

E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI – 625 014.

(An Autonomous Institution – Affiliated to Madurai Kamaraj University)

Re-accredited (**3rd Cycle**) with Grade **A+** & **CGPA 3.51** by NAAC

DEPARTMENT OF MATHEMATICS



CBCS with OBE

MASTER OF SCIENCE

PROGRAMME CODE - OPM

COURSE STRUCTURE

(w.e.f. 2022 – 2023 Batch onwards)



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CRITERION - I

1.2.2 Details of Programmes offered through Choice Based Credit System (CBCS) / Elective Course System

**Syllabus copies with highlights of contents focusing on
Elective Course System**



To be Noted:

| HIGHLIGHTED | COURSE |
|--------------------|-----------------|
| <div></div> | Elective |

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To mold the students to have strong Mathematical and Analytical skills to meet the challenges open to them.

MISSION

To provide the students with a strong Mathematical Foundation through courses which cater to the needs of Industry, Research and Higher Education

Programme Educational Objectives (PEOs)**M.Sc.,**

| PEO | On completion of the Programme, the student will be able to |
|------------|---|
| PEO1 | Apply their knowledge in modern industry or teaching, or secure acceptance in high quality graduate programs in mathematics. |
| PEO2 | Keep on discovering new avenues in the chosen field and exploring areas that remain conducive for research and development. |
| PEO3 | Promote the culture of interdisciplinary research among all disciplines and Applied Mathematics. |
| PEO4 | Strengthen in logical and analytical ability by knowing the Knowledge of Mathematics |
| PEO5 | Handle the problems faced by industry through Mathematical knowledge and scientific computational techniques |
| PEO6 | To develop teaching skills, subject knowledge in the course of their study which will help them to shine in various field including Education ,IT etc., |

Programme Outcomes (POs) with Graduate Attributes

| PO | Graduate Attributes | On completion of the Programme, the student will be able to |
|-----------|---|--|
| PO1 | Knowledge Base | Equipped with intense knowledge in their discipline. |
| PO2 | Problem Analysis & Investigation | Develop specialized skills to plan, analyze and draw conclusions related to their respective field of study. |
| PO3 | Communication Skills & Design | Assess and interpret complex situations which enables them to choose successful career in Education and Industry |
| PO4 | Individual and Team Work | Undergo projects and research activities to develop knowledge and become expertise in their field of study. |
| PO5 | Professionalism, Ethics and equity | Develop social and ethical responsibility in the transfer of knowledge. |
| PO6 | Lifelong learning | Crack lectureship and fellowship exams approved by UGC like CSIR – NET and SET. |

Programme Specific Outcomes (PSOs) with Graduate Attributes

| PSO | Graduate Attributes | On completion of the Programme, the student will be able to |
|------------|------------------------------------|---|
| PSO1 | Knowledge Base | Understand of the fundamental axioms in mathematics and capability of developing ideas based on them. |
| PSO 2 | Problem Analysis & Investigation | Solve complex problems by critical understanding, analysis and synthesis |
| PSO 3 | Communication Skills & Design | Provide knowledge of a wide range of mathematical techniques and application of mathematical methods |
| PSO 4 | Individual and Team Work | Solving problems skills, thinking, creativity through assignments, project work |
| PSO 5 | Professionalism, Ethics and equity | Broaden their professional foundations through activities such as internships, fellowships, teaching and project work. |
| PSO 6 | Lifelong learning | Recognize the need to engage in lifelong learning through continuous education, and research leading to higher degrees like PhD, D.Sc., etc |

Eligibility for Admission: Pass in B.Sc., Mathematics

Duration of the Course:

The students shall undergo prescribed courses of study for the period of two academic years under CBCS semester pattern with Outcome Based Education.

Medium of Instruction: English

System: Choice Based Credit System with Outcome Based Education.

Courses of Study with Credit Distribution

| Category | No. of Courses | No. of Credits |
|--|----------------|----------------|
| Core | 16 | 64 |
| Discipline Specific Elective Course | 4 | 16 |
| Inter Disciplinary Course | 2 | 4 |
| Project | 1 | 6 |
| Total | 23 | 90 |

Nature of the Course

Courses are classified according to the following nature

1. Knowledge & Skill
2. Employability Oriented
3. Entrepreneurship Oriented

Outcome Based Education (OBE) & Assessment

Students understanding must be built on and assessed for wide range of learning activities, which includes different approaches and are classified along several bases, such as

1. Based on purpose:

- Formative (Internal tests, Assignment, Seminar, Quiz, Documentation, Case lets, ICT based Assignment, Mini Projects administered during the learning process)
- Summative (Evaluation of students learning at the end of instructional unit)

2. Based on Domain knowledge: (Post Graduate Up to K5 Levels)

- Assessment through K1, K2, K3, K4 & K5

Evaluation

| | |
|---|-------------|
| Continuous Internal Assessment Test (CIA) | : 25 Marks |
| Summative Examination | : 75 Marks |
| Total | : 100 Marks |

CIA-Continuous Internal Assessment: 25 Marks

| Components | Marks |
|--|-----------|
| Test (Average of three tests) (Conduct for 150 marks and converted into 15 marks) | 15 |
| Assignment | 5 |
| Seminar | 5 |
| Total | 25 |

- Centralized system of Internal Assessment Tests
- There will be a three Internal Assessment Tests
- Duration of Internal Assessment Test I will be 1 1/4 hours and Internal Assessment Test II and III will be 2 1/2 hours.
- Students shall write retest on the genuine grounds if they are absent in either Test I or Test II and Test III with the approval of Head of the Department.

