# MANNAR THIRUMALAI NAICKER COLLEGE PASUMALAI, MADURAI- 625004 

(An Autonomous Institution Affiliated to Madurai Kamaraj University)
(Re-accredited with 'A' Grade by NAAC)


B.Sc., Mathematics<br>\section*{SYLLABUS AND REGULATIONS}

UNDER<br>CHOICE BASED CREDIT SYSTEM (CBCS)<br>(For those who joined during 2018-2019 and after)

## Qualification for Admission

Candidate should have passed the Higher Secondary Examination conducted by the Board of Higher Secondary Education, Government of Tamil Nadu CBSE Board with Mathematics as one of the subjects in Higher Secondary Education.

## Duration of the Course

The students shall undergo the prescribed B.Sc(Mathematics) course of study for a period of three academic years (six semesters).

## Subject of Study

Part I: Tamil
Part II: English
Part III:

1. Core Subjects
2. Allied Subjects
3. Electives

Part IV :

1. Non Major Electives
2. Skill Based Subjects
3. Environmental Studies
4. Value Education

Part V
Extension activities

## The scheme of Examination

The components for continuous internal assessment are:

Two tests and their average --15 marks

| Seminar /Group discussion | --5 marks |
| :--- | :--- |
| Assignment | --5 marks |
| Total | --25 marks |

## Pattern of the questions paper for the continuous Internal Assessment

## (For Part I, Part II, Part III , NME \& Skilled Paper in Part IV )

The components for continuous internal assessment are:

## Part -A

Six multiple choice questions (answer all)
Part -B
Two questions ('either .... or 'type)

$$
6 \times 01=06 \text { Marks }
$$

$2 \times 07=14$ Marks
Part -C
One question out of two
$1 \times 10=10$ Marks
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30 Marks

Pattern of the question paper for the Summative Examinations:

## Note: Duration- 3 hours

## Part -A

Ten multiple choice questions $10 \times 01=10$ Marks
(No Unit shall be omitted; not more than two questions from each unit.)

## Part -B

Five Paragraph questions ('either .... or 'type)
$5 \times 07=35$ Marks
(One question from each Unit)

## Part -C

Three Essay questions out of five
(One question from each Unit)

> Total

$$
3 \times 10 \quad=30 \text { Marks }
$$

$\qquad$
75 Marks

## The Scheme of Examination (Environmental Studies and Value Education)

Two tests and their average
Project Report
Total --25 marks
** The students as Individual or Group must visit a local area to document environmental assets river / forest / grassland / hill / mountain - visit a local polluted site - urban / rural / industrial / agricultural - study of common plants, insects, birds - study of simple ecosystem - pond, river, hill slopes, etc.

Question Paper Pattern<br>Pattern of the Question Paper for Environmental Studies \& Value Education only) (Internal)

## Part -A

(Answer is not less than 150 words)
Four questions ('either .... or 'type) 4 x 05=20 Marks
Part -B
(Answer is not less than 400 words)
One question ('either .... or 'type)
$1 \times 10=10$ Marks
Total
30 Marks

## Pattern of the Question Paper for Environmental Studies \& Value Education only) (External)

## Part -A

(Answer is not less than 150 words)
Five questions (either or type)

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5x 06 =30 Marks
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(One question from each Unit)
Part -B
(Answer is not less than 400 words)
Three questions out of Five each unit (One question from each Unit)

