Lecture, Quiz, Group discussion, Brain storming, e-content.

# CORE COURSE – IX (CC)

# STATICS

# 2019-2020 Onwards

| Semester – V | STATICS | Hours/Week – 5 | |
|---|---|---|---|
| Core Course IX - (CC) | | Credits – 4 | |
| Course Code – 19UMA5CC9 | | Internal 25 | External 75 |

**Objectives:**

- To provide the basic knowledge of equilibrium of a particle.
- To develop a working knowledge to handle practical problems.
- To understand the procedure for analysis of static objects.

**Course Outcomes:**

On the Successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| **CO1** | Explain the basic concepts of force, equilibrium and the resultant of two forces. | **K2** |
| **CO2** | Classify friction and relate limiting equilibrium on a rough inclined plane. | **K3** |
| **CO3** | Compute moment of a force. | **K3** |
| **CO4** | Reduce coplanar force into a couple and a force. | **K4** |
| **CO5** | Ascertain the different aspects of strings and application of common catenary. | **K4** |
| **CO6** | Determine the principle of Virtual Work for applying the system of bodies in equilibrium. | **K4** |

**Mapping with Programme Outcome:**

| COS/POS | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | S | S | M | M | S |
| **CO2** | S | S | M | M | S |
| **CO3** | S | S | S | S | S |
| **CO4** | S | S | S | M | S |
| **CO5** | S | S | S | M | S |
| **CO6** | S | S | S | M | S |

**S-Strong, M-Medium, L-Low**

## CORE COURSE –IX (CC)

## STATICS

## SYLLABUS

**UNIT – I** **(15 Hours)**

**(a)Forces:**

Newton's laws of motion-Resultant of two forces on a particle.

**(b)Equilibrium of a particle:**

Equilibrium of a particle –Limiting equilibrium of a particle on an inclined plane.

**UNIT –II** **(15 Hours)**

**Forces on a rigid body:**

Moment of a force – Equivalent systems of forces- Parallel forces – Forces along the sides of a Triangle – Couples.

**UNIT –III** **(15 Hours)**

**(a)Coplanar Forces:**

Resultant of several coplanar forces-Equation of the line of action of the resultant-Equilibrium of a rigid body under three coplanar forces.

**(b)A specific Reduction of forces:**

Reduction of coplanar forces into a force & a couple – Problems involving frictional forces.

**UNIT – IV** **(15 Hours)**

**Virtual Work:**

Virtual Work- Principle of Virtual Work – applied to a body or a system of bodies in equilibrium –Equation of Virtual Work –Simple Problems.

**UNIT – V:** **(15 Hours)**

**Hanging Strings:**

Strings - Equilibrium of Strings under gravity – Common Catenary – Suspension bridge.

**TEXT BOOKS:**

| S. No. | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | P.Duraipandiyan<br>Laxmi Duraipandiyan<br>Muthamizh Jayapragasam | Mechanics | S.Chand &<br>Company<br>Pvt Ltd | 2010 |

**CHAPTERS AND SECTIONS:**

| UNIT | CHAPTER | SECTIONS |
|---|---|---|
| I | 2 & 3 | 2.1,2.2 and 3.1,3.2 |
| II | 4 | 4.1-4.6(Omit 4.2) |
| III | 4 &5 | 4.7-4.9 and 5.1,5.2 |
| IV | 8 | 8.1 |
| V | 9 | 9.1 and 9.2 |

**REFERENCE BOOKS:**

| S.No. | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | M.K.Venkataraman | Statics | Agasthiyar Publications | 2002 |
| 2. | A.V.Dharmapadham | Statics | S. Viswanathan Publishers Pvt Ltd | 2006 |
| 3. | A.S.Ramsey | Statics | CBS Publishers and Distributors Private Ltd | 2004 |

**Web links:**

1. **https://youtu.be/FdJF_4uZkSQ**
2. **https://youtu.be/JJX3-af_JQw**
3. **https://youtu.be/YqtrfQ4H7V8**
4. **https://youtu.be/QBWk996hg5E**
5. **https://youtu.be/xP1lpCIe1VM**

**Pedagogy:**

Power point presentations, Group Discussion, Seminar, Quiz , Assignment, Brain storming, E-content, Lecture.

**CORE COURSE – X (CC)**

**METHODS IN NUMERICAL ANALYSIS**

**2019-2020 Onwards**

<table>
<tr><td>Semester – V</td><td rowspan="3">METHODS IN NUMERICAL ANALYSIS</td><td colspan="2">Hours/Week –5</td></tr>
<tr><td>Core Course – X (CC)</td><td colspan="2">Credits – 4</td></tr>
<tr><td>Course Code – 19UMA5CC10</td><td>Internal 25</td><td>External 75</td></tr>
</table>

**Objectives:**

- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals.
- To understand the knowledge of numerical techniques of differentiation and integration.

**Course Outcomes:**

On the Successful completion of the course the student would be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| **CO1** | Apply numerical methods to solve Algebraic, Transcendental equations. | **K2** |
| **CO2** | Explain and solve the numerical techniques of interpolation in various intervals. | **K2** |
| **CO3** | Solve numerical integration and differentiation. | **K3** |
| **CO4** | Solve the system of linear equation with understanding by appropriate methods. | **K3** |
| **CO5** | Compute the numerical solution of ordinary differential equation by various methods. | **K3** |

**Mapping with Programme Outcomes:**

| COS/POS | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | S | S | S | S | S |
| **CO2** | S | S | S | S | S |
| **CO3** | M | M | S | S | S |
| **CO4** | M | M | S | S | S |
| **CO5** | S | S | S | S | S |

**S-Strong, M-Medium, L-Low**

## CORE COURSE – X (CC)
## METHODS IN NUMERICAL ANALYSIS
## SYLLABUS

**UNIT I** **(15 Hours)**

**SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS:**

Introduction – Method of False Position – Iteration Method – Newton-Raphson Method – Ramanujan's Method – Secant Method – Muller's Method.

**UNIT II** **(15 Hours)**

**INTERPOLATION:**

Introduction – Errors in Polynomial Interpolation – Finite Differences –Newton's Formulae for Interpolation – Interpolation with Unevenly Spaced Points: Lagrange's Interpolation Formula – Divided Differences and Their Properties: Newton's General Interpolation Formula.

**UNIT III** **(15 Hours)**

**NUMERICAL DIFFERENTIATION AND INTEGRATION:**

Introduction – Numerical Differentiation – Numerical Integration: Trapezoidal Rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule – Boole's and Weddle's Rules –Use of Cubic Splines – Romberg Integration – Newton-Cotes Integration Formulae.

**UNIT IV** **(15 Hours)**

**NUMERICAL LINEAR ALGEBRA:**

Introduction – Solution of Linear Systems – Direct Methods : Gauss Elimination – Necessity for pivoting – Gauss-Jordan Method – Modification of the Gauss Method to Compute the Inverse – Solution of Linear Systems – Iterative Methods.

**UNIT V** **(15 Hours)**

**NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS:**

Introduction – Solution by Taylor's Series – Picard's Method of Successive Approximations – Euler's Method: Modified Euler's Method, Runge - Kutta Methods – Predictor – Corrector Methods.

**TEXT BOOKS:**

| S. No. | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | S. S. Sastry | Introductory Methods of Numerical Analysis | Fifth Edition , PHI Learning Private Limited, Delhi | 2018 |

**CHAPTERS AND SECTIONS:**

| UNIT | CHAPTER | SECTION |
|---|---|---|
| I | 2 | 2.1, 2.3 – 2.8 |
| II | 3 | 3.1 – 3.3, 3.6, 3.9 (3.9.1 Only) & 3.10 (3.10.1 Only) |
| III | 6 | 6.1, 6.2 & 6.4 |
| IV | 7 | 7.1, 7.5 (7.5.1– 7.5.4) & 7.6 |
| V | 8 | 8.1–8.3, 8.4(8.4.2 Only), 8.5 & 8.6 |

**REFERENCE BOOKS:**

| S.No. | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | M.K. Jain, S.R.K. Iyengar and R.K. Jain | Numerical Methods for Scientific and Engineering Computations | New Age International Private Limited | 1999 |
| 2. | C.E. Froberg | Introduction to Numerical Analysis | II Edition , Addison Wesley | 1979 |
| 3. | Dr. P. Kandasamy, Dr.K. Thiligavathy and Dr.K. Gunavathi | Numerical Methods | S. Chand & Company Pvt. | 2013 |

**Web links:**

1. **https://www.youtube.com/watch?v=3j0c_FhOt5U**
2. **https://nptel.ac.in/courses/111/107/111107105/**
3. **https://www.youtube.com/watch?v=0rtaUUonwkU**
4. **https://nptel.ac.in/courses/111/107/111107106/**
5. **https://www.youtube.com/watch?v=QugqSa3Gl-w**

**Pedagogy:**

Power point presentation, Group Discussion, Seminar, Quiz, Assignment.