Question Paper Pattern for Continuous Internal Assessment Test I

| Section | Marks |
|--|-----------|
| A – Multiple Choice Questions (4x1 Mark) | 4 |
| B– Short Answer (3x2 Marks) | 6 |
| C – Either Or type (2/4 x 5 Marks) | 10 |
| D – Open Choice type (1/2 x10 Marks) | 10 |
| Total | 30 |

Question Paper Pattern for Continuous Internal Assessment Test II and Test III

| Section | Marks |
|---|-----------|
| A – Multiple Choice Questions (8x1Mark) | 8 |
| B – Short Answer (6 x 2 Marks) | 12 |
| C – Either Or type (4/8 x 5 Marks) | 20 |
| D – Open Choice type (2/4 x 10 Marks) | 20 |
| Total | 60 |

Conducted for 150 marks and converted into 15 marks

Question Paper Pattern for Summative Examination

| Section | Marks |
|---|-----------|
| A – Multiple Choice Questions without choice (10x 1Mark) | 10 |
| B – Short Answer Questions without choice (5 x 2 Marks) | 10 |
| C – Either Or type (5/10 X 5Marks) | 25 |
| D – Open Choice type(3out of 5 X 10Marks) | 30 |
| Total | 75 |

- In respect of external examinations passing minimum is **45%** for Post Graduate Courses and in total, aggregate of **50%**.

Latest amendments and revisions as per UGC and TANSCH Norms are taken into consideration in curriculum preparation.

Distribution of Marks in % with K levels CIAI, II, III & External Assessment

| Blooms Taxonomy | Internal Assessment | | | External Assessment |
|-------------------|---------------------|-----|-----|---------------------|
| | I | II | III | |
| Knowledge(K1) | 8% | 8% | 8% | 5% |
| Understanding(K2) | 28% | 12% | 8% | 14% |
| Apply(K3) | 44% | 40% | 24% | 27% |
| Analyze(K4) | 20% | 40% | 40% | 27% |
| Evaluate(K5) | - | - | 20% | 27% |

BLUE PRINT FOR INTERNAL ASSESSMENT - I
Articulation Mapping - K Levels with Course Learning Outcomes (CLOs)

| Sl. No | CLOs | K- Level | Section A | | Section B | | Section C | Section D | Total |
|------------------------------------|-------|--------------|---------------------|-------------|------------------------------|----------------|--|------------------|-------|
| | | | MCQs (No Choice) | | Short Answers (No Choice) | | (Either or Type) | (Open Choice) | |
| | | | No. of Questions | K- Level | No. of Questions | K- Level | | | |
| 1 | CLO 1 | Up to K 4 | 2 2 | K1 K2 | 1 1 1 | K1 K2 K3 | 1(K2) 1(K3) (Each set of questions must be in the same level) | 1(K3) 1(K4) | |
| No. of Questions to be asked | | | 4 | | 3 | | 4 | 2 | 13 |
| No. of Questions to be answered | | | 4 | | 3 | | 2 | 1 | 10 |
| Marks for each question | | | 1 | | 2 | | 5 | 10 | |
| Total Marks for each section | | | 4 | | 6 | | 20 | 20 | 50 |

BLUE PRINT FOR INTERNAL ASSESSMENT – II
Articulation Mapping - K Levels with Course Learning Outcomes (CLOs)

| Sl. No | CLOs | K- Level | Section A | | Section B | | Section C | Section D | Total |
|------------------------------------|-------|--------------|---------------------|----------|------------------------------|----------|--|------------------|-------|
| | | | MCQs (No Choice) | | Short Answers (No Choice) | | (Either or Type) | (Open Choice) | |
| | | | No. of Questions | K- Level | No. of Questions | K- Level | | | |
| 1 | CLO 2 | Up to K 4 | 2 2 | K1 K2 | 1 2 | K1 K2 | 1(K3) 1(K4) | 1(K3) 1(K4) | |
| 2 | CLO 3 | Up to K 4 | 2 2 | K1 K2 | 1 2 | K1 K2 | 1(K3) 1(K4) (Each set of questions must be in the same level) | 1(K3) 1(K4) | |
| No. of Questions to be asked | | | 8 | | 6 | | 8 | 4 | 26 |
| No. of Questions to be answered | | | 8 | | 6 | | 4 | 2 | 20 |
| Marks for each question | | | 1 | | 2 | | 5 | 10 | |
| Total Marks for each section | | | 8 | | 12 | | 40 | 40 | 100 |