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3x 15 = 45 Marks
75 Marks
```

Total

## Minimum Marks for a Pass

$40 \%$ of the aggregate (Internal +Summative Examinations).
No separate pass minimum for the Internal Examinations.
27 marks out of 75 is the pass minimum for the Summative Examinations.

## PROGRAM EDUCATIONAL OUTCOMES (PEO)

PEO1: Acquire good knowledge in analytical, algebraic structures, applied mathematics and statistics.

PEO2: Work independently and collaboratively in mathematical projects.
PEO3: Empower to face the competitive exams, employability in MNC, Govt. Sectors, etc.
PEO4: Engage in lifelong learning through continuing education, environmental studies.

## PROGRAM OUTCOMES

PO1: Problem solving and analytic, reasoning
PO2: Modern tool usage and knowledge
PO3: Leadership readiness and Reflective thinking
PO4: Communication skills and Digital literacy
PO5: Moral and Ethical Reasoning
PO6: Cooperation and team work
PO7: Lifelong learning and research related skills

## PROGRAMME SPECIFIC OUTCOMES

PSO1: To understand the basic rules of logic, including the role of axioms or assumptions
PSO2: To recognize connections between different branches of mathematics and appreciate the connections between theory and applications.

PSO3: To enable the students to gain knowledge in basic Mathematics.
PSO4: To provide sufficient knowledge on computer skills through MS office, C, C++ and Java Programming and many innovative and modern subjects in Mathematics.

## B.Sc (Mathematics)

(Those who joined in 2018-2019 and after)
Table: 1: Course pattern

| Study Component | $\begin{aligned} & \hline \text { I } \\ & \text { Sem } \end{aligned}$ | $\begin{aligned} & \hline \text { II } \\ & \text { Sem } \end{aligned}$ | $\begin{aligned} & \hline \text { III } \\ & \text { Sem } \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline \text { IV } \\ & \text { Sem } \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline \mathrm{V} \\ & \text { Sem } \end{aligned}$ | $\begin{aligned} & \text { VI } \\ & \text { Sem } \end{aligned}$ | Total Hours | Total Credit | No.of course | Total marks |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Part - I <br> Tamil | 6(3) | 6(3) | 6(3) | 6(3) |  |  | 24 | 12 | 4 | 400 |
| Part -II <br> English | 6(3) | 6(3) | 6(3) | 6(3) |  |  | 24 | 12 | 4 | 400 |
| Part -III |  |  |  |  |  |  |  |  |  |  |
| Core subjects | 6(4) | 6(5) | $\begin{aligned} & \hline 5(5) \\ & 5(5) \end{aligned}$ | $\begin{aligned} & 5(5) \\ & 5(5) \end{aligned}$ | $\begin{aligned} & \hline 5(5) \\ & 5(5) \\ & 6(5) \\ & 6(5) \\ & \hline \end{aligned}$ | $\begin{aligned} & 5(5) \\ & 5(5) \\ & 6(5) \\ & 6(5) \\ & \hline \end{aligned}$ | 76 | 69 | 14 | 1400 |
| Allied Subject-I | 4(4) | 4(3) | 4(4) | 4(3) |  |  | 16 | 14 | 4 | 400 |
| Allied Subject-I (P) | 2(0) | 2(1) | 2(0) | 2(1) |  |  | 8 | 2 | 2 | 200 |
| Allied Subject-II |  |  |  |  | 6(5) | 6(5) | 12 | 10 | 2 | 200 |
| Allied Subject II (P) |  |  |  |  |  |  |  |  | 1 | 100 |
| Part-IV |  |  |  |  |  |  |  |  |  |  |
| Allied <br> Mathematics | 6(4) | 6(4) | 4(4) | 4(4) |  |  | 20 | 16 | 4 | 400 |
| Skill Based Subjects | $\begin{aligned} & 2(2) \\ & 2(2) \end{aligned}$ | $\begin{aligned} & 2(2) \\ & 2(2) \end{aligned}$ |  |  | 2(2) | 2(2) | 12 | 12 | 6 | 600 |
| Environment studies / value education | 2(2) | 2(2) |  |  |  |  | 4 | 4 | 2 | 200 |
| Non Major Elective |  |  | 2(2) | 2(2) |  |  | 4 | 4 | 2 | 200 |
| Part V |  |  |  |  |  |  |  |  |  |  |
| Extension Activities |  |  |  | 0(1) |  |  | 0 | 1 | 1 | 100 |
| Total | $\begin{gathered} \hline 30 \\ (20) \\ \hline \end{gathered}$ | $\begin{gathered} \hline 30 \\ (21) \\ \hline \end{gathered}$ | $\begin{gathered} \hline 30 \\ (\mathbf{2 2}) \\ \hline \end{gathered}$ | $\begin{gathered} \mathbf{3 0} \\ (23) \\ \hline \end{gathered}$ | $\begin{gathered} \hline \mathbf{3 0} \\ (27) \\ \hline \end{gathered}$ | $\begin{gathered} \hline 30 \\ (27) \\ \hline \end{gathered}$ | 180 | 140 | 42 | 4200 |

## SEMESTER -I

| Subject code | Subjects | No. of Courses | Hours / week | Credits | Maximum Marks |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  | Int. | Ext | Total |
| 18UTAG11 | Part -I Tamil Subject <br> Tamil-I: <br> தற்கால கவிதையும் உரைநடையும் | 1 | 6 | 3 | 25 | 75 | 100 |
| 18UENG11 | Part -II English Subject Exploring Language Through LiteratureI | 1 | 6 | 3 | 25 | 75 | 100 |
| 18UMTC11 | Part -III Core Subject Differential Calculus | 1 | 6 | 4 | 25 | 75 | 100 |
| 18UPHA11 <br> 18UPHAP1 | Part -III Allied Subject <br> Allied Physics -I Mechanics, Properties of Matter and Relativity <br> Allied Physics Practical - I | 1 - | $\begin{aligned} & 4 \\ & 2 \end{aligned}$ | 4 | 25 | 75 | 100 |
| 18UMTS11 | Part -IV Skill Subject <br> Numerical Aptitude | 1 | 2 | 2 | 25 | 75 | 100 |
| 18UMTS12 | Trigonometry | 1 | 2 | 2 | 25 | 75 | 100 |
| 18UEVG11 | Part -IV Mandatory Subject Environmental Studies | 1 | 2 | 2 | 25 | 75 | 100 |
|  | Total | 7 | 30 | 20 | 175 | 525 | 700 |

SEMESTER - II

| Subject code | Subjects | No. of <br> Courses | Hours <br> /week | Credits | Maximum Marks |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  | Int |  | Total |  |  |  |  |
| 18UTAG21 | Part -I Tamil Subject <br> Tamil -II: பக்தி இலக்கியமும் bாடகமும் | 1 | 6 | 3 | 25 | 75 | 100 |
| 18UENG21 | Part -II English Subject <br> Exploring Language Through Literature- <br> II | 1 | 6 | 3 | 25 | 75 | 100 |
| 18UMTC21 | Part -III Core Subject <br> Theory of Equations and its applications | 1 | 6 | 5 | 25 | 75 | 100 |
| 18UPHA21 | Part -III Allied Subject <br> Allied Physics -II <br> Thermal Physics and Sound | 1 | 4 | 3 | 25 | 75 | 100 |
| 18UPHAP1 | Allied Physics Practical - I | 1 | 2 | 1 | 40 | 60 | 100 |
| 18UMTS21 | Part -IV Skill Subject <br> MS Office | 1 | 2 | 2 | 25 | 75 | 100 |
| 18UMTSP1 | MS Office Lab | 1 | 2 | 2 | 40 | 60 | 100 |
| 18UVLG21 | Part -IV Mandatory Subject <br> Value Education | 1 | 2 | 2 | 25 | 75 | 100 |
|  | Total | $\mathbf{8}$ | $\mathbf{3 0}$ | $\mathbf{2 1}$ | $\mathbf{2 3 0}$ | $\mathbf{5 7 0}$ | $\mathbf{8 0 0}$ |


| SEMESTER -III |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Subject code | Subjects | No. of Courses |  | Hours / week | Credits |  | Maximum Marks |  |  |  |
|  |  |  |  | Int |  |  |  | Ext | Total |