**CORE PRACTICAL – I (CP)**

**NUMERICAL METHODS WITH MATLAB PROGRAMMING (PRACTICAL)**

**2019-2020 Onwards**

| **Semester – V** | **NUMERICAL METHODS WITH MATLAB PROGRAMMING (PRACTICAL)** | **Hours/Week – 2** | |
|---|---|---|---|
| **Core Practical –I (CP)** | | **Credits – 2** | |
| **Course Code – 19UMA5CC1P** | | **Internal 40** | **External 60** |

**Objectives:**

- To identify different mathematical problems and reformulate them in a way that is appropriate for numerical treatment.
- Use functions from the programming language library for efficient calculations and visualisation.
- Solve problems systematically and to implement the solution in MATLAB.

**Course Outcome:**

On the Successful completion of the course the student would be able to

| **CO Number** | **CO Statement** | **Knowledge Level** |
|---|---|---|
| **CO1** | Describe the use of fundamental data structures. | **K2** |
| **CO2** | Apply MATLAB effectively to analyze and visualize data. | **K3** |
| **CO3** | Solve scientific and mathematical problems. | **K3** |
| **CO4** | Apply basic functions for numerical integration, differentiation, and curve fitting. | **K3** |
| **CO5** | Compute simple programs in MATLAB | **K3** |

**Mapping with Programme Outcomes:**

| **COS/POS** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
|---|---|---|---|---|---|
| **CO1** | S | S | S | S | S |
| **CO2** | S | S | S | S | S |
| **CO3** | S | S | S | S | M |
| **CO4** | S | S | S | S | S |
| **CO5** | S | S | S | S | M |

**S-Strong, M-Medium, L-Low**

## CORE PRACTICAL – I (CP)

## NUMERICAL METHODS WITH MATLAB PROGRAMMING (PRACTICAL)

## SYLLABUS

1. Newton – Raphson method of solving equations.
2. Lagrange's method of interpolation.
3. Trapezoidal rule of integration.
4. Simpson's 1/3 rule of integration.
5. Gauss – Elimination method of solving simultaneous equations.
6. Gauss – Seidal method of solving simultaneous equations.
7. R-K fourth order method of solving differential equations.

**Web links:**

1. **https://www.youtube.com/watch?v=NZfd-EuBYyo**
2. **https://www.youtube.com/watch?v=PLHC4NKNxys**
3. **https://in.mathworks.com/videos/introduction-to-matlab-81592.html**
4. **https://www.youtube.com/watch?v=ajJD0Df5CsY**
5. **https://www.youtube.com/watch?v=dOg631hdPIc**

**Pedagogy:**

Power point presentation, Hand on Training.

**SKILL BASED ELECTIVE – I (A)**

**INTRODUCTION TO R**

**2019-2020 Onwards**

| **Semester – V** | **INTRODUCTION TO R** | **Hours/Week – 2** | |
|---|---|---|---|
| **Skill Based Elective –I(A)** | | **Credits – 2** | |
| **Course Code – 19UMA5SBE1A** | | **Internal 25** | **External 75** |

**Objectives:**

- To explore and understand how to use the R documentation.
- To master the use of the R and R Studio interactive environment.
- To understand how to create and manipulate data's in R.

**Course Outcomes:**

On the successful completion of the course, students will be able to

| **CO Number** | **CO Statement** | **Knowledge Level** |
|---|---|---|
| **CO1** | Navigate in the R Studio interface. | **K2** |
| **CO2** | Explain concepts of matrices and arrays. | **K3** |
| **CO3** | Discuss about List and data frames. | **K3** |
| **CO4** | Apply R effectively to analyze and visualize data. | **K3** |
| **CO5** | Classify various testing of hypothesis. | **K2** |

**Mapping with Programme Outcomes:**

| COS/POS | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | S | S | S | S | S |
| **CO2** | S | M | S | S | M |
| **CO3** | S | S | S | S | S |
| **CO4** | S | M | S | S | M |
| **CO5** | S | S | S | S | S |

**S-Strong, M-Medium, L-Low**

## SKILL BASED ELECTIVE – I (A)

## INTRODUCTION TO R

## SYLLABUS

**UNIT I** **(6 Hours)**

**Getting Started**:

Obtaining and Installing R from CRAN – Opening R for the First Time – Saving Work and Exiting R – Conventions.

**Numerics, Arithmetic, Assignment and Vectors**:

R for Basic Math – Assigning Objects – Vectors.

**UNIT II** **(6 Hours)**

**Matrices and Arrays**:

Defining a Matrix – Subsetting – Matrix Operations and Algebra – Multidimensional Arrays.

**Non-Numeric Values:**

Logical Values – Characters.

**UNIT III** **(6 Hours)**

**Lists and Data Frames**:

Lists of Objects – Data Frames.

**Special Values, Classes and Coercion**:

Some Special Values – Understanding Types, Classes and Coercion.

**UNIT IV** **(6 Hours)**

**Elementary Statistics:**

Describing Raw Data – Summary Statistics.

**Basic Data Visualization**:

Barplots and Pie Charts – Histograms – Box-and-Whisker Plots – Scatter Plots.

**UNIT V** **(6 Hours)**

**Common Probability distributions**:

Common Probability Mass Functions – Common Probability Density Functions.

**Hypothesis Testing**:

Components of a Hypothesis Test – Testing Means – Testing Proportions – Testing Categorical Variables – Errors and Power.

**TEXT BOOKS:**

| S.No | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | Tilman M. Davies | The Book of R A First Course in Programming and Statistics | No Starch Press Inc., | 2016 |

**CHAPTERS AND SECTIONS:**

| UNIT | CHAPTER | SECTIONS |
|---|---|---|
| I | 1 | 1.1 -1.4 |
| | 2 | 2.1 -2.3 |
| II | 3 | 3.1 - 3.4 |
| | 4 | 4.1 - 4.2 |
| III | 5 | 5.1 & 5.2 |
| | 6 | 6.1 & 6.2 |
| IV | 13 | 13.1 & 13.2 |
| | 14 | 14.1 – 14.4 |
| V | 16 | 16.1 & 16.2 |
| | 18 | 18.1 – 18.5 |

**REFERENCE BOOKS:**

| S.No | Authors Name | Title of the Book | Publishers Name | Year ofPublication |
|---|---|---|---|---|
| 1 | Dr. Mark Gardener | Beginning R The Statistical Programming Language | John Wiley & Sons, Inc | 2012 |
| 2 | Joseph Schmuller | Statistical Analysis R for Dummies | John Wiley & Sons, Inc | 2017 |
| 3 | Andy Field Jeremy miles Zoe Field | Discovering Statistics Using R | Sage Publications Ltd | 2012 |

**Web links:**

1. **https://youtu.be/V8eKsto3Ug**
2. **https://youtu.be/RwDV802ckU8**
3. **https://youtu.be/fDRa82lxzaU**
4. **https://youtu.be/lL0s1coNtRk**
5. **https://youtu.be/SJpd7KC18fQ?list=PLJ5C6qdAvBFfF7qtFi8PvRK8x55jsUQ**

**Pedagogy:**

Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

# SKILL BASED ELECTIVE- I (B)

# INTRODUCTION TO STATISTICAL TOOLS AND TECHNIQUES - SPSS

## 2019-2020 Onwards

| Semester – V | INTRODUCTION TO STATISTICAL TOOLS AND TECHNIQUES - SPSS | Hours/Week – 2 | |
|---|---|---|---|
| Skill Based Elective- I (B) | | Credits – 2 | |
| Course Code – 19UMA5SBE1B | | Internal 25 | External 75 |

**Objectives:**

- To learn basic data analysis and interpretation with SPSS.
- To manipulate and transform variables in SPSS.
- To establish a sound knowledge on SPSS.