BLUE PRINT FOR INTERNAL ASSESSMENT – III
Articulation Mapping - K Levels with Course Learning Outcomes (CLOs)

| Sl. No | CLOs | K- Level | Section A | | Section B | | Section C | Section D | Total |
|------------------------------------|-------|-------------|---------------------|----------|------------------------------|----------------|--|------------------|-------|
| | | | MCQs (No Choice) | | Short Answers (No Choice) | | (Either or Type) | (Open Choice) | |
| | | | No. of Questions | K- Level | No. of Questions | K- Level | | | |
| 1 | CLO 4 | Up to K5 | 2 2 | K1 K2 | 1 1 1 | K1 K2 K3 | 1(K3) 1(K4) | 1(K4) 1(K5) | |
| 2 | CLO 5 | Up to K5 | 2 2 | K1 K2 | 1 1 1 | K1 K2 K3 | 1(K3) 1(K4) (Each set of questions must be in the same level) | 1(K4) 1(K5) | |
| No. of Questions to be asked | | | 8 | | 6 | | 8 | 4 | 26 |
| No. of Questions to be answered | | | 8 | | 6 | | 4 | 2 | 20 |
| Marks for each question | | | 1 | | 2 | | 5 | 10 | |
| Total Marks for each section | | | 8 | | 12 | | 40 | 40 | 100 |

Distribution of Marks with choice K Levels CIA I, CIA II and CIA III

| CIA | K Levels | Section- A MCQ (No choice) | Section -B Short Answer (No choice) | Section- C (Either or Type) | Section-D (Open Choice) | Total Marks | % of Marks |
|------------|-----------------|---|--|--|--|--------------------|-----------------------|
| I | K1 | 2 | 2 | | | 4 | 8 |
| | K2 | 2 | 2 | 10 | - | 14 | 28 |
| | K3 | | 2 | 10 | 10 | 22 | 44 |
| | K4 | | | | 10 | 10 | 20 |
| | Marks | 4 | 6 | 20 | 20 | 50 | 100 |
| II | K1 | 4 | 4 | | | 8 | 8 |
| | K2 | 4 | 8 | | | 12 | 12 |
| | K3 | | | 20 | 20 | 40 | 40 |
| | K4 | | | 20 | 20 | 40 | 40 |
| | Marks | 8 | 12 | 40 | 40 | 100 | 100 |
| III | K1 | 4 | 4 | | | 8 | 8 |
| | K2 | 4 | 4 | | | 8 | 8 |
| | K3 | | 4 | 20 | | 24 | 24 |
| | K4 | | | 20 | 20 | 40 | 40 |
| | K5 | | | | 20 | 20 | 20 |
| | Marks | 8 | 12 | 40 | 40 | 100 | 100 |

Articulation Mapping - K Levels with Course Learning Outcomes (CLOs) for Internal Assessment (IDC)

| Sl. No | CLOs | K- Level | Section A | | Section B | | Section C | Section D | Total |
|---------------------------------|-------|----------|-------------------------|-------------|------------------------------|-------------|---|-----------|---------------|
| | | | MCQs (No choice) | | Short Answers (No choice) | | | | |
| | | | No. of Question s | K- Level | No. of Question s | K- Level | | | |
| 1 | CLO 1 | Up to K4 | 2 | K1 | | | 2(K3&K3) 2(K3&K3 2 (K4&K4) 2 (K5&K5) | 1(K3) | |
| 2 | CLO 2 | Up to K4 | 2 | K1 | | | | 1(K4) | |
| 3 | CLO 3 | Up to K4 | | | 1 | K2 | | 1(K4) | |
| 4 | CLO 4 | Up to K5 | | | 1 | K2 | | 1(K5) | |
| 5 | CLO 5 | Up to K5 | | | 1 | K2 | | 1(K5) | |
| No. of Questions to be asked | | | 4 | | 3 | | 8 | 5 | 20 |
| No. of Questions to be answered | | | 4 | | 3 | | 4 | 2 | 13 |
| Marks for each question | | | 1 | | 2 | | 5 | 10 | |
| Total Marks for each section | | | 4 | | 6 | | 20 | 20 | 50 (Marks) |

Distribution of Section-wise Marks with K Levels for Internal Assessment (IDC)

| K Levels | Section A (MCQ'S) (No choice) | Section B (Short Answer) (No choice) | Section C (Either or Type) | Section D (Open Choice) | Total Marks | % of Marks |
|--------------------|-------------------------------------|--|-------------------------------|----------------------------|-------------|------------|
| K1 | 4 | | | | 4 | 4 |
| K2 | | 6 | | | 6 | 6 |
| K3 | | | 20 | 10 | 30 | 30 |
| K4 | | | 10 | 20 | 30 | 30 |
| K5 | | | 10 | 20 | 30 | 30 |
| Total Marks | 4 | 6 | 40 | 50 | 100 | |

K1- Remembering and recalling facts with specific answers.

K2- Basic understanding of facts and stating main ideas with general answers.

K3- Application oriented- Solving Problems, Justifying the statement and deriving Inferences.

K4- Examining, analyzing, presentation and make inferences with evidences.