| 18UTAG31 | Part -I Tamil காப்பிய இலக்கியமும் சிறுகதையும் | 1 |  |  | 6 | 3 |  | 25 | 75 |  | 100 |
| 18UENG31 | Part -II English <br> Exploring Language Through Literature-III | 1 |  | 6 | 3 |  | 25 |  | 75 | 100 |
| 18UMTC31 <br> 18UMTC32 | Part -III Core Subject Integral Calculus Sequences and Series | 1 |  | $5$ | $5$ |  |  |  | 75 | $\begin{aligned} & 100 \\ & 100 \\ & \hline \end{aligned}$ |
| 18UPHA31 <br> 18UPHAP2 | Part -III Allied Subject <br> Allied Physics -III <br> Electricity and Electronics <br> Allied Physics <br> Practical - II | 1 |  |  | 4 |  | 25 |  | 75 | 100 100 |
| 18UMTN31 | Part -IV NME <br> Mathematics for Competitive Examination - I | 1 |  | 2 | 2 |  | 25 |  | 75 | 100 |
|  | Total | 6 |  | 30 | 22 |  | 150 | 450 |  | 600 |
| SEMESTER IV |  |  |  |  |  |  |  |  |  |  |
| Subject | Title of the Paper |  | $\begin{aligned} & \text { No.of } \\ & \text { Courses } \\ & \hline \end{aligned}$ |  | Hours /Week | Credits |  | Maximum Marks |  |  |
| Code |  |  | Int | Ext |  |  |  | Total |
| 18UTAG41 | Part - I Tamil பழந்தமிழ் இலக்கியமும் புதிஎமும் |  |  |  | 1 |  | 6 | 3 |  | 25 | 75 | 100 |
| 18UENG41 | Part -II English Exploring Language Through Literature-IV |  | 1 | 6 | 6 | 3 |  | 25 | 75 | 100 |
| 18UMTC41 <br> 18UMTC42 | Part -III Core Subject <br> Analytical geometry 3D and Vector calculus Statistics - I |  | $1$ | 5 5 | 5 5 | 55 |  | $\begin{aligned} & 25 \\ & 25 \\ & \hline \end{aligned}$ | $\begin{array}{\|l} 75 \\ 75 \\ \hline \end{array}$ | $\begin{array}{r} 100 \\ 100 \\ \hline \end{array}$ |
| 18UPHA41 | Part -III Allied Subject Allied Physics- IV Optics, Spectroscopy and Mod Physics |  | 1 | 4 | 4 | 3 |  | 25 | 75 | 100 |
| 18UPHAP2 | Allied Physics Practical -II |  | 1 | 2 |  | 1 |  | 40 | 60 | 100 |
| 18UMTN41 | Part -IV <br> Non Major Elective <br> Mathematics for Competitive <br> Examination - II |  | 1 |  | 2 | 2 |  | 25 | 75 | 100 |
| $\begin{aligned} & \text { 18UEAG40- } \\ & \text { 18UEAG49 } \end{aligned}$ | Part V- Extension Activities |  | 1 |  | - | 1 |  | 100 | - | 100 |

Volume VI - Science Syllabus / 2020-2021

|  | Total 8 | $\mathbf{3 0}$ | $\mathbf{2 3}$ | 290 | 510 | 800 |
| :--- | ---: | ---: | :--- | :--- | :--- | :--- | :--- |


| Course <br> code | Name of the course | No. of <br> Courses | Hours / <br> week | Credit <br> s | Maximum Marks |  |  |
| :--- | :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| 18UMTC51 | Part -III Core Subject <br> Real Analysis | 1 | 5 | 5 | 25 | 75 | 100 |
| 18UMTC52 | Modern Algebra | 1 | 6 | 5 | 25 | 75 | 100 |
| 18UMTC53 | Statistics II | 1 | 6 | 5 | 25 | 75 | 100 |
| 18UMTA51 | Programming in C | 1 | 5 | 5 | 25 | 75 | 100 |
| 18UMTE51 <br> 18UMTE52 <br> 18UMTE53 | Differential Equations <br> Fuzzy sets <br> Astronomy | $\mathbf{1}$ | $\mathbf{6}$ | $\mathbf{5}$ | $\mathbf{2 5}$ | $\mathbf{7 5}$ | $\mathbf{1 0 0}$ |
| 18UMTS51 | Part IV Skill Subject <br> Laplace Transforms \& Fourier <br> Series | 1 | 2 | 2 | 25 | 75 | 100 |
|  | Total | $\mathbf{6}$ | $\mathbf{3 0}$ | $\mathbf{2 7}$ | $\mathbf{1 5 0}$ | $\mathbf{4 5 0}$ | $\mathbf{6 0 0}$ |

SEMESTER -VI

| Course code | Name of the subject | No. of <br> Courses | Hours / <br> week | Credits | Maximum Marks |  |  |
| :--- | :--- | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Int | Ext | Total |  |  |  |  |
| 18UMTC61 | Part -III Core Subject <br> Complex Analysis | 1 | 5 | 5 | 25 | 75 | 100 |
| 18UMTC62 | Linear Algebra | 1 | 6 | 5 | 25 | 75 | 100 |
| 18UMTPR1 | Project \& Viva-voce | 1 | 6 | 5 | 40 | 60 | 100 |
| 18UMTA61 | Operations Research | 1 | 5 | 5 | 25 | 75 | 100 |
| 18UMTE61 <br> 18UMTE62 <br> 18UMTE63 | Graph Theory <br> Stochastic Process <br> Number Theory | $\mathbf{1}$ | $\mathbf{6}$ | $\mathbf{5}$ | $\mathbf{2 5}$ | $\mathbf{7 5}$ | $\mathbf{1 0 0}$ |
| 18UMTS61 | Part IVSkill Subject <br> Programming in C++ | 1 | 2 | 2 | 25 | 75 | 100 |
|  | Total | $\mathbf{6}$ | $\mathbf{3 0}$ | $\mathbf{2 7}$ | $\mathbf{1 6 5}$ | $\mathbf{4 3 5}$ | $\mathbf{6 0 0}$ |

## MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous) DEPARTMENT OF MATHEMATICS (For those who joined in 2018-2019 and after)

| Class | $:$ B.Sc (Mathematics) | Part III | $:$ Core |
| :--- | :--- | :--- | :--- |
| Semester | $: V$ | Hours | $: 05$ |
| Course Code | $: 18 U M T C 51$ | Credits | $: 05$ |

## REAL ANALYSIS

## Course Outcomes:

On successful completion of the course, the learners will be able to
CO1: demonstrate the understanding of basic concepts of Real analysis. (K2)
CO2: determine whether subsets of a metric space are open, closed, complete, connected and/or compact.
CO3: examine whether a function on a metric space is continuous, discontinuous, or uniformly continuous.
CO4: comprehend arguments developing the theory behind real analysis (K2)
CO5: construct mathematical proofs of basic results in real analysis (K3)

Unit - I
Countable and uncountable sets -Holder's and Minkowski's inequalities - Metric space open sets and closed sets.

Unit -II
Completeness - Cantor's intersection theorem and Baire's category theorem - Problems.

## Unit -III

Continuity -- Homeomorphism -- Uniform continuity. Theorems and problems.

## Unit -IV

Connectedness -Connected subsets of R - Connectedness and continuity - Intermediate value theorem.

## Unit -V

Compactness- Compact subsets of R- Heine Borel Theorem - Equivalent characterization of compactness- Finite intersection property- Totally Bounded metric space - sub sequence - sequentially compact metric space - problems.

## Text Book:

1. Dr.S.Arumugam, Mr. A. Thangapandi Isaac, Dr. A. Somasundaram, Modern Analysis, Yes Dee Publishing Pvt Ltd.

Unit I - Chapter 1: Sections 1.3-1.5, Chapter 2: Sections 2.2, 2.5, 2.8

Unit II - Chapter 3: Full
Unit III - Chapter 4: sections 4.2-4.4

Unit IV - Chapter 5: Full
Unit V - Chapter 6: Sections 6.2-6.4

## Reference books:

1. Shanthi Narayan, Elements of Real Analysis, S.Chand and Company Ltd, New Delhi, Sixth Edition, Revised edition 1989.
2. Richard R. Goldberg, Methods of Real Analysis, Oxford and IBH Publishing Pvt. Ltd, New Delhi, 1970.
3. Goldberg .R - Methods of Real Analysis, Oxford and IBH Publishing Co., New Delhi.

## MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous) DEPARTMENT OF MATHEMATICS (For those who joined in 2018-2019 and after)

| Class | $:$ B.Sc (Mathematics) | Part III | $:$ Core |