**Course Outcome:**

On the Successful completion of the course the student would be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| **CO1** | Explain the objectives of SPSS. | **K2** |
| **CO2** | Apply SPSS for data interpretation. | **K3** |
| **CO3** | Compute various test using SPSS. | **K3** |
| **CO4** | Interpretation of several graphs in SPSS. | **K2** |
| **CO5** | Classify Data View, Variable View and Output View Screens. | **K2** |

**Mapping With Programme Outcomes:**

| COS/POS | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | S | S | S | S | S |
| **CO2** | S | S | S | S | S |
| **CO3** | S | S | M | S | M |
| **CO4** | S | M | S | S | S |
| **CO5** | S | S | M | S | M |

**S – Strong , M – Medium, L– Low**

## SKILL BASED ELECTIVE- I (B)
## INTRODUCTION TO STATISTICAL TOOLS AND TECHNIQUES - SPSS
## SYLLABUS

**UNIT I** **(6 hours)**

**First Encounters:**

Introduction and objectives- Entering, Analyzing and Graphing Data

**Navigating in SPSS:**

SPSS variable View screen-SPSS data view screen-SPSS Main menu- Data Editor Toolbar – Short tour of variable View screen.

**UNIT II** **(6 hours)**

**Getting Data In and Out of SPSS:**

typing data using the computer keyboard- Saving your SPSS Data and Output files- Opening your saved SPSS files – opening SPSS sample files- Copying and pasting data to other applications-Importing files from other applications- Exporting SPSS files to other applications.

**Levels of Measurement:**

Variable view screen**:** Measure column -Variables measured at the Nominal level- Variables measured at the Ordinal level- Variables measured at the Scale level.

**UNITIII** **(6 hours)**

**Entering Variables and Data and Validating Data:**

Entering Variables and assigning attributes (Properties)-Entering Data for each variable – Validating Data.

**Working with Data and Variables:**

Computing a new variable - Recoding Scale Data into a String Variable- Inserting new variables and Cases in to Existing Databases- Data View page: Copy, Cut and Paste procedures.

**UNIT IV** **(6 hours)**

**Using the SPSS Help Menu:**

Help Options – Using Help Topics – Using Help Tutorial – Using Help Case Studies – Getting Help When Using Analyze on the Main Menu.

**Creating Basic Graphs and Charts:**

Using Legacy Dialogs to Create a Histogram – Using Chart Builder to Create a Histogram – Using Legacy Dialogs to Create a Bar Graph – Using Chart Builder to Create a Bar Graph - Using Legacy Dialogs to Create a line Graph - Using Chart Builder to Create a line Graph - Using Legacy Dialogs to Create a Pie Chart - Using Chart Builder to Create a Pie Chart.

**UNIT V** **(6 hours)**

**Editing and Embellishing Graphs:**

Creating a Basic Graph – Editing a Basic Graph – Editing a Three-Dimensional Graph – Exporting Graphs to Documents.

**Printing Data View, Variable View and Output Viewers Screens:**

Printing Data From the Variable View Screen – Printing Variable Information From and Output Viewer – Printing Tables From and Output Viewer.

**TEXT BOOKS:**

| S. No. | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | James B. Cunningham & James O. Aldrich | An Interactive Hands-on Approach | SAGE Publications India Pvt Ltd, New Delhi | 2012 |

**CHAPTERS AND SECTIONS:**

| UNIT | CHAPTERS | SECTIONS |
|---|---|---|
| I | 1 & 2 | 1.1-1.2, 2.1-2.6 |
| II | 3 & 4 | 3.1-3.8, 4.1-4.5 |
| III | 5 & 6 | 5.1-5.4, 6.1-6.5 |
| IV | 7 & 8 | 7.1- 7.6, 8.1-8.9 |
| V | 9 & 10 | 9.1-9.5 10.1-10.4 |

**REFERENCE BOOKS:**

| S. No. | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | Keith McCormick & Jesus Salcedo with Aaron Poh | SPSS Statistics for Dummies | Wiley India Pvt Ltd, New Delhi, 3rd Edition. | 2015 |
| 2. | Robert H. Carver &Jane Gradwohl Nash | Doing Data Analysis | Thompson Brooks/Cole | 2013 |
| 3. | Dr. S .L. Gupta & Hitesh Gupta | SPSS17.0 for Researchers | International Book House Pvt. Ltd- 2nd Edition. | 2014 |

**Web links:**

1. **https://youtu.be/Bku1p481z80**
2. **https://www.youtube.com/watch?v=_zFBUfZEBWQ**
3. **https://youtu.be/DmS63ivVjis**
4. **https://youtu.be/i8lmUkB4lag**

**Pedagogy:**

Power point presentation, Group Discussion, Seminar, Assignment.

**SKILL BASED ELECTIVE – II (A)**

**STATISTICAL TOOLS AND TECHNIQUES – R PROGRAMMING (PRACTICAL)**

**2019-2020 Onwards**

| | | | |
|---|---|---|---|
| **Semester – V** | **STATISTICAL TOOLS AND TECHNIQUES – R PROGRAMMING (PRACTICAL)** | **Hours/Week – 2** | |
| **Skill Based Elective –II(A)** | | **Credits – 2** | |
| **Course Code – 19UMA5SBE2AP** | | **Internal 40** | **External 60** |

**Objectives:**

- To explore and understand how to use the R documentation.
- To familiar with R interactive environment.
- To understand how to create and manipulate datas in R.

**Course Outcome:**

On the Successful completion of the course the student would be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| **CO1** | Navigate in the R Studio interface. | **K2** |
| **CO2** | Apply the Statistical Programming Software. | **K2** |
| **CO3** | Explain concepts related to Statistical datas. | **K3** |
| **CO4** | Explain the terms of constructs, control statements, string functions. | **K3** |
| **CO5** | Compute R programming from a statistical Perspective. | **K3** |

**Mapping with Programme Outcomes:**

| COS/POS | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | S | S | S | S | S |
| **CO2** | S | S | S | S | S |
| **CO3** | S | S | S | S | M |
| **CO4** | S | S | S | S | S |
| **CO5** | S | S | S | S | M |

**S-Strong, M-Medium, L-Low**

**SILL BASED ELECTIVE – II (A)**

**STATISTICAL TOOLS AND TECHNIQUES – R PROGRAMMING (PRACTICAL)**

**SYLLABUS**

1. Creating and Displaying data.
2. Matrix Manipulations.
3. Creating and manipulating a List and an Array.
4. Frequency Distribution.
5. Bar diagrams, Bar plots and subdivided Bar plots.
6. Pie diagram, 3D Pie diagram and Histogram.
7. Measures of Central Tendency.
8. Quantiles.
9. Variation of data.
10. Correlation and Regression.

**Web links:**

1. **https://youtu.be/_V8eKsto3Ug**
2. **https://youtu.be/BvKETZ6kr9Q**
3. **https://youtu.be/HPJn1CMvtmI**
4. **https://youtu.be/ANMuuq502rE**
5. **https://youtu.be/I6FJo8x1wZE**

**Pedagogy:**

Power point presentation, Hands on training.

**SKILL BASED ELECTIVE – II (B)**

**STATISTICAL TOOLS AND TECHNIQUES – SPSS (PRACTICAL)**

**2019-2020 Onwards**

<table>
<tr><td>Semester - V</td><td rowspan="3">STATISTICAL TOOLS AND TECHNIQUES – SPSS (PRACTICAL)</td><td colspan="2">Hours/Week - 2</td></tr>
<tr><td>Skill Based Elective – II(B)</td><td colspan="2">Credits - 2</td></tr>
<tr><td>Course Code - 19UMA5SBE2BP</td><td>Internal 40</td><td>External 60</td></tr>
</table>

**Objectives:**

- To analyse scientific data related with social science.
- To process critical data.
- To manipulate and decipher survey data.