K5- Evaluating, making Judgments based on criteria

Articulation Mapping - K Levels with Course Learning Outcomes (CLOs) for External Assessment

| Sl. No | CLOs | K- Level | Section A | | Section B | | Section C | Section D | Total |
|---------------------------------|-------|----------|-------------------------|-------------|------------------------------|-------------|---------------------|------------------|---------------|
| | | | MCQs (No choice) | | Short Answers (No choice) | | (Either/or Type) | (open choice) | |
| | | | No. of Question s | K- Level | No. of Question s | K- Level | | | |
| 1 | CLO 1 | Up to K4 | 2 | K1&K2 | 1 | K1 | 2 (K2& K2) | 1(K3) | |
| 2 | CLO 2 | Up to K4 | 2 | K1&K2 | 1 | K2 | 2(K3& K3) | 1(K4) | |
| 3 | CLO 3 | Up to K4 | 2 | K1&K2 | 1 | K3 | 2 (K3 &K3) | 1(K4) | |
| 4 | CLO 4 | Up to K5 | 2 | K1&K2 | 1 | K4 | 2 (K4 & K4) | 1(K5) | |
| 5 | CLO 5 | Up to K5 | 2 | K1&K2 | 1 | K5 | 2 (K5 & K5) | 1(K5) | |
| No. of Questions to be asked | | | 10 | | 5 | | 10 | 5 | 30 |
| No. of Questions to be answered | | | 10 | | 5 | | 5 | 3 | 23 |
| Marks for each question | | | 1 | | 2 | | 5 | 10 | |
| Total Marks for each section | | | 10 | | 10 | | 25 | 30 | 75 (Marks) |

Distribution of Section-wise Marks with K Levels for External Assessment

| K Levels | Section A (MCQ'S) (No choice) | Section B (Short Answer) (No choice) | Section C (Either or Type) | Section D (Open Choice) | Total Marks | % of Marks |
|--------------------|-------------------------------------|--|-------------------------------|----------------------------|-------------|------------|
| K1 | 5 | 2 | - | - | 7 | 5 |
| K2 | 5 | 2 | 10 | - | 17 | 14 |
| K3 | - | 2 | 20 | 10 | 32 | 27 |
| K4 | - | 2 | 10 | 20 | 32 | 27 |
| K5 | - | 2 | 10 | 20 | 32 | 27 |
| Total Marks | 10 | 10 | 50 | 50 | 120 | 100 |

K1- Remembering and recalling facts with specific answers.

K2- Basic understanding of facts and stating main ideas with general answers.

K3- Application oriented- Solving Problems, Justifying the statement and deriving Inferences.

K4- Examining, analyzing, presentation and make inferences with evidences.

K5- Evaluating, making Judgments based on criteria

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(w.e.f. 2022 – 2023 Batch onwards)

COURSE STRUCTURE –SEMESTER WISE

| Sem | Category | Course Code | Title of the Course | Teaching hrs(per Week) | Exam Duration (Hrs.) | Marks Allotted | | | |
|------------|-------------|-------------|---|------------------------|----------------------|----------------|----|-------|-----------|
| | | | | | | CIA | SE | Total | Credits |
| I | Core | 22OPMA11 | Abstract Algebra | 5 | 3 | 25 | 75 | 100 | 4 |
| | Core | 22OPMA12 | Real Analysis | 5 | 3 | 25 | 75 | 100 | 4 |
| | Core | 22OPMA13 | Differential Equations | 6 | 3 | 25 | 75 | 100 | 4 |
| | Core | 22OPMA14 | Differential Geometry | 6 | 3 | 25 | 75 | 100 | 4 |
| | | | DSEC-I | 6 | 3 | 25 | 75 | 100 | 4 |
| | IDC | 22OPMAID1 | Teaching & Research Aptitude Paper –I | 2 | 3 | 25 | 75 | 100 | 2 |
| II | Core | 22OPMA21 | Linear Algebra | 5 | 3 | 25 | 75 | 100 | 4 |
| | Core | 22OPMA22 | Measure and Integration | 5 | 3 | 25 | 75 | 100 | 4 |
| | Core | 22OPMA23 | Graph Theory with Applications | 6 | 3 | 25 | 75 | 100 | 4 |
| | Core | 22OPMA24 | Advanced Statistics-I | 6 | 3 | 25 | 75 | 100 | 4 |
| | | | DSEC-II | 6 | 3 | 25 | 75 | 100 | 4 |
| | IDC | 22OPMAID2 | Teaching & Research Aptitude Paper -II | 2 | 3 | 25 | 75 | 100 | 2 |
| III | Core | 22OPMA31 | Advanced Statistics-II | 6 | 3 | 25 | 75 | 100 | 4 |
| | Core | 22OPMA32 | Complex Analysis | 6 | 3 | 25 | 75 | 100 | 4 |
| | Core | 22OPMA33 | Mechanics | 6 | 3 | 25 | 75 | 100 | 4 |
| | Core | 22OPMA34 | Topology | 6 | 3 | 25 | 75 | 100 | 4 |
| | | | DSEC-III | 6 | 3 | 25 | 75 | 100 | 4 |
| IV | Core | 22OPMA41 | Advanced Topology | 6 | 3 | 25 | 75 | 100 | 4 |
| | Core | 22OPMA42 | Research Methodology & Mathematical Methods | 6 | 3 | 25 | 75 | 100 | 4 |
| | Core | 22OPMA43 | Functional Analysis | 6 | 3 | 25 | 75 | 100 | 4 |
| | Core | 22OPMA44 | Operations Research | 6 | 3 | 25 | 75 | 100 | 4 |
| | | | DSEC-IV | 6 | 3 | 25 | 75 | 100 | 4 |
| | | 22OPMAPR4 | Project | | | 20 | 80 | | 6 |
| | | | Total Credits | | | | | | 90 |