| :--- | :--- | :--- | :--- |
| Semester | $: V$ | Hours | $: 06$ |
| Course Code | $: 18 U M T C 52$ | Credits | $: 05$ |

## MODERN ALGEBRA

## Course Outcome:

## On successful completion of the course, the learners will be able to

CO 1: Demonstrate the basic concepts like sets, relations, definition of groups(K1)
CO 2: Explain the concepts of subgroups, cosets, isomorphism, rings (K2)
CO 3: Justify the results like isomorphism in various groups (K5)
CO 4: Apply the important theorems (K3)
CO 5: Examine the properties of various groups (K4)

## Unit -I

Subgroups - Examples - Theorems on subgroups- Permutation groups - Cycles and transpositions - Even permutations - Theorems on Permutations - $\mathrm{S}_{\mathrm{n}}$ and $\mathrm{A}_{\mathrm{n}}$ - Cyclic groups- Definitions, Examples, Theorems

## Unit -II

Order of an element - Generators - Number of generators of Cyclic groups - Cosets Theorems on cosets, Lagrange's theorem, problems using Lagrange's Theorem - Euler's, Fermat's Theorems .

## Unit -III

Normal subgroups - Theorems on Normal subgroups - Quotient group- IsomorphismsExamples, theorems - Automorphism

## Unit -IV

Homomorphisms - Types and examples - Theorems on Homomorphisms - Fundamental theorem of Homomorphism - Any infinite cyclic group is isomorphic to ( $\mathrm{Z},+$ ) - Any finite group is isomorphic to $\left(\mathrm{Z}_{\mathrm{n}},+\right)$ - Cayley's Theorem-Rings - Definition and examples .

## Unit- V

Elementary properties - Isomorphism types of rings - Integral domains, Fields - Zero divisors - Theorems on Integral domains and Fields, Characteristic of a ring.

## Text Book:

1. Dr.S.Arumugam and Isaac, Modern Algebra, Scitech Publication, Chennai, Reprint, June 2019.

Unit I - Section 3.4 to 3.6

Unit II - Section 3.7 to 3.8

Unit III - Section 3.9 to 3.10

Unit IV - Section 3.11, Section 4.1

Unit V - Section 4.2 to 4.5

## Reference books:

1. M.L Santiago, Modern Algebra, Tata MC Graw Hill Publication, New Delhi, 1988.
2. K.Sivasubramaniam, A.S.Kumaraswamy and K.Sitaraman, Modern Algebra, S.Chand and Company Ltd, New Delhi, 1979.
3. Basic Modern Algebra with Applications, Adhikari, MahimaRanjan, Adhikari, Avishek, Springer, 2014.

Percentage of change: $30 \%$

## MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous) DEPARTMENT OF MATHEMATICS (For those who joined in 2018-2019 and after)

| Class | $:$ B. Sc (Mathematics) | Part III | : Core |
| :--- | :--- | :--- | :--- |
| Semester | $: V$ | Hours | $: 06$ |
| Course Code | $: 18 U M T C 53$ | Credits | $: 05$ |

## STATISTICS II

## Course Outcomes:

On successful completion of the course, the learners will be able to
CO 1: Remember and understanding of statistics and data analysis (K1, K2)
CO 2: Apply various types of distribution (K3)
CO 3: Analyze statistical techniques to interpret the data. (K4)
CO 4: Evaluate problems on test of significance and probability functions. (K5)
CO 5: Create sampling development and scientific attitude through Statistics. (K6)

Unit - I

Theory of probability - Sample space - Probability function - Conditional probability Boole's inequality -Baye's theorem - Problems.

Unit - II

Random variables - Distribution function - Discrete and Continuous random variables Probability density function - Mathematical expectation(one dimensional only).

## Unit -III

Moment generating function - Cumulants - Characteristic function- Theoretical distribution -Binomial - Poisson -Normal.

Unit -IV

Test of significance of large samples.
Unit -V

Test of significance of small samples - t-test, F-test and Chi-square test.

## Text Book:

1. Dr.S.Arumugam and Isaac, Statistics, New Gamma Publications, Palayamkottai, Reprint 2012.

Unit I - Chapter 11
Unit II - Chapter 12 : Section 12.1 to 12.4

Unit III - Chapter 12 : Section 12.5-12.6 \& Chapter 13
Unit IV - Chapter 14

Unit V - Chapter 15, 16

## Reference Books:

1. T. Sankara Narayanan and A.Mangaldoss, Statistics and its Application, Preist Publications, New Delhi, 1994.
2. R.S.N.Pillai and Bagavathi, Practical Statistics, ,S.Chand and Company Pvt Ltd, New Delhi, 1987.
3. Bhat B.R, Srivenkataramana T and Rao Madhava K.S.(1996): Statistics: A Beginner s Text, Vol. I, New Age International (P) Ltd.

## MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous) DEPARTMENT OF MATHEMATICS (For those who joined in 2018-2019 and after)

Class : B.Sc (Mathematics) Part III : Allied<br>Semester : V<br>Course Code: 18UMTA51<br>Hours : 05

## PROGRAMMING IN C

## Course Outcomes:

On successful completion of the course, the learners will be able to
CO 1: Identify appropriate program concepts. (K1)
CO 2: Explain the concept of programming and pseudo codes (K2)
CO 3: Analyze problems, identify subtasks and implement them as functions/procedures. (K4)
CO 4: Implement variables and looping techniques. (K5)
CO 5: Apply branching statement and iteration techniques to solve application programs. (K3)
Unit 1: Programming Fundamentals - program development life cycle - algorithm - flow chart pseudo code

Unit 2: C character set - identifiers and keywords - declaration statement - data types - type quantifiers and type modifiers - difference between declaration and definition- variables and constants - structure of a C program - Executing a C program.

Unit 3: Expressions - Simple Expressions and compound expressions - classification of operators - combined precedence of all operators - reading strigs - printing strings.

Unit 4: Statement - classification of statements - branching statements: if statement, if-else statement, nested if statement, nested if-else statements, switch statement, jump statement, goto statement, break statement, return statement

Unit 5: Iteration statement: counter-controlled loops, for statement, while statement, do-while statement, sentinel -controlled loops - nested loops- break and continue statements

## Text book:

1. Anita Goel and Ajay Mittal, Computer fundamentals and programming in C, $2^{\text {nd }}$ Edition, Pearson publication.

Unit 1: section 2.12 to 2.17
Unit 2: section 3.4 to 3.13 (excluding 3.10)
Unit 3: section 4.1 to 4.8
Unit 4: section 5.1 to 5.4
Unit 5: section 5.5 full.

## Reference book:

1. E.Balagurusamy, Programming in ANSI C, sixth Edition, Tata McGraw Hill Publishing Company, Uttar Pradesh, 2005.