**Course Outcomes:**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| **CO1** | Apply the built in functions for data manipulation. | **K2** |
| **CO2** | Explain the ideas and concepts of various charts and Box plots. | **K2** |
| **CO3** | Classify the given data for various tests. | **K2** |
| **CO4** | Solve Measures of Central Tendency and Dispersion. | **K3** |
| **CO5** | Compute Correlation and Regression. | **K3** |

**Mapping with Programme Outcomes:**

| COS/POS | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | S | S | S | S | S |
| **CO2** | S | M | S | S | M |
| **CO3** | S | S | S | S | S |
| **CO4** | S | M | S | S | M |
| **CO5** | S | S | S | S | S |

**S-Strong, M-Medium, L-Low**

**SKILL BASED ELECTIVE – II (B)**

**STATISTICAL TOOLS AND TECHNIQUES - SPSS (PRACTICAL)**

**SYLLABUS**

1. Frequencies: Counts and Percents
2. Measures of Central Tendency
3. Measures of Dispersion
4. Histograms, Bar Charts, Boxplots and Scatter Plots
5. T-test and Chi-square Test
6. Correlation
7. Regression

**Web links:**

1. **https://www.youtube.com/watch?v=Bku1p481z80**
2. **https://www.youtube.com/watch?v=_zFBUfZEBWQ**
3. **https://www.youtube.com/watch?v=bapuGcjwiLQ**
4. **https://www.youtube.com/watch?v=C2Qa5d9ij0Y**
5. **https://www.youtube.com/watch?v=cNrnSEWKJgg**

**Pedagogy:**

Power Point Presentation, Hands on training.

# SEMESTER VI

## Core Course – XI (CC)

## LINEAR ALGEBRA

## 2019-2020 Onwards

| Semester - VI | LINEAR ALGEBRA | Hours/Week –5 | |
|---|---|---|---|
| Core Course – XI (CC) | | Credit – 5 | |
| Course Code – 19UMA6CC11 | | Internal 25 | External 75 |

**Objectives:**

- To facilitate a better understanding of vector space.
- To analyse problems in linear algebra.
- To solve problems in matrices.

**Course Outcome:**

On the Successful completion of the course the student would be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Explain the ideas of Vector Spaces, Linear Independence and Bases. | K3 |
| CO2 | Distinguish the concepts of Roots of a Polynomial and the Algebra of Linear Transformations. | K3 |
| CO3 | Explain the concepts of matrix and Elementary transformation. | K3 |
| CO4 | Compute Characteristic Equation of a matrix and its inverse by Cayley Hamilton theorem. | K3 |
| CO5 | Solve the problems related to Eigen Values and Eigen Vectors | K3 |
| CO6 | Describe Inner Product Space and Modules. | K3 |

**Mapping with Programme Outcomes:**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | S | M | S | S | S |
| **CO2** | S | S | S | S | S |
| **CO3** | M | M | S | S | S |
| **CO4** | M | M | S | S | S |
| **CO5** | S | S | S | S | S |
| **CO6** | M | S | M | M | S |

**S-Strong, M-Medium, L-Low**

## Core Course – XI (CC)

## LINEAR ALGEBRA

## 2019-2020 Onwards

**Unit I** **(15 Hours)**

Elementary Basic Concepts – Linear Independence and Bases – Dual Spaces.

**Unit II** **(15 Hours)**

Roots of polynomials – Construction with Straight edge and Compass - More about Roots. - The Algebra of Linear Transformations – Characteristic Roots.

**Unit III** **(15 Hours)**

Algebra of Matrices – Types of Matrices – The Inverse of a Matrix – Elementary Transformations – Rank of a matrix.

**Unit IV** **(15 Hours)**

Characteristic Equation and Cayley – Hamilton theorem – Eigen Values and Eigen Vectors.

**Unit V** **(15 Hours)**

Inner Product Spaces: Norm – Orthogonal – Orthogonal Complement – Subspace – Gram Schmidt orthogonalization process – Modules.

**TEXT BOOKS:**

| S. No. | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | I.N.Herstein | Topics in Algebra | John Wiley & Sons | 2013 |
| 2. | Arumugam S and Thangapandi Issac A | Modern Algebra | Scitech Publications (India) Private Limited, Chennai. | 2012 |

**CHAPTERS AND SECTIONS:**

| Unit | Chapter | Sections |
|---|---|---|
| I | 4[1] | 4.1 – 4.3 |
| II | 5[1] | 5.3 – 5.5 |
| | 6[1] | 6.1 & 6.2 |
| III | 7[2] | 7.0 -7.5 |
| IV | 7[2] | 7.7 & 7.8 |
| V | 4[1] | 4.4 & 4.5 |

**REFERENCE BOOKS:**

| S.No. | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | P. B. Bhattacharya, S. K. Jain and S. R. Nagpaul | First Course in Linear Algebra | Wiley Easterrn Limited | 1985 |
| 2. | Kenneth Hoffman and Ray Kunze | Linear Algebra | PHI Learning Private Limited | 2009 |
| 3. | K. S. Narayanan and T. K. Manicavachagom Pillay | Modern Algebra, Volume I | S. Viswanathan Private Limited | 1982 |

**Web links:**

1. **https://youtu.be/1XIT3Y2oyAU**
2. **https://youtu.be/Pc2dWW3aSrk**
3. **https://youtu.be/ERfbtPBEYVA**
4. **https://youtu.be/6NFIsQ7APY**
5. **https://youtu.be/fdsgsMP9JnA**

**Pedagogy:**

Power point presentations, Group Discussion, Seminar, Quiz, Assignment, Lecture.

# CORE COURSE–XII(CC)

# COMPLEX ANALYSIS

## 2019-2020 Onwards

| Semester – VI | COMPLEX ANALYSIS | Hours/Week – 5 | |
|---|---|---|---|
| Core Course –XII (CC) | | Credit – 5 | |
| Course Code – 19UMA6CC12 | | Internal 25 | External 75 |

**Objectives:**

- Identify curves and region in the complex plane defined by simple expressions.
- To study about the concepts of Complex Variables and Complex Integration
- To know about the concept of Power Series Expansion, Singularities and Residues.

**Course Outcomes:**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| **CO1** | Describe the functions of Complex variables, continuity and differentiation of complex variable functions, C – R equations of analytic functions. | **K2** |
| **CO2** | Explain about Elementary transformations in Complex variables. | **K2** |
| **CO3** | Compute Complex Integration through Cauchy's theorem. | **K3** |
| **CO4** | Determine the Power series expansions for Taylor's and Laurent's series. | **K4** |
| **CO5** | Diagnose the singularity concept and residues, solving definite integrals using residues. | **K4** |

**Mapping with Programme Outcomes:**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | S | S | M | S | S |
| **CO2** | S | S | M | S | M |
| **C03** | S | S | S | S | M |
| **C04** | S | S | S | M | M |
| **CO5** | S | S | S | M | M |

**S-Strong , M-Medium , L-Low.**

## CORE COURSE –XII (CC)

## COMPLEX ANALYSIS

## 2019-2020 Onwards

**UNIT I**

**Analytical Functions:** **(15 Hours)**

Functions of a Complex Variable – Limits– Theorems on Limits- Limits Involving the Point at Infinity – Continuity – Derivatives – Cauchy-Riemann Equations – Sufficient Conditions for Differentiability – Polar- Coordinates - Analytic Functions – Examples - Harmonic functions.

**UNIT II** **(15 Hours)**

**Integrals:**

Definite Integrals of Functions *w(t)* – Contours – Cauchy- Goursat Theorem – Proof of the Theorem – Simply Connected Domains – Multiply Connected Domain – Cauchy Integral Formula – An Extension of the Cauchy Integral Formula – Some Consequences of the Extension – Liouville's Theorem and the Fundamental Theorem of Algebra – Maximum Modulus Principle.

**UNIT III** **(15 Hours)**

**Series:**

Convergence of Sequences – Convergence of Series – Taylor's Series – Proof of Taylor's Theorem – Examples – Laurent Series – Proof of Laurent's Theorem – Examples.

**Mapping by Elementary Functions :**

Linear Transformations – The Transformation $w = 1/z$ – Mappings by $1/z$ – Linear Fractional Transformations – An Implicit Form – Mappings of the Upper Half Plane –The Transformation $w = Sin\ z$ – Mappings by $z^2$ and Branches of $z^{1/2}$.

**UNIT IV** **(15 Hours)**

**Residues and Poles:**

Isolated Singular Points – Residues – Cauchy's Residue Theorem – Residue at infinity – The Three Types of Isolated Singular Points – Residues at Poles – Examples – Zeros of Analytic Functions – Zeros and Poles – Behaviour of Functions Near Isolated Singular Points.

**UNIT V** **(15 Hours)**

**Applications of Residues:**

Evaluation of Improper Integrals – Example – Improper Integrals from Fourier Analysis – Jordan's Lemma – Indented Paths – An Indentation Around a Branch Point – Integration Along a Branch Cut – Definite Integrals Involving Sines and Cosines – Argument Principle – Rouche's Theorem.