DSEC- Discipline Specific Elective Course**IDC-** Inter Disciplinary Course

DSEC: Discipline Specific Elective Courses:

DSEC – I has to be chosen in Semester I from the following:

1. Number Theory& Cryptography - 22OPMADSE1A
2. Fluid Dynamics - 22OPMADSE1B

DSEC – II has to be chosen in semester II from the following:

1. Fuzzy Sets and Logic -22OPMADSE2A
2. Automata Theory and Formal Languages -22OPMADSE2B

DSEC – III has to be chosen in semester III from the following:

1. Numerical Analysis -22OPMADSE3A
2. Stochastic Process -22OPMADSE3B

DSEC –IV has to be chosen in semester IV from the following:

1. Discrete Mathematics - 22OPMADSE4A
2. Financial Mathematics - 22OPMADSE4B

| Department of Mathematics | | | | | I M.Sc., | | | |
|---------------------------|----------|-------------|--------------------------------|---------|--------------------|-----|----|-------|
| Sem | Category | Course Code | Course Title | Credits | Contact Hours/week | CIA | SE | Total |
| 1 | DSEC | 22OPMADSE1A | Number Theory and Cryptography | 4 | 6 | 25 | 75 | 100 |

| Nature of the Course | | |
|------------------------------|------------------------|---------------------------|
| Knowledge and Skill Oriented | Employability Oriented | Entrepreneurship oriented |

Course Objectives

1. To know about fundamental algorithms for integer arithmetic and greatest common divisor calculation.
2. To find modular arithmetic and other number theoretic computations.
3. To derive algorithms and linear congruence
4. To Analyze Quadratic Residues and Diophantine equation
5. To explore applications of number theory in cryptography.

| Unit | Course Contents | 90 Hours | K Level | CLO |
|------|---|----------|----------|------|
| I | Arithmetical Functions and Dirichlet Multiplication Introduction – Divisibility – The Mobius function $\mu(n)$ – The Euler totient function $\Phi(n)$ – A relation connecting Φ and μ – The divisor functions $\sigma_\alpha(n)$ - Generalized convolutions – Formal power series – The Bell series of an arithmetical function – Bell series and Dirichlet multiplication – Derivatives of an arithmetical functions – The Selberg Identity. | 18 | Up to K4 | CLO1 |
| II | Averages of Arithmetical Functions Introduction – The big oh notation. Asymptotic equality of functions – Euler's summation formula – Some elementary asymptotic formulas – The average order of $d(n)$ - The average order of the divisor functions $\sigma_\alpha(n)$ - The average order of $\Phi(n)$ - An application to the distribution of lattice points visible from the origin – The average order of $\mu(n)$ and of $\dot{U}(n)$ - The partial sums of a Dirichlet product - Applications to $\mu(n)$ and $L(n)$ - Another identity for the partial sums of a Dirichlet product. | 18 | Up to k4 | CLO2 |

| | | | | |
|-----|--|----|----------|------|
| III | Some Elementary Theorems on the Distribution of Prime Numbers and Congruence's: Introduction – Chebyshev's functions (x) and (x) - Definition and basic properties of congruence - Residue classes and complete residue systems – Linear congruence – Reduced residue systems and Euler Fermat theorem – Polynomial congruence modulo p .Lagrange's theorem – Applications of Lagrange's theorem – Simultaneous linear Congruence . The Chinese Remainder theorem – Applications of the Chinese Remainder theorem – Polynomial congruence with prime power moduli - The Principle of cross classification – A decomposition property of reduced residue systems | 18 | Up to K4 | CLO3 |
| IV | Quadratic Residues and the Quadratic Reciprocity Law: Quadratic residues – Legendre's symbol and its properties – Evaluation of $(-1/p)$ and $(2/p)$ –Gauss' lemma- The quadratic reciprocity law-Applications of the reciprocity law- The Jacobi symbol - Applications of Diophantine equations- Gauss sums and the Quadratic reciprocity law. | 18 | Up to K5 | CLO4 |
| V | More on Number Theory: Public-Key Cryptography, RSA and Other Public Cryptosystems Discrete logarithm – Principles of public key – Cryptosystem – RSA algorithm – Elliptic curve cryptography. | 18 | Up to K5 | CLO5 |

Books for study:

1. TOM.M. Apostol, *Introduction to Analytic Number theory*, Narosa Publishing House (1998).
2. William Stallings, *Cryptography and Network Security Principles and Practice*, Prentice Hall, Fifth Edition, 2011

| UNIT | CHAPTER(S) | SECTIONS |
|------|------------|----------------------------------|
| I | 2 | 2.1 to 2.19 Book No.1 |
| II | 3 | 3.1 to 3.12 BookNo1 |
| III | 4&5 | 4.1,4.2 &5.1 to 5.11 Book No1 |
| IV | 9 | 9.1 to 9.9 Book No1 |
| V | 8,9&10 | 8.5, 9.1,9.2 & 10.4 Book No2 |

Books for Reference:

- 1) S.G. Telang, *Number Theory*, Tata McGraw-Hill (2001).
- 2) Neal Koblitz, *A Course in Number Theory and Cryptography*, Springer-Verlag, 1987.
- 3) Ivan Niven, Niven Ivan, Herbert S. Zuckerman, Zuckerman Herbert S *An introduction to the theory of numbers* ,1972.
- 4) Martin Erickson, Anthony Vazzana, *introduction to Number Theory* ,first Indian , 2009.
- 5) David M.Burton, *Elementary Number Theory*, Wm.C.Brown Publishers 1989.

Web Resources

1. <http://www.fuchs-braun.com/media/532896481f9c1c47ffff8077fffff0.pdf>
2. <https://www.flowsurf3.net/c.php?cu=https%253A%252F%252Fwstein.org%252Fent%252Fent.pdf&l=IN&po=2&u=mbeh-20210420-ccmnet-flga33&a=3100&tr=7gb1211411dgd&keyword=number%2Btheory%2Bpdf%2Bfree%2Bdownload&aid=61a887bb708ea&t=8&bc=0&rt=1638434746.9534&n=5&loc=normal>.
3. <https://crypto.stanford.edu/pbc/notes/numbertheory/book.pdf>

E-books

1. <http://www.freebookcentre.net/maths-books-download/gotoweb.php?id=9568>
2. <https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbXha2hsYWdoZWf8Z3g6MTRmYTdkZDQ4Y2Q2MmFhMQ>

Pedagogy:

- Chalk and Talk, Power point presentations, Group Discussions, Quiz, Assignment and Seminar

Rationale for nature of Course:**Knowledge and Skill:**

- Develop a deeper conceptual understanding of the theoretical basis of number theory and cryptography.
- Apply elementary number theory to cryptography

Activities to be given:

We will be providing students with intellectual problems, theory application problems and other practical works and also insist them to check the Books for References and web resources.

Course Learning Outcome (CLOs)

On completion of the course, behind the students would be able to:

| No. | Course Learning Outcomes | Knowledge Level (According to Bloom's Taxonomy) |
|------|---|---|
| CLO1 | Understand the properties of divisibility and congruence. | Up to K4 |
| CLO2 | Use arithmetic functions in area of mathematics | Up to K4 |
| CLO3 | Understand and use the theorems ,Chinese remainder theorem and Lagrange's theorem | Up to K4 |
| CLO4 | Know the applications of reciprocity law and Diophantine equation | Up to K5 |
| CLO5 | Apply elementary number theory concepts in cryptography. | Up to K5 |

K1- Remembering facts with specific answers

K2- Basic understanding of facts.

K3- Application oriented

K4- Analyzing, examining and making presentations with evidence.

K5- Evaluating, making Judgments based on criteria

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|------|-----|-----|-----|-----|-----|-----|
| CLO1 | 3 | 2 | 3 | 2 | 3 | 3 |
| CLO2 | 3 | 2 | 2 | 2 | 1 | 3 |
| CLO3 | 3 | 3 | 2 | 2 | 2 | 3 |
| CLO4 | 3 | 3 | 2 | 2 | 1 | 3 |
| CLO5 | 3 | 3 | 2 | 2 | 1 | 3 |

1-Basic Level 2- Intermediate Level 3- Advanced Level

Lesson Plan

| Unit | Course Content | 90 Hours | Total Hours | Mode of Teaching |
|------|---|-------------|----------------|---------------------|
| I | Arithmetical Functions and Dirichlet Multiplication Introduction – Divisibility – The Mobius function $\mu(n)$ – The Euler totient function $\Phi(n)$ – A relation connecting φ and μ | 6 | 18 | Chalk & Talk |
| | A product formula for $\Phi(n)$ – The Dirichlet product of arithmetical functions – Dirichlet inverses and the mobius inversion formula – The Mangoldt function $L(n)$ – Multiplicative functions - Multiplicative functions and Dirichlet multiplication | 6 | | |
| | The inverse of a completely multiplicative function- Liouville's function $\lambda(n)$ - The divisor functions $\sigma_a(n)$ - Generalized convolutions – Formal power series – The Bell series of an arithmetical function – Bell series and Dirichlet multiplication – Derivatives of an arithmetical functions – The Selberg Identity. | 6 | | |
| II | Averages of Arithmetical Functions Introduction – The big oh notation. Asymptotic equality of functions – Euler's summation formula – Some elementary asymptotic formulas | 6 | 18 | Chalk & Talk |
| | The average order of $d(n)$ - The average order of the divisor functions $\sigma_a(n)$ - The average order of $\Phi(n)$ - An application to the distribution of lattice points visible from the origin | 6 | | |
| | The average order of $\mu(n)$ and of $\Lambda(n)$ - The partial sums of a Dirichlet product - Applications to $\mu(n)$ and $\Lambda(n)$ - Another identity for the partial sums of a Dirichlet product. | 6 | | |