2. Byron Gottfried, Programming with C, Tata McGraw Hill, New Delhi, 2011
3. Yashavant Kanethkar, Let us C, BPB Publications, New Delhi, Jan 2010.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous) DEPARTMENT OF MATHEMATICS
(For those who joined in 2018-2019 and after)

| Class $:$ B.Sc (Mathematics) | Part III | $:$ Elective |
| :--- | :--- | :--- |
| Semester $: V$ | Hours | $: 06$ |
| Course Code: | 18UMTE51 | Credits |
| Con |  |  |

## DIFFERENTIAL EQUATIONS

## Course Outcomes:

On successful completion of the course, the learners will be able to
CO 1: Identify linear, nonlinear, partial and ordinary differential equations. (K2)
CO 2: Apply different methods for solving differential equations. (K3)
CO 3: Evaluate ordinary and partial differential equation. (K5)
CO 4: Convert different forms into standard forms. (K4)
CO 5: Solve different types of differential equations. (K3)

## Unit -I

Exact differential equations of first order but of higher degree - Equations solvable
for y - Equations solvable for x - Clairaut's form - Equation that do not contain $\mathrm{x}, \mathrm{y}$ explicitly, Equation homogeneous in x and y .

## Unit -II

Linear Equations with constant coefficients and variable coefficients - Equations reducible to the linear homogeneous equations.

## Unit -III

Simultaneous Linear differential equations - Linear Equations of the second order Reduction to the normal form - Change of independent variables - Variation of parameters.

## Unit -IV

Partial differential equation of the first order - Formation of PDEs - Elimination of arbitrary constants and functions - Derivation of partial differential equation - Lagrange method of solving linear equations.

## Unit - V

Standard forms - Equations reducible to the standard forms - Charpit's method.

## Text Book:

1. T.K.Manickavasagam Pillai and S.Narayanan, Differential equations and its Applications, S.Viswanathan Publication, Chennai, 2014.

| Unit I $\quad-\quad$ Chapter 1: Section 6.1, 6.3 and |  |
| :--- | :--- |
|  | Chapter 4: Section 1, 2, 3\& 4 |

Unit II - Chapter 5: Section 4, 5 \& 6

| Unit III $\quad$ | Chapter 6: Section 5, 6 and |
| ---: | :--- |
|  | Chapter 8: Section 1, 2, 3, \& 4 |

Unit IV - Chapter 12: Section 1, 2, 3\& 4

Unit V - Chapter 12: Section 5, 6

## Reference Books:

1. Dr. M.D. Raisinghania, Advanced Differential Equations, S.Chand and Company Pvt. Ltd, New Delhi, Reprint, 2012
2. Dr.S. Arumugam and Issac, Differential equations and its Applications, New Gamma Publications, Palayamkottai, 2011.
3. M.D.Raisinghania , Ordinary and Partial Differential Equations, S.Chand \& Co

# MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous) <br> DEPARTMENT OF MATHEMATICS <br> (For those who joined in 2018-2019 and after) 

| Class | $:$ B.Sc (Mathematics) | Part III | $:$ Elective |
| :--- | :--- | :--- | :--- |
| Semester | $: V$ | Hours | $: 06$ |
| Course Code | $:$ 18UMTE52 | Credits | $: 05$ |

## FUZZY SETS

## Course Outcomes:

On successful completion of the course, the learners will be able to
CO1: Remember and understand the basic concepts of fuzziness. (K1, K2)
CO 2: Prepare concepts in projection and extension of the fuzzy numbers (K3)
CO 3: Conclude the properties of fuzzy relations and fuzzy sets (K4)
CO 4: Importance of the multi valued logics values and fuzzy logic values (K5)
CO 5: Compose applications of fuzzy sets and its logics. (K6)

## Unit - I

Introduction - concept of fuzzy set - relation between fuzzy sets - operations on fuzzy sets - properties of the standard operations - numbers associated with a fuzzy set - crisp sets associated with fuzzy set - fuzzy sets associated with a given fuzzy set.
Unit - II
Crisp relation - fuzzy relations - operations on fuzzy relations - $\alpha$-cuts of a fuzzy relation composition of fuzzy relation.

Unit - III
Projection of fuzzy relations - cylindric extension - cylindric closure - fuzzy relation on a domain.

Unit - IV
Compositions of Fuzzy Relations - Properties of the Min-Max Composition - Fuzzy Graphs - Special Fuzzy Relations.

Unit - V
Linguistic Variables - Fuzzy Logic - Classical Logics Revisited - Linguistic Truth Tables.

## Text Book:

1. M. Ganesh, Introduction to fuzzy sets and fuzzy logic, PHI Learning Private Limited, New Delhi, 2009.

Unit 1: Chapter 6
Unit 2: 7.1 to 7.5
Unit 3: 7.6 to 7.9
2. H.-J. Zimmermann, Fuzzy Set Theory and Its Applications, Library of Congress Cataloguing-in-Publication Data, Fourth Edition.

Unit 4: Chapter 6: section 6.1 to 6.8
Unit 5: Chapter 9: section 9.1 to 9.3

## Reference Books:

1. Klir.G, Yuan B.B. Fuzzy sets and Fuzzy Logic Prentice Hall of India private limited, 1997.
2. Rajasekaran. S. Vijayalakshmi Pai. G.A. "Neural Networks, Fuzzy Logic and Genetic Algorithms", Prentice Hall of India Private Limited, 2003.
3. George J. Klir and Tina .A Folger - Fuzzy sets, uncertainty and Informations - Prentice Hall of India, 2003, New Delhi.

## MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous) <br> DEPARTMENT OF MATHEMATICS <br> (For those who joined in 2018-2019 and after)

| Class $:$ B.Sc. (Mathematics) | Part III | $:$ Elective |  |
| :--- | :--- | :--- | :--- |
| Semester $: V$ | Hours | $: 06$ |  |
| Course Code: | 18UMTE53 | Credits | $: 05$ |

## ASTRONOMY

## Course Outcome:

On successful completion of the course, the learners will be able to
CO 1: Remember the daily and long-term motion of planets and others. (K1)
CO 2: Apply mathematical concepts in studying space objects. (K3)
CO 3: Analyze the concepts of the spherical, horizontal systems. (K4)
CO 4: Evaluate the Meridian system. (K5)
CO 5: Create the interest about astronomy. (K6)

## UNIT I:

Sphere and related theorem - great circles and small circles- Axis and poles of a circleDistance between two points on a sphere- angle between two circles - secondaries -Angular, radius or spherical radius - Related theorems (without proof)- Spherical figures - spherical triangle -polar triangle -Related theorems(without proof)- some properties of spherical triangles (without proof) - colunar and antipodal triangles - Examples.

## UNIT II:

Relation between the sides and angles of a spherical triangle- Five parts formula - functions of half an angle- functions of half a side- Delambre's analogies and Napier's analogies- Right angled spherical triangle (without proof) - Theorem.