**TEXT BOOKS:**

| S.No. | Authors | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | James Ward Brown and Ruel V.Churchill | Complex Variables and Applications | McGraw Hill Higher Education. Eighth Edition, New York. | 2009 |

**CHAPTERS AND SECTIONS:**

| UNIT | CHAPTER | SECTIONS | PAGE NUMBER |
|---|---|---|---|
| I | 2 | 12, 15 - 19, 21 - 26 | 35-38, 45-59, 63-82 |
| II | 4 | 38,39, 46 - 54 | 119 – 126, 150 - 175 |
| III | 5 and 8 | 55 – 62, 90 - 97 | 181 – 208, 311 - 336 |
| IV | 6 | 68 – 77 | 229 - 260 |
| V | 7 | 78 – 87 | 261 - 298 |

**REFERENCE BOOKS:**

| S.No | Authors | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | S.Arumugam, A.Thangapandi Isaac & A.Somasundaram | Complex Analysis | New Scitech Publications (India) Pvt Ltd. | 2005 |
| 2. | T.K.Manickavachagam Pillai | Complex Analysis | S.Viswanathan Publishers Pvt Ltd, Chennai. | 1994 |
| 3. | Duraipandian. P, KayalalPachaiyappa | Complex Analysis | S. Chand & company Pvt. Ltd, 1st Edition, New Delhi. | 2014 |

**Web links:**

1. **https://www.youtube.com/watch?v=b5VUnapu-qs.**
2. **https://www.youtube.com/watch?v=2v95JHiapxU.**
3. **https://www.youtube.com/watch?v=WBvRL-QCEN8.**
4. **https://www.youtube.com/watch?v=qjpLIlVo_6E.**
5. **https://www.youtube.com/watch?v=o77UV7YrWvw.**

**Pedagogy:**

Power Point Presentation, Group Discussion, Seminar, Assignment.

# CORE COURSE – XIII (CC)

# DYNAMICS

## 2019-2020 Onwards

| Semester – VI | DYNAMICS | Hours/Week – 5 | |
|---|---|---|---|
| Core Course - XIII (CC) | | Credits – 4 | |
| Course Code – 19UMA6CC13 | | Internal 25 | External 75 |

**Objectives:**

- To analyze the bodies in motion using the basics of kinematics.
- To provide the basic knowledge of equilibrium of a particle.
- To develop a working knowledge to handle practical problems.

**Course Outcomes:**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| **CO1** | Explain the motion under the action of central force. | **K2** |
| **CO2** | Compute motion of a straight line using relative velocity and acceleration. | **K3** |
| **CO3** | Apply the concepts of impulsive forces and impact of spheres. | **K3** |
| **CO4** | Ascertain the various aspect of projectile. | **K4** |
| **CO5** | Examine simple harmonic motions and its characteristics. | **K4** |
| **CO6** | Determine differential equation and pedal equation of a cental orbit. | **K4** |

**Mapping with Programme Outcomes:**

| COS/POS | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | S | S | S | S | S |
| **CO2** | S | S | M | S | S |
| **CO3** | S | S | S | S | S |
| **CO4** | S | S | S | S | S |
| **CO5** | S | S | S | M | S |
| **CO6** | S | S | S | S | S |

**S-Strong, M-Medium, L-Low**

## CORE COURSE – XIII (CC)

## DYNAMICS

## SYLLABUS

**UNIT I** **(15 Hours)**

**Kinematics:**

Basic units – Velocity – Acceleration – Coplanar Motion.

**UNIT II** **(15 Hours)**

**Projectile:**

Forces on a Projectile – Projectile projected on an inclined plane – Enveloping parabola or bounding parabola.

**UNIT III** **(15 Hours)**

**Impact:**

Impulsive force – Impact of sphere – Impact of two smooth spheres – Impact of a smooth sphere on a plane – Oblique Impact of two smooth spheres.

**UNIT IV** **(15 Hours)**

**Rectilinear motion under varying forces:**

Simple harmonic motion – S.H.M. along a horizontal line – S.H.M. along a vertical line.

**UNIT V** **(15 Hours)**

**Central Orbits:**

General Orbits– Central Orbit – Conic as a centred orbit.

**TEXT BOOKS:**

| S.No | Authors Name | Title Of The Book | Publishers Name | Year Of Publication |
|---|---|---|---|---|
| 1. | P. Duraipandian, Laxmi Duraipandian and Muthamizh Jayapragasam | Mechanics | S.Chand & Company Pvt Ltd | 2014 |

**CHAPTERS AND SECTIONS:**

| UNIT | CHAPTER | SECTIONS |
|---|---|---|
| I | 1 | 1.1-1.4 |
| II | 13 | 13.1-13.3 |
| III | 14 | 14.1-14.5 |
| IV | 12 | 12.1-12.3 |
| V | 16 | 16.1-16.3 |

**REFERENCE BOOKS:**

| S.No | Authors Name | Title Of The Book | Publishers Name | Year Of Publication |
|---|---|---|---|---|
| 1. | M.K.Venkataraman | Dynamics | Agasthiyar Publications | 2009 |
| 2. | A.V.Dharmapadham | Dynamics | S. Viswanathan Publishers Pvt Ltd | 2006 |
| 3. | Narayanan S | A Text book of Dynamics | S. Chand and Company | 1986 |

**Web links:**

1. **https://youtu.be/40RU9lWdfTA**
2. **https://youtu.be/qk7KV0llKrM**
3. **https://youtu.be/4HZtV_PGHo0**
4. **https://youtu.be/uM2HpLBVAkA**
5. **https://youtu.be/MlNmlY_yoZ0**
6. **https://youtu.be/NsNUuSxaa2Y**

**Pedagogy:**

Power point presentations, Group Discussion, Seminar, Quiz , Assignment, , Brain storming, e-content, Lecture.

# CORE COURSE – XIV (CC)

# OPERATIONS RESEARCH

## 2019-2020 Onwards

| Semester - VI | OPERATIONS RESEARCH | Hours/Week – 4 | |
|---|---|---|---|
| CORE COURSE - XIV | | Credits – 4 | |
| Course Code - 19UMA6CC14 | | Internal 25 | External 75 |

**Objectives:**

- To impart knowledge in concepts and tools of operations research.
- To equip the students with mathematical methods formatted for their major concepts..
- To apply these techniques constructively to make effective business making.

**Course Outcomes:**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Explain the Game theory problems | K2 |
| CO2 | Illustrate the Network Problems. | K2 |
| CO3 | Describe the Inventory Models. | K2 |
| CO4 | Solve the given LPP under various methods. | K3 |
| CO5 | Compute solutions to Transportation and Assignment Problem. | K3 |

**Mapping with Programme Outcomes**

| COS/POS | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | S | S | S | S | S |
| CO2 | S | M | S | S | M |
| CO3 | S | S | S | S | S |
| CO4 | S | M | S | S | M |
| CO5 | S | S | S | S | S |

**S-Strong, M-Medium, L-Low**

**CORE COURSE – XIV (CC)**
**OPERATIONS RESEARCH**
**SYLLABUS**

**UNIT I** **(12 Hours)**

**Linear Programming Problem**:

Introduction – Linear Programming Problem – Mathematical formulation of the problem– Illustrations on Mathematical formulation of Linear Programming Problems.

**Linear Programming Problem-Graphical solution and Extension:**

Introduction – Graphical Solution Method – Some Exceptional Cases – General Linear Programming Problem – Canonical and Standard Forms of Linear Programming Problem.

**Linear Programming Problem-Simplex Method:**

Introduction – The Computational Procedure

**UNIT II** **(12 Hours)**

**Linear Programming Problem - Simplex Method:**

Use of Artificial Variables

**Duality in Linear Programming:**

Introduction – General Primal - Dual Pair –Formulating a Dual Problem – Dual Simplex Method.

**UNIT III** **(12 Hours)**

**Transportation Problem :**

Introduction– LP formulation of the Transportation Problem – Existence of Solution in T.P - Solution of a Transportation Problem – Finding an initial basic feasible solution –Test for optimality-Economic Interpretation of $u_j$'s and $v_j$'s- Degeneracy in Transportation Problem-Transportation Algorithm (MODI Method).

**Assignment problem:**

Introduction **–** Mathematical Formulation of the Problem – Solution Methods of Assignment Problem –Special cases in Assignment Problems – The Travelling Salesmen problem.

**UNIT IV** **(12 Hours)**

**Games and Strategies:**

Introduction- Two Person Zero sum Games –Some Basic Terms– The Maximin - Minimax Principle –Games without Saddle Points – Mixed Strategies – Graphical Solution of 2 x n and m x 2 games.