| | | | | |
|-----|--|---|----|-----------------------------------|
| III | Some Elementary Theorems on the Distribution of Prime Numbers and Congruence's: Introduction – Chebyshev's functions $\psi(x)$ and $I(x)$ - Definition and basic properties of congruence - Residue classes and complete residue systems | 6 | 18 | Chalk & Talk |
| | Linear congruence – Reduced residue systems and Euler Fermat theorem – Polynomial congruence modulo p - Lagrange's theorem – Applications of Lagrange's theorem – Simultaneous linear Congruence . The Chinese Remainder theorem – Applications of the Chinese Remainder theorem | 6 | | |
| | Polynomial congruence with prime power moduli - The Principle of cross classification – A decomposition property of reduced residue systems. | 6 | | |
| IV | Quadratic Residues and the Quadratic Reciprocity Law: Quadratic residues – Legendre's symbol and its properties –Applications of the reciprocity law- The Jacobi symbol | 6 | 18 | PowerPoint Presentation & Seminar |
| | Evaluation of $(-1/p)$ and $(2/p)$ –Gauss' lemma- The quadratic reciprocity law | 6 | | |
| | Applications of Diophantine equations- Gauss sums and the Quadratic reciprocity law. | 6 | | |
| V | More on Number Theory: Public-Key Cryptography, RSA and Other Public Cryptosystems Discrete logarithm | 6 | 18 | PowerPoint Presentation & Seminar |
| | Principles of public key – Cryptosystem | 6 | | |
| | RSA algorithm – Elliptic curve cryptography | 6 | | |

Course Designer: Dr. Mrs. S. Sripriya, Assistant Professor of Mathematics

| Department of Mathematics | | | | | I M.Sc., | | | |
|---------------------------|----------|-------------|----------------|---------|--------------------|-----|----|-------|
| Sem | Category | Course Code | Course Title | Credits | Contact Hours/week | CIA | SE | Total |
| 1 | DSEC | 22OPMADSE1B | Fluid Dynamics | 4 | 6 | 25 | 75 | 100 |

| Nature of the Course | | |
|------------------------------|------------------------|---------------------------|
| Knowledge and Skill Oriented | Employability Oriented | Entrepreneurship oriented |

Course Objectives

1. To develop an application for properties of Newtonian Fluid.
2. To Study analytical solution to variety of simplified problems.
3. To understand the dynamics of fluid flows and governing the non dimensional parameters.
4. To give fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows.
5. To describe the principles of motion for fluids.

| Unit | Course Content | 90 Hours | K Level | CLO |
|------|---|----------|----------|------|
| I | Real fluids and Ideal fluids- Velocity of a fluid at a point – streamlines path lines- velocity potential –Vorticity Vector – Equation of continuity – acceleration of a fluid | 18 | Up to K4 | CLO1 |
| II | Equation of motion of a fluid: Pressure at a point in a fluid at rest – pressure at a point in a moving fluid-Euler's equations of motion – Bernoulli's Equation, Bernoulli's theorem. | 18 | Up to K4 | CLO2 |
| III | Some two-dimensional flows: meaning of two- dimensional flow –stream function – two dimensional image systems- Milne – Thomson circle theorem –Theorem of Blasius. | 18 | Up to K4 | CLO3 |
| IV | Elements of Thermodynamics: The equation of state of a substance – the first law of thermodynamics- internal energy of a gas – specific heats of a gas- function of state; Entropy- Maxwell's thermodynamics relation | 18 | Up to K5 | CLO4 |
| V | Shock waves: formation of shock waves – elementary analysis of normal shock waves –elementary analysis of oblique shock waves-the method of characteristics for two – dimensional ,homotropic, irrational flow. | 18 | Up to K5 | CLO5 |

Book for study:

F.Chorlton: *Text book of Fluid Dynamics*, CBS publishers and Distributors Pvt.Limited,2004.

Books for Reference:

1. M.D.Raisinghania: *Fluid Dynamics*, S.Chand,2003.
2. Michel Rieutord: *Fluid Dynamics*, Springer International Publishing,2015.
3. Geoffrey K. Vallis *Essentials of Atmospheric and Oceanic Dynamics* 1st dition,2019.
4. Richard W. Johnson : *Handbook of Fluid Dynamics* 2nd Edition.
5. George EmKarniadakis , Spencer J. SherwinSpectral/hp *Element Methods for Computational Fluid Dynamics (Numerical Mathematics and Scientific Computation)* 2nd Edition

Web Resources:

- 1.https://www.meteo.physik.unimuenchen.de/lehre/roger/manuskripte/Fluid_Dynamics.pdf
2. <http://www.ccpo.odu.edu/~klinck/Reprints/PDF/groschBook2011.pdf>
- 3.https://www.engineerclassroom.com/2019/01/a-textbook-of-fluid-mechanics-and_18.html