## UNIT III:

Napier's rules - Spherical coordinates - Relation between spherical and rectangular coordinates (without proof) - General proof of the cosine formula- small variations -Formulae in plane trigonometry - Worked Examples (1-6).

## UNIT IV:

Celestial sphere - Diurnal motion, Celestial axis and equator - cardinal points- First point of Aries and First point of Libra- Equinoxes and Solstices - Colures - Celestial Coordinates Horizontal system - equatorial system.

UNIT V:

Meridian system - Ecliptic system - Different systems of co -ordinates in the same figure Conversion of coordinates (without proof) - The relation between Right Ascension and Longitude of the sun -Trace the Changes in the coordinates of the sun in the course of a year - The longitude of the sun on the day - Worked Examples (1-4 problems only).

## Text Book:

1. "Astronomy for Degree Students" by Kumaravelu and Susila Kumaravelu 1996, Reprint 2006.

Unit I: Chapter 1: Sections 1 to 19 .

Unit II: Chapter 1: Sections 20 to31 (31 without proof).
Unit III: Chapter 1: Section 32 to 38 ( 34 without proof)
Unit IV: Chapter 2: Sections 40 to 61.

Unit V: Chapter 2: Sections 62 to 68 ( 65 without proof)

## Reference Books:

1. M.L.KHANNA, Spherical Astronomy Prakash printers, 1973.
2. George - O-Abell - Exploration of the Universe (Second Edition)
3. G V Ramachandran, Text Book of Astronomy, Mission Press, Palayamkottai, 1965

## MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous) <br> DEPARTMENT OF MATHEMATICS <br> (For those who joined in 2018-2019 and after)

| Class $:$ B.Sc (Mathematics) | Part IV | $:$ Skill |
| :--- | :--- | :--- |
| Semester $: V$ | Hours | $: 02$ |
| Course Code: | 18UMTS51 | Credits |
| 02 |  |  |

## LAPLACE TRANSFORMS AND FOURIER SERIES

## Course Outcome:

On successful completion of the course, the learners will be able to
CO1: Learn Laplace transforms and understanding its inverse. (K1, K2)
CO2: Apply Laplace Transform to solve ordinary differential equation. (K3)
CO3: Solve problems in inverse Laplace transform. (K3)
CO4: Examine the Laplace transform in periodic function. (K4)
CO5: Evaluate the Fourier series and half range Fourier series. (K5)

## Unit -I

Laplace Transforms -Definitions - Sufficient conditions for the existence of the Laplace transform - Laplace transform of periodic functions - Some general Theorems - Problems Evaluation of integrals.

Unit -II
The Inverse Laplace Transforms - Problems -Results.

## Unit -III

Solving ordinary differential equations with constant coefficients and variable coefficients

- Simultaneous linear equations using Laplace Transforms - Solving certain equation involving integrals using Laplace Transforms.


## Unit -IV

Fourier series -Trigonometric series - Even and Odd functions.

## Unit - V

Half range Fourier cosine series and Fourier sine series.

## Text Books:

1. S.Narayanan and T.K.Manicka Vasagam Pillay, Differential equations and its Applications, S.Viswanathan Publications, Chennai, 2006.
2. Dr.S. Arumugam and Issac, Sequence \& Series and Fourier Series, New Gamma Publishing House, Palayamkottai, 2006.

| Unit I (Book 1) | - | Chapter 9: Section 1 to 5 |
| :--- | :--- | :--- |
| Unit II (Book 1) | - | Chapter 9: Section 6 to 7 |
| Unit III (Book 1) | - | Chapter 9: Section 8 to 11 |
| Unit IV (Book 2) | - | Chapter 6: Pg.No: 1 to 14 |
| Unit V (Book 2) | - | Chapter 6: Pg.No: 15 to 20 |

## Reference Books:

1. Dr. M.D. Raisinghania, Advanced Differential Equations, S.Chand and Company PVT.LTD, New Delhi, Reprint, 2012.
2. George yankovsky, Differential and Integral Calculus (Volume II), MIR Publishers, Moscow, 1974.
3. Ray Hanna J., - Fourier Series, Transforms and Boundary Value Problems, Dover Publications, New York, 2008.

## MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous) <br> DEPARTMENT OF MATHEMATICS (For those who joined in 2018-2019 and after)

| Class : B.Sc (Mathematics) | Part III | $:$ Core |
| :--- | :--- | :--- |
| Semester $:$ VI | Hours | $: 05$ |
| Course Code: 18 UMTC61 | Credits | $: 05$ |

## COMPLEX ANALYSIS

## Course Outcome:

On successful completion of the course, the learners will be able to
CO 1: List the basic concepts of analytic function and harmonic functions. (K1)
CO 2: Express analytic property, conformal mapping and identify singularities. (K2, K3)
CO 3: Examine the basic properties of singularities, convergence of power series.(K4)
CO 4: Choose the Cauchy's integral formula or integral theorem. (K5)
CO 5: Reduce the complex integration with the help of integral formula.(K6)

## Unit - I

Continuous functions - Differentiability - Cauchy-Riemann Equations - Alternative forms of Cauchy-Riemann equations - Analytic functions - Harmonic functions -Milne-Thompson method. Unit - II

Conformal mapping definition and examples - Elementary transformations: translation, rotations, magnification, inversion - Bilinear Transformation - cross ratio - Fixed points.

Unit - III
Cauchy's Integral formula - Maximum modulus theorem -Higher derivatives.
Unit - IV
Taylor's series - Maclaurin's series - Laurent's series - Zeros - Singularities - types of singularities - meromorphic function.

Unit - V
Residues - Cauchy's residue theorem - Evaluation of definition integrals ofstandard types Jordan's lemma (without proof).

## Text Book:

1. S. Arumugam, A. Thangapandi Isaac and A. Somasundaram, Complex Analysis, Scitech publications, 2019.

Unit - I: Chapter 2: Section 2.4 to section 2.9
Unit - II: Chapter 3: Section 3.0 to section 3.4
Unit - III: Chapter 6: Section 6.2 to 6.4
Unit - IV: Chapter 7
Unit - V: Chapter 8

## References Books:

1. S.Ponnusamy, Foundations of Complex Analysis, Narosa Publishing House, New Delhi. 2000.
2. L.V Ahlfors, Complex Analysis, McGraw Hill Co., New York, 1988.
3. Ponnuswamy .S - "Foundations of Complex Analysis", Narosa Publication House, New Delhi, II edition 2005.

## MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous) <br> DEPARTMENT OF MATHEMATICS (For those who joined in 2018-2019 and after)

| Class | $:$ B.Sc (Mathematics) | Part III | $:$ Core |
| :--- | :--- | :--- | :--- |
| Semester | : VI | Hours | $: 06$ |
| Course Code | $:$ 18UMTC62 | Credits | $: 05$ |

## LINEAR ALGEBRA

## Course Outcome:

On successful completion of the course, the learners will be able to