**Inventory control:**

Introduction – Types of Inventories – Reasons for carrying inventories– The inventory Decisions– Objectives of scientific inventory control– Cost associated with inventories– Factors affecting inventory control– An inventory control problem– the concept of EOQ- Deterministic Inventory Problems with no Shortages – Deterministic Inventory Problems with Shortages.

**UNIT V** **(12 Hours)**

**Network Scheduling by PERT/CPM:**

Introduction– Network : Basic components – Logical Sequencing – Rules of Network Construction – Concurrent activities– Critical Path analysis–Probability Considerations in PERT-Distinction between PERT and CPM.

**TEXT BOOKS:**

| S.NO. | AUTHORS | TITLE | PUBLISHERS |
|---|---|---|---|
| 1. | Kanti Swaroop, Gupta.P.K,& Manmohan | Operations Research | Sultan Chand & Sons, 2014 |

**CHAPTERS AND SECTIONS:**

| UNIT | CHAPTER | SECTIONS |
|---|---|---|
| I | 2 | 2.1-2.4 |
| | 3 | 3.1-3.5 |
| | 4 | 4.1, 4.3 |
| II | 4 | 4.4 |
| | 5 | 5.1-5.3,5.9 |
| III | 10 | 10.1-10.3,10.8-10.13 |
| | 11 | 11.1-11.4, 11.7 |
| IV | 17 | 17.1-17.6 |
| | 19 | 19.1-19.11 |
| V | 25 | 25.1-25.8 |

**REFERENCE BOOKS:**

| S.NO. | AUTHORS | TITLE | PUBLISHERS | YEAR OF PUBLICATION |
|---|---|---|---|---|
| 1. | Hamdy A. Taha | Operations Research, An Introduction | Prentice Hall of India | 2002 |
| 2. | Richard Bronson | Theory and Problems of Operations Research | Tata McGraw Hill Publishing Company | 2001 |
| 3 | S Kalavathy | Operations Research | Vikas apublishing House Private Limited | 2013 |

**Web links:**

1. **https://youtu.be/ItOuvM2KmD4**
2. **https://youtu.be/SZdKDeubMg8**
3. **https://www.youtube.com/watch?v=vKVkOpNDZ2s**
4. **https://youtu.be/M8POtpPtQZc**
5. **https://youtu.be/8IRrgDoV8Eo**

**Pedagogy:**

Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

# MAJOR BASED ELECTIVE – II (A)

# GRAPH THEORY

# 2019-2020 Onwards

| Semester – VI | GRAPH THEORY | Hours/Week – 4 | |
|---|---|---|---|
| Major Based Elective – II (A) | | Credits – 3 | |
| Course Code – 19UMA6MBE2A | | Internal 25 | External 75 |

**Objectives:**

- To understand the fundamental concepts in graph theory.
- To introduce the notion of graph theory and its applications.
- To learn the techniques of Combinatorics in graph theory.

**Course Outcomes**:

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| **CO1** | Define basic definitions of graphs | **K1** |
| **CO2** | Explain the notion of Eulerian Graphs. | **K2** |
| **CO3** | Describe the concepts of Hamiltonian Graphs and Characterization of Trees. | **K2** |
| **CO4** | Compute the properties of Planar Graphs. | **K3** |
| **CO5** | Apply the concepts of Directed Graphs for solving Kruskal's and Dijkstra's Algorithms. | **K3** |

**Mapping with Programme Outcomes:**

| COS\POS | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | S | S | S | S | S |
| **CO2** | S | M | S | S | M |
| **CO3** | S | S | S | S | S |
| **CO4** | S | M | S | S | M |
| **CO5** | S | S | S | S | S |

**S – Strong, M – Medium, L – Low.**

## MAJOR BASED ELECTIVE – II (A)

## GRAPH THEORY

## SYLLABUS

**UNIT I** **(12 Hours)**

**Introduction:**

Introduction - The Konigsberg Bridge Problem.

**Graphs and Subgraphs:**

Introduction-Definition and Examples - Degrees - Subgraphs - Isomorphism - Independent Sets and Coverings.

**UNIT II** **(12 Hours)**

**Graphs and Subgraphs:**

Matrices - Operations on Graphs.

**Connectedness:**

Introduction-Walks, Trails and Paths – Connectedness and Components.

**Eulerian and Hamiltonian Graphs:**

Introduction- Eulerian Graphs.

**UNIT III** **(12 Hours)**

**Eulerian and Hamiltonian Graphs:**

Hamiltonian Graphs (Omit Chavatal Theorem).

**Trees:**

Introduction-Characterization of Trees - Centre of a Tree.

**UNIT IV** **(12 Hours)**

**Planarity:**

Introduction - Definition and Properties - Characterization of Planar Graphs.

**UNIT V** **(12 Hours)**

**Directed Graphs:**

Introduction - Definitions and Basic Properties.

**Some Applications:**

Introduction -Connector Problem - Shortest Path Problem.

**TEXT BOOKS:**

| S.No. | Authors Name | Title Of The Book | Publishers Name | Year Of Publication |
|---|---|---|---|---|
| 1. | S. Arumugam & S. Ramachandran | Invitation to Graph Theory | SciTech Publications (India) Pvt. Ltd, Chennai. | 2006 |

**CHAPTERS AND SECTIONS:**

| UNIT | CHAPTER | SECTIONS |
|---|---|---|
| I | 1 | 1.0, 1.1 |
| | 2 | 2.0 – 2.4, 2.6 |
| II | 2 | 2.8, 2.9 |
| | 4 | 4.0, 4.1, 4.2 |
| | 5 | 5.0, 5.1 |
| III | 5 | 5.2 |
| | 6 | 6.0 – 6.2 |
| IV | 8 | 8.0 – 8.2 |
| V | 10 | 10.0, 10.1 |
| | 11 | 11.0 – 11.2 |

**REFERENCE BOOKS:**

| S.No. | Authors Name | Title Of The Book | Publishers Name | Year Of Publication |
|---|---|---|---|---|
| 1. | Narsingh Deo | Graph Theory with applications to Engineering and Computer Science | Prentice Hall of India | 2004 |
| 2. | Gary Chartrand and Ping Zhang | Introduction to Graph Theory | Tata McGraw-Hill Edition | 2004 |
| 3. | S. Arumugam and S. Ramachandran | Introduction to Graph Theory | SciTech Publications (India)Pvt., Ltd., | 2006 |

**Web links:**

1. **https://youtu.be/AtDgXyluW-Y**
2. **https://youtu.be/gxL6kCc9yS4**
3. **https://youtu.be/ONdaQOJK574**
4. **https://youtu.be/mm9YUqZTsNE**
5. **https://youtu.be/wnYtITkWAYA**
6. **https://youtu.be/amaH38_mXK4**

**Pedagogy:**

Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

# MAJOR BASED ELECTIVE – II (B)

# NUMBER THEORY

# 2019-2020 Onwards

<table>
<tr><td>Semester - VI</td><td rowspan="3">NUMBER THEORY</td><td colspan="2">Hours/Week – 4</td></tr>
<tr><td>Major Based Elective – II(B)</td><td colspan="2">Credits – 3</td></tr>
<tr><td>Course Code – 19UMA6MBE2B</td><td>Internal<br>25</td><td>External<br>75</td></tr>
</table>

**Objectives:**

- To highlight the details and distinctions in the world of numbers.
- To equip the students with basic concepts of Congruences formatted for their major concepts.
- To prepare the students for coding through Congruences.

**Course Outcome:**

On the Successful completion of the course the student would be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| **CO1** | Apply the concept of divisibility and the linear Diophantine equations. | **K2** |
| **CO2** | Explain permutations and combinations in Fermat's little theorem and Wilson's theorem. | **K2** |
| **CO3** | Describe the basic properties of congruences. | **K2** |
| **CO4** | Solve the congruences using Chinese Remainder theorem and Polynomial congruences. | **K3** |
| **CO5** | Compute the theory of multiplicative arithmetic function and the Mobius inversion formula. | **K3** |

**Mapping with Programme Outcomes:**

| COS / POS | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | S | M | S | M | S |
| **CO2** | S | S | S | M | M |
| **CO3** | S | S | S | M | S |
| **CO4** | S | M | S | M | M |
| **CO5** | S | M | S | M | S |

**S - Strong, M - Medium, L - Low**

## MAJOR BASED ELECTIVE – II (B)

## NUMBER THEORY

## SYLLABUS

**UNIT I** **(12 Hours)**

**The Fundamental Theorem of Arithmetic:**

Euclid's Division Lemma – Divisibility – The Linear Diophantine Equation – The Fundamental Theorem of Arithmetic.