CO1: Exhibit vector space, inner product space, span of a set and understand the fundamental theorem of homomorphism (K1, K2)

CO2: Characterize vector spaces and matrices. (K3)
CO3: Apply properties of matrices and vector space (K3)
CO4: Analyze orthogonality and bilinear forms (K4)
CO5: Reduce quadratic form into diagonal form. (K6)

## Unit -I

Vector Spaces - Definition and examples - Subspaces - Linear Transformation Fundamental theorem of Homomorphism.

## Unit -II

Span of a set - Linear independence - Basis and Dimension - Rank and Nullity - Matrix and Linear Transformations.

## Unit-III

Inner Product Spaces - Definition and examples - Orthogonality - Orthogonal complement.

Unit -IV
Theory of Matrices -Algebra of Matrices -Types -Inverse-Elementary TransformationRank of a Matrix- Simultaneous Linear equations - Characteristic equation and Cayley Hamilton theorem - Eigen values and Eigen Vectors.

Unit - V
Bilinear forms - Matrix of a Bilinear form - Quadratic forms - Reduction to Quadratic forms.

## Text Book:

1. Dr.S.Arumugam and Issac A.T, Modern Algebra, Scitech Publications, Chennai, Reprint July 2014.

Unit I - Chapter 5: Section 5.0 to 5.3

Unit II - Chapter 5: Section 5.4 to 5.8
Unit III - Chapter 6: Section 6.0 to 6.3

Unit IV - Chapter 7: Section 7.0 to 7.8
Unit V - Chapter 8: Section 8.0 to 8.2

## Reference Books:

1. Leadership Project Committee, University of Bombay, Text book of Algebra, Tata McGraw Hill Publication, New Delhi, 1985.
2. V.Krishnamurthy, V.P.Mainra \& J.L.Arora, An Introduction to Linear Algebra, Affiliated East - West press Pvt Ltd, New Delhi, 1990.
3. Manicavasagam Pillai .T.K and others - Modern Algebra, S. Viswanathan Publishers, Chennai 1993.

## MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)

DEPARTMENT OF MATHEMATICS
(For those who joined in 2018-2019 and after)

| Class | $:$ B.Sc (Mathematics) |
| :--- | :--- |
| Semester | : VI |
| Course Code | $: 18 U M T P R 1$ |

## PROJECT AND VIVA

| Part III | $:$ Core |
| :--- | :--- |
| Hours | $: 06$ |
| Credits | $: 05$ |

## Course Description

The Project is conducted by the following Course Pattern.

## Internal

$\left.\begin{array}{l}\text { Presentation } \\ \text { Submission }\end{array}\right\} \mathbf{4 0}$

## External

$\left.\begin{array}{l}\text { Project Report } \\ \text { Viva Voce }\end{array}\right\} \mathbf{6 0}$
Total $\quad \mathbf{- 1 0 0}$

# MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous) <br> DEPARTMENT OF MATHEMATICS <br> (For those who joined in 2018-2019 and after) 

| Class $:$ B.Sc (Mathematics) | Part III | $:$ Allied |
| :--- | :--- | :--- |
| Semester $:$ VI | Hours | $: 05$ |
| Course Code: | 18UMTA61 | Credits |
| :05 |  |  |

## OPERATIONS RESEARCH

## Course Outcome:

On successful completion of the course, the learners will be able to
CO1: Illustrate linear problem, special forms and game theory. (K2)
CO2: Evaluate game theory and linear problems. (K5)
CO3: Compare different types of methods in solving linear problem. (K4)
CO4: Solve linear programming problem. (K3)
CO5: Design real life problem into a linear problem. (K6)

## Unit -I

Linear Programming Problem - Formulation of LPP. Mathematical form - Solution by Graphical Method, The Simplex method and Method of penalty (Big M Method only).

## Unit -II

Duality - Dual simplex method- Problems.

## Unit -III

Transportation problem - Mathematical form - Initial solutions by all methods - MODI method for both balanced and unbalanced TP- The assignment problems.

## Unit -IV

Game theory - Two person zero sum game - saddle point - Game with saddle point -
Solution of game by using formula, graphical method, method of dominance and LPP method.

## Unit -V

Sequencing-Replacement problem.

## Text Book:

1. Kanti Swarup , P.K. Gupta and Man Mohan, Operations Research, Sultan Chand and Sons Publications, New Delhi, Reprint 2006.

Unit I - Chapter 2 Section2.1, 2.2
Chapter 3 Section 3.1 to 3.5
Chapter 4 Section 4.1 to 4.4

Unit II - Chapter 5: Section 5.1 to 5.4 and 5.7

Unit III - Chapter 10: Section 10.1 to 10.5, 10.8 to 10.11 and 10.14
Chapter 11: Section 11.1 to 11.4

Unit IV - Chapter17: Section 17.1 to 17.7
Unit V - Chapter 12: Section 12.1 to 12.5

Chapter 18: Section 18.1 to 18.3

## Reference Books:

1. Dr.S.Arumugam and ISAAC, Topics in Operations Research -Linear Programming, New Gamma Publishing House, Palayamkottai, June 2012.
2. P.R.Vital and V.Malini, Operations Research, Margham Publications, Chennai, 2002.
3. Hamdy A. Taha, - Operations Research, an Introduction, 8th Ed., Prentice - Hall India, 2006.

## MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous) <br> DEPARTMENT OF MATHEMATICS <br> (For those who joined in 2018-2019 and after)

| Class | $:$ B.Sc (Mathematics) | Part III | $:$ Elective |
| :--- | :--- | :--- | :--- |
| Semester | $:$ VI | Hours | $: 06$ |
| Course Code | $: 18 U M T E 61$ | Credits | $: 05$ |

## GRAPH THEORY

## Course Outcomes

On successful completion of the course, the learners will be able to
CO1: Demonstrate the basic concepts of graph theory. (K2)
CO2: Develop mathematical proofs in graph theory. (K3)
CO3: Examine types of graph and finding its index. (K4)
CO4: Present various graph models. (K5)
C05: Build mathematical models using graph theory. (K6)

## Unit -I

Graphs- Degrees - Sub graphs, Isomorphism, Ramsey numbers - Independent sets and Coverings -Matrices of graphs - Operation on graphs.

## Unit -II

Degree sequences - Graphic sequences- Walks, Trials and Paths - Connectedness and Components - Blocks- Connectivity.

## Unit -III

Eulerian graphs - Hamiltonian graphs - Trees - Characterization of trees - Centre of a tree - Matching - Matching in bipartite graphs.

## Unit -IV

Planar graph and properties - Characterization of Planar graphs - Thickness - Crossing numbers and Outer planarity.

## Unit -V

Chromatic number and Chromatic index - Five colour theorem and Four colour theorem Chromatic polynomial.

## Text Book:

1. Dr.S.Arumugam and S.Ramachandran, Invitation to Graph Theory, Scitech Publication, Chennai, 2015.

Unit I - Chapter 2: Section 2.1 to $2.6 \& 2.8$ to 2.9

Unit II - Chapter 3, 4
Unit III - Chapter 5, 6 \& 7

Unit IV - Chapter 8

Unit V - Chapter 9

## Reference Books:

1. Harry, Graph Theory, Narosa Publishing House, New Delhi, 2001.