**UNIT II** **(12 Hours)**

**Combinatorial and Computational Number Theory:**

Permutations and Combinations – Fermat's Little Theorem – Wilson's Theorem – Generating Functions.

**UNIT III** **(12 Hours)**

**Fundamentals of Congruences:**

Basic Properties of Congruences – Residue Systems

**Solving Congruences:**

Linear Congruences – The Theorems of Fermat and Wilson Revisited.

**UNIT IV** **(12 Hours)**

**Solving Congruences:**

The Chinese Remainder Theorem – Polynomial Congruences.

**Arithmetic Functions:**

Combinatorial Study of $\phi(n)$.

**UNIT V** **(12 Hours)**

**Arithmetic Functions:**

Formulae for d(n) and $\sigma(n)$ – Multiplicative Arithmetic Function – The Mobius Inversion Formula.

**TEXT BOOKS:**

| S. No. | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | George E. Andrews | Number Theory | W.B. Saunders Company | 1971 |

**CHAPTERS AND SECTIONS:**

| UNIT | CHAPTER | SECTION |
|---|---|---|
| I | 2 | 2.1 – 2.4 |
| II | 3 | 3.1 – 3.4 |
| III | 4 | 4.1 & 4.2 |
| | 5 | 5.1 & 5.2 |
| IV | 5 | 5.3 & 5.4 |
| | 6 | 6.1 |
| V | 6 | 6.2 – 6.4 |

**REFERENCE BOOKS:**

| S. No. | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | David M. Burton | Elementary Number Theory, 7th Edition | Mc Graw Hill Publishing Company | 2011 |
| 2. | S.G.Telang | Number Theory | Tata McGraw-Hill Publishing Company Limited | 2003 |
| 3. | Joseph H. Silverman | A Friendly Introduction to Number Theory | Pearson Education | 2009 |

**Web Links:**

1. **https://www.youtube.com/watch?v=ep695eRaAyU**
2. **https://www.youtube.com/watch?v=vPRNx6ry7SM**
3. **https://www.youtube.com/watch?v=zP9t001PXiU**
4. **https://www.youtube.com/watch?v=Owcepi5zoF0**
5. **https://www.youtube.com/watch?v=nT2KAKNDG58**
6. **https://www.youtube.com/watch?v=4_1D1BBibzw**

**Pedagogy:**

Power point presentation, Group Discussion, Seminar, Assignment.

# MAJOR BASED ELECTIVE COURSE – III (A)

# FUZZY SETS AND SYSTEMS

## 2019-2020 Onwards

<table>
<tr><td>Semester – VI</td><td rowspan="3">FUZZY SETS AND SYSTEMS</td><td colspan="2">Hours/Week – 4</td></tr>
<tr><td>Major Based Elective – III (A)</td><td colspan="2">Credits – 3</td></tr>
<tr><td>Course Code – 19UMA6MBE3A</td><td>Internal<br>25</td><td>External<br>75</td></tr>
</table>

**Objectives:**

- To introduce the concept of fuzzy theory and study its application in real problems.
- To acquire knowledge of the uncertainty environment through the fuzzy sets that incorporates imprecision and subjectivity.
- To provide a good outline of a model formulation and solution process.

**Course Outcome:**

On the Successful completion of the course the student would be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| **CO1** | Explain the basic concepts of Fuzzy set theory. | **K2** |
| **CO2** | Classify the operations on Fuzzy sets and Fuzzy measures and give examples. | **K3** |
| **CO3** | Explain the basic concepts of arithmetic fuzzy numbers. | **K3** |
| **CO4** | Compose clear and accurate proofs using the concepts of Fuzzy logic and propositions. | **K6** |
| **CO5** | Develop Fuzzy concepts to design fuzzy control system models. | **K6** |

**Mapping with Programme Outcomes:**

| COS/POS | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | S | S | S | S | S |
| **CO2** | S | S | S | S | S |
| **CO3** | S | S | S | S | M |
| **CO4** | S | S | S | S | S |
| **CO5** | S | S | S | S | M |

**S-Strong, M-Medium, L-Low**

## MAJOR BASED ELECTIVE – III (A)

## FUZZY SETS AND SYSTEMS

## SYLLABUS

**UNIT I** **(12 Hours)**

**FUZZY SET THEORY:**

Introduction – Fuzzy Versus Crisp – Number System – Interval – Sets – Representation of a Set – Types of Sets – Subsets – Universal Set – Venn Diagrams – Operations on Sets – Difference of Two Sets – Some Important Results – Some More Results – Some Results on Venn Diagrams – Fuzzy Sets – Fuzzy Set: Definition – Types of Fuzzy Sets – Characteristics of Fuzzy Sets – Other Important Operations – General Properties : Fuzzy Vs Crisp.

**UNIT II** **(12 Hours)**

**OPERATIONS ON FUZZY SETS:**

Introduction – Some Important Theorems – Extension Principle for Fuzzy Sets – Fuzzy Compliments – Further Operations on Fuzzy Sets – t-Norms and t-Conorms – Definition of Intersection and Union by Hamacher – Yager's Union and Intersection of Two Fuzzy Sets – Union and Intersection of Two Fuzzy Sets as given by Dubois and Prade – Extension Principle for Fuzzy Sets – Aggregation Operations.

**UNIT III** **(12 Hours)**

**FUZZY NUMBERS AND ARITHMETIC:**

Introduction – Fuzzy Numbers – Algebraic Operations with Fuzzy Numbers – Binary Operation of Two Fuzzy Numbers – Some Special Extended Operations – Extended Operations

for L-R Representation of Fuzzy Sets – Fuzzy Arithmetic – Arithmetic Operations on Fuzzy Numbers in the Form of $\alpha$-Cut Sets – Fuzzy Equations – Approximate Methods of Extension – Interval Analysis in Arithmetic – Lattice of Fuzzy Numbers.

**UNIT IV** **(12 Hours)**

**FUZZY LOGIC:**

An Overview of Classical Logic – Connectives – Types of Sentences – Truth Values and Truth Table – Tautology – Algebra of Statements – Validity of Arguments – Logical Identities of Crisp Logic – Well Formed Formulas (WFF) – Predicates and Quantifiers – Quantifiers and Logical Operators – Normal Forms – Fuzzy Logic and Fuzzy Propositions – Fuzzy Connectives– Fuzzy Inference – Fuzzy Propositions – Fuzzy Quantifiers.

**UNIT V** **(12 Hours)**

**FUZZY SYSTEMS AND FUZZY CONTROL:**

Introduction – Fuzzy Rule Based System – Fuzzification and Defuzzification – Fuzzy Control – Assumptions in a Fuzzy Control System Design – Design of Fuzzy Controllers – Fuzzy Control System Models.

**TEXT BOOKS:**

| S. No. | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1 | Sudhir K. Pundir & Rimple Pundir | Fuzzy Sets and their Applications | A Pragati Edition | 2006 |

**CHAPTERS AND SECTIONS:**

| UNIT | CHAPTER | SECTIONS |
|---|---|---|
| I | 1 | 1.1 - 1.21 |
| II | 2 | 2.1 - 2.11 |
| III | 3 | 3.1 - 3.12 |
| IV | 7 | 7.1 - 7.17 |
| V | 8 | 8.1 - 8.7 |

**REFERENCE BOOKS:**

| S.No. | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1 | H.J.Zimmermann | Fuzzy Set Theory and its Applications Fourth Edition | Springer(India) Private Limited | 2006 |
| 2 | George J. Klir and Bo Yuan | Fuzzy Sets & Fuzzy Logic Theory and Applications | Prentice-Hall of India | 1995 |
| 3 | Kwang H.Lee | First course on Fuzzy theory and Applications | Springer | 2005 |

**Web links:**

1. **https://youtu.be/HjCTfx2AAaw**
2. **https://youtu.be/XHNhqCSGV60**
3. **https://youtu.be/6daiRieEQlU**
4. **https://youtu.be/N8yhE1GaaQc**
5. **https://youtu.be/_po4FxxE9c8**

**Pedagogy:**

Power point presentation, Group Discussion, Seminar, Quiz, Assignment.

# MAJOR BASED ELECTIVE – III (B)

# ASTRONOMY

# 2019–2020 Onwards

| Semester – VI | ASTRONOMY | Hours/Week – 4 | |
|---|---|---|---|
| Major Based Elective – III (B) | | Credits – 3 | |
| Course Code -19UMA6MBE3B | | Internal 25 | External 75 |

**Objectives:**

- To introduce the exciting world of astronomy to the students.
- To help the students to study spherical trigonometry in the field of astronomy.
- To understand the movements of the celestial objects.

**Course Outcomes:**

On the Successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| **CO1** | Explain the concepts of Celestial sphere, diurnal motion, Celestial coordinates and sidereal time. | **K2** |
| **CO2** | Classify circumpolar stars, zones of earth, perpetual day, dip of horizon and twilight. | **K3** |
| **CO3** | Derive refraction, laws of refraction, tangent formula, Cassini's formula, horizontal refraction, geocentric parallax and horizontal parallax. | **K3** |
| **CO4** | Discuss lunar and solar eclipses and ecliptic limits. | **K3** |
| **CO5** | Ascertain Kepler's laws, verification of $1^{st}$ and $2^{nd}$ laws in the case of earth, Anomalies, Kepler's equation, Seasons, causes and kinds of years. | **K4** |

**Mapping with Programme Outcomes:**

| COS/POS | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | S | S | M | M | S |
| **CO2** | S | S | M | M | S |
| **CO3** | S | S | S | S | S |
| **CO4** | S | S | S | M | S |
| **CO5** | S | S | S | M | S |

**S–Strong, M–Medium, L–Low**

## MAJOR BASED ELECTIVE – III (B)

## ASTRONOMY

## SYLLABUS

**UNIT I** **(12 Hours)**

Relevant properties of sphere and formulae in spherical trigonometry (no proof, no problems) – Celestial sphere and diurnal motion – Celestial coordinates – sidereal time.

**UNIT II** **(12 Hours)**

Morning and evening stars – circumpolar stars – diagram of the celestial sphere – zones of earth – perpetual day –dip of horizon–twilight.

**UNIT III** **(12 Hours)**

Refraction – laws of refraction – tangent formula – Cassini's formula – horizontal refraction – geocentric parallax – horizontal parallax.

**UNIT IV** **(12 Hours)**

Kepler's laws – Anomalies – Kepler's equation – Kinds of years.

**UNIT V** **(12 Hours)**

Moon–sidereal and synodic months – elongation – phase of moon – eclipses–umbra and penumbra – lunar and solar eclipses – ecliptic limits – maximum and minimum number of eclipses near a node and in a year – Saros of Chaldeans.

**TEXT BOOKS:**

| S. No | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | S. Kumaravel and Susheela Kumaravel | Astronomy | SKV Publications | 2004 |

**CHAPTERS AND SECTIONS:**

| UNIT | CHAPTER | ART |
|---|---|---|
| I | 1 | 1 – 38 |
| | 2 | 39 – 79 |
| II | 2 | 80–86 |
| | 3 | 87 – 101, 106 – 116 |
| III | 4 | 117–134 |
| | 5 | 135 – 144 |
| IV | 6 | 146–149, 153-165 |
| | 7 | 166–172,175–189 |
| V | 12 | 229–255 |
| | 13 | 256–275 |

**REFERENCE BOOKS:**

| S.No. | Authors Name | Title of the Book | Publishers Name | Year of Publication |
|---|---|---|---|---|
| 1. | G.V. Ramachandran | Astronomy | Mission Press, Palayamkottai. | 1965 |

**Web links:**

1. **https://youtu.be/GIMAocKlagM**
2. **https://youtu.be/qNLAb–Rdcgs**
3. **https://youtu.be/F6Tkb8syTK8**
4. **https://youtu.be/re3oEKX6Fks**
5. **https://youtu.be/ZS2FvljQXsk**

**Pedagogy:**

Power point presentations, Group Discussion, Seminar, Quiz , Assignment, e–content, Lecture.

# SKILL BASED ELECTIVE – III (A)

# LaTeX (PRACTICAL)

# 2019-2020 Onwards

| Semester – VI | LaTeX (PRACTICAL) | Hours/Week – 2 | |
|---|---|---|---|
| Skill Based Elective – III (A) | | Credits – 2 | |
| Course Code – 19UMA6SBE3AP | | Internal 40 | External 60 |

**Objectives:**

- To introduce the basic concepts of LaTeX, a typesetting software.
- To get knowledge about creating a bibliographic database.
- To write mathematical documents in LaTeX.

**Course Outcome:**

On the Successful completion of the course the student would be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Define and use new commands within LaTeX. | K1 |
| CO2 | Apply mathematical formulae using LaTeX. | K2 |
| CO3 | Create a table using LaTeX. | K3 |
| CO4 | Classify various types of formulae, equations, matrix etc. by using LaTeX. | K3 |
| CO5 | Prepare a bibliography for a particular document. | K3 |

**Mapping with Programme Outcomes:**

| COS/POS | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | S | S | S | S | S |
| CO2 | S | S | S | S | S |
| CO3 | S | S | S | S | M |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | S | M |

**S-Strong, M-Medium, L-Low**

**SKILL BASED ELECTIVE – III (A)**

**LaTeX (PRACTICAL)**

**SYLLABUS**

1. Create a LaTeX document for the given Mathematical Expression.
2. Create a table in LaTeX document.
3. Construct a LaTeX document using sums, integrals and limits.
4. Construct a differential equation and integral equation.
5. Create a LaTeX document that contains the following: Title – Author's name – Abstract– Introduction – Sections.
6. Create a bibliography in LaTeX document.
7. Create a letter in LaTeX.

**Web links:**

1. **https://www.youtube.com/watch?v=fCzF5gDy60g**
2. **https://www.youtube.com/watch?v=0ivLZh9xK1Q**
3. **https://www.youtube.com/watch?v=bCumVPGR4ts**
4. **https://www.youtube.com/watch?v=kefvRACdXHs**
5. **https://www.youtube.com/watch?v=8byt3ywt1H8&list=RDCMUCGCHc7LsEYT6_2dQauh2NYw&index=8**

**Pedagogy:**

Power point presentation, Hand on Training.

# SKILL BASED ELECTIVE – III (B)

# PYTHON PROGRAMMING (PRACTICAL)

## 2019-2020 Onwards

| Semester – VI | PYTHON PROGRAMMING (PRACTICAL) | Hours/Week – 2 | |
|---|---|---|---|
| Skill Based Elective –III(B) | | Credits – 2 | |
| Course Code – 19UMA6SBE3BP | | Internal 40 | External 60 |

**Objectives:**

- To explore and understand how to use python.
- To describe the core syntax and semantics of Python programming language.
- To understand how to create and manipulate data's in python.

**Course Outcome:**

` On the Successful completion of the course the student would be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| **CO1** | Interpret the fundamental Python syntax and the use of Python input statements. | **K2** |
| **CO2** | Classify various control structures of Python in simple programs. | **K3** |
| **CO3** | Compute simple programs using input statements of Python programming language. | **K3** |
| **CO4** | Infer the usage of Dictionaries, Sets and Object-Oriented programming concepts in Python. | **K4** |
| **CO5** | Explain the need for working with functions in Python. | **K2** |

**Mapping with Programme Outcomes:**

| COS/POS | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | S | S | S | S | S |
| **CO2** | S | S | S | S | S |
| **CO3** | S | S | S | S | M |
| **CO4** | S | S | S | S | S |
| **CO5** | S | S | S | S | M |

**S-Strong, M-Medium, L-Low**

**SKILL BASED ELECTIVE – III (B)**

**PYTHON PROGRAMMING (PRACTICAL)**

**SYLLABUS**

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method).
3. Exponentiation (power of a number).
4. Find the maximum of a list of numbers.
5. Linear search and Binary search.
6. Selection sort, Insertion sort and Merge sort.
7. First n prime numbers.
8. Multiply matrices.
9. Programs that take command line arguments (word count).
10. Find the most frequent words in a text read from a file.

**Web links:**

1. **https://youtu.be/rfscVS0vtbw**
2. **https://youtu.be/_uQrJ0TkZlc**
3. **https://youtu.be/1QDvkkdyGw0**
4. **https://youtu.be/t8pPdKYpowI**
5. **https://youtu.be/woVJ4N5nl_s**

**Pedagogy:**

Power point presentation, Hand on Training.