2. S.K.Yadav, Elements of Graph Theory, Ane Books Private Ltd, New Delhi, 2010.
3. Narasingh Deo - Graph theory with application to engineering and computer science, Prentice - Hall of india pvt. Ltd., New Delhi.

# MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous) <br> DEPARTMENT OF MATHEMATICS <br> (For those who joined in 2018-2019 and after) 

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| :--- | :--- | :--- |
| Semester $:$ VI | Hours | $: 06$ |
| Course Code: | 18UMTE62 | Credits |
| :05 |  |  |

## STOCHASTIC PROCESS

## Course Outcomes:

On successful completion of the course, the learners will be able to
CO1: List the definition of Markov chain and random walk.(K2)
CO2: Illustrate Stochastic Process, Markov Process. (K3)
CO3: Evaluate the transition probability matrices. (K4)
CO4: Justify the type of Markov Chain. (K5)
CO5: Model the concepts and theorems for real life problems (K6)

Unit -I
Stochastic Processes - types - Stationary Processes -examples - Ergodicity

## Unit -II

Discrete Time Markov Chain - Transition Probabilities - Chapman - Kolmogorov equation - Classification of States - Limit Theorems for Markov Chains.

## Unit -III

Stationary Distribution - Special Chains and Foster Type Theorems - Theorems Regarding Finite Markov Chains - Methods of Evaluation of the n-step Transition Probability

## Unit -IV

Random walks- Types - Sequential Analysis - Wald's Equation and Wald's IdentityFluctuation Theory.

## Unit- V

Continuous Time Discrete State Markov Process - Transition Function -
Kolmogorov Differential Difference Equation- Birth and death Process - Yule's Process

## Text Book:

1. Introduction to Stochastic Processes, A.K.BASU, Narosa Publishing House, New Delhi

Unit I: Section 1.1-1.3
Unit II: Section 2.1-2.4
Unit III: Section 2.5-2.8
Unit IV: Section 3.1-3.4
Unit V : Section 6.1-6.6

## Reference Books:

1. Stochastic Process, J.Medhi ,Wiley Eastern Company ,New Delhi,1987.
2. Basic Stochastic Processes, Zdzistaw Brzeniak and Tomasz Zastawniak, Springer International Edition, New Delhi ,1999.
3. Essentials of Stochastic Processes, Rick Durrett, Springer, 1999.

Percentage of change: 100\%

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MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF MATHEMATICS
(For those who joined in 2018-2019 and after)

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| :--- | :--- | :--- | :--- |
| Semester | $:$ VI | Hours | $: 06$ |
| Course Code | $:$ 18UMTE63 | Credits | $: 05$ |

## NUMBER THEORY

## Course Outcomes:

On successful completion of the course, the learners will be able to
CO1: Explain the basic concepts of numbers (K2)
CO2: Solve congruence and number problems. (K3)
CO3: Apply theoretical concepts in number theory (K3)
CO4: Examine the divisibility using several methods (K4)
CO5: construct mathematical proofs of basic results in number theory (K3)

## Unit I :

Early Number theory- The division Algorithm-The g.c.d-The Euclidean algorithm

## Unit-II

The fundamental Theorem of arithmetic- The sieve of Eratosthenes -The Goldbach Conjecture

## Unit-III

Basic properties of Congruences-special divisibility test - linear congruences.

## Unit-IV

Fermat's Factorization method - The Little theorem -Wilson's theorem

## Unit-V

The sum and number of divisors-The mobious inversion formula- The greatest integer function

## Text Book:

1. Elementary Number Theory by David M.Burton ,TATA Mc Graw-Hill Ltd Edition : 6th edition

Unit-I : Chapter 1: Sec 1.3
Chapter 2: Sec 2.1, 2.2.

Unit-II : Chapter 3: Sec 3.1 to 3.3
Unit-III : Chapter 4: Sec 4.2 to 4.4

Unit-IV : Chapter 5: Sec 5.2 to 5.4
Unit-V : Chapter 6: Sec 6.1 to 6.3

## Reference Books:

1. An Introduction to Theory of Numbers: Niven and Zuckermann Publishers

Wiley Eastern Ltd Edition/Year: 13rd Edition / 1972.
2. Introduction to Analytic Number Theory by " Tom .M.Apostal"
3. Elements of Number Theory by Kumaravelu and Sucila Kumaravelu, 2002.

## MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)

## DEPARTMENT OF MATHEMATICS

(For those who joined in 2018-2019 and after)

| Class | : B.Sc (Mathematics) | Part IV | : Skill |
| :--- | :--- | :--- | :--- |
| Semester | : VI | Hours | $: 02$ |
| Course Code: | 18UMTS61 | Credits | $: 02$ |

## Programming in C++

## Course Outcomes:

## At the end of the course the students can able to

CO1: Demonstrate how C++ improves C with object-oriented features. (K2)
CO2: Write inline functions for efficiency and performance. (K3)
CO3: Make use of constructors and member functions. (K3)
CO4: Differentiate Overload functions and operators in C++. (K4)
CO5: Design C++ classes for code reuse. (K5)

## Unit - I

Objects Oriented Programming - Structure of C++ program - Basic data type - User defined data type -Derived data type.

## Unit - II

Operators in C++ - Control structures - Functions - Inline functions - Default arguments Function overloading.

## Unit - III

Class- Creating objects - Accessing class members- Defining member function - Static data members- Static member function.

Unit - IV
Friend function - Constructors - Destructors - Operator overloading - Rules for operator overloading.

Unit - V
Inheritance - Defining Derived classes - Single inheritance - Multilevel inheritance Multiple Inheritance - Hierarchical in heritance - Hybrid Inheritance.

## Text Book:

1. E. Balagurusamy, Programming with C++, Tata McGraw Hill, New Delhi, Fifth Edition, 2011.

| Unit I | - | Chapter 1: Section <br> Chapter 2: Section$: 2.5$ |  |
| :--- | :--- | :--- | :--- |
|  |  | Chapter 3: Sections$: 3.2-3.6,3.8$. |  |
| Chapter 3: Sections | $: 3.14,3.15,3.25$ |  |  |
| Unit II | - | Chapter 4: Section | $: 4.2,4.6,4.7,4.10$ |
|  |  | Chapter 5: Sections | $: 5.3,5.4,5.11,5.12$ |
| Unit III | - | Chapter 5: Sections | $: 5.15$ |
| Unit IV | - | Chapter 6: Sections $\quad: 6.2,6.11$ |  |
|  |  | Chapter 7: Sections $\quad: 7.2,7.8$ |  |
| Unit V | - | Chapter 8: Sections $: 8.2,8.3,8.5,8.6,8.7,8.8$ |  |

## Reference Books:

1. Bjarne Stroustrup, The C++ Programming Language, Addison-Wesley, New York, 1999.
2. Robert Lafore, Object-Oriented Programming in Microsoft C++, Galgotia Publications, New Delhi, 2000.
3. D.Ravichandran, Programming with C++, Tata McGraw Hill Education (India) Private Limited, New Delhi, Sixth Reprint, 2005.