E-books:

- 1.http://www.issp.ac.ru/ebooks/books/open/Advanced_Fluid_Dynamics.pdf
- 2.https://www.u-cursos.cl/usuario/5d90bc31eadb7b756f4a0d3fd9789c4f/mi_blog/r/1205763481Batchelor.-Introduction-to-Fluid-Dynamics.pdf

Pedagogy:

- Chalk and Talk, Powerpoint presentations, Group Discussions, Quiz, Assignment and Seminar

Rationale for nature of Course:**Knowledge and Skill:**

- Students will get the knowledge of basic principles of fluids mechanics
- To get the ability to analyze the fluid flow problems with the application of Bernoulli's theorem.

Activities to be given: We will be providing students with intellectual problems, theory application problems, group discussions and other practical works and also insist them to check the Books for References and web resources.

Course Learning Outcome (CLOs)

On completion of the course, behind the students would be able to:

| No. | Course Learning Outcomes | Knowledge Level (According to Bloom's Taxonomy) |
|------|---|---|
| CLO1 | Describe the principles of motion for fluids | Up to K4 |
| CLO2 | Formulate the motion of fluid element | Up to K4 |
| CLO3 | Use the dimensional analysis and derive dimensional numbers | Up to K4 |
| CLO4 | Understanding of thermo dynamics properties and processes | Up to K5 |
| CLO5 | Be able to analyze shock waves | Up to K5 |

K1- Remembering facts with specific answers

K2- Basic understanding of facts.

K3- Application oriented

K4- Analyzing, examining and making presentations with evidence.

K5- Evaluating, making Judgments based on criteria

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-------------|-----|-----|-----|-----|-----|-----|
| CLO1 | 2 | 1 | 3 | 2 | 3 | 3 |
| CLO2 | 1 | 2 | 2 | 2 | 1 | 3 |
| CLO3 | 1 | 1 | 3 | 3 | 1 | 3 |
| CLO4 | 2 | 2 | 2 | 2 | 2 | 3 |
| CLO5 | 2 | 2 | 3 | 2 | 3 | 3 |

1-Basic Level 2- Intermediate Level 3- Advanced Level

Lesson Plan

| Unit | Course Content | Hours | 90 Hours | Mode of Teaching |
|------|--|-------|----------|-----------------------------------|
| I | Real fluids and Ideal fluids- Velocity of a fluid at a point | 6 | 18 | Chalk and Talk |
| | streamlines path lines- velocity potential | 6 | | |
| | Vorticity Vector – Equation of continuity – acceleration of a fluid. | 6 | | |
| II | Equation of motion of a fluid: Pressure at a point in a fluid at rest | 6 | 18 | Chalk and Talk |
| | pressure at a point in a moving fluid-Euler's equations of motion | 6 | | |
| | Bernoulli's Equation, Bernoulli's theorem. | 6 | | |
| III | Some two-dimensional flows: meaning of two-dimensional flow | 6 | 18 | Chalk and Talk |
| | stream function – two dimensional image systems | 6 | | |
| | Milne – Thomson circle theorem –Theorem of Blasius. | 6 | | |
| IV | Elements of Thermodynamics: The equation of state of a substance – the first law of thermodynamics | 6 | 18 | PowerPoint Presentation & Seminar |
| | internal energy of a gas – specific heats of a gas- function of state; Entropy | 6 | | |
| | Maxwell's thermodynamics relation | 6 | | |
| V | Shock waves: formation of shock waves – elementary analysis of normal shock waves | 6 | 18 | PowerPoint Presentation & Seminar |
| | elementary analysis of oblique shock waves-the method of characteristics for two | 6 | | |
| | dimensional, homentropic, irrational flow. | 6 | | |

Course Designer: Dr. Mrs. S. Sripriya, Assistant Professor of Mathematics

| Department of Mathematics | | | | | I M.Sc., | | | |
|---------------------------|----------|-------------|----------------------|---------|--------------------|-----|----|-------|
| Sem | Category | Course Code | Course Title | Credits | Contact Hours/week | CIA | SE | Total |
| II | DSEC | 22OPMADSE2A | Fuzzy Sets and Logic | 4 | 6 | 25 | 75 | 100 |

| Nature of the Course | | |
|------------------------------|------------------------|---------------------------|
| Knowledge and Skill Oriented | Employability Oriented | Entrepreneurship oriented |

Course Objectives:

1. To understand fundamental of fuzzy set.
2. To learn fuzzy set, Arithmetic operation on fuzzy set.
3. To understand fuzzy notation
4. To know about fuzzy relation.
5. To apply fuzzy logic in real world problem.

| Unit | Course Content | 90 Hours | K-Level | CLO |
|------|--|----------|----------|------|
| I | Introduction ,Crisp Sets: An Overview, The Notation of Fuzzy Sets, Basic Concepts of Fuzzy Sets, Classical Logic: An Overview, Fuzzy Logic | 18 | Up to K4 | CLO1 |
| II | General Discussion, Fuzzy Complement, Fuzzy Union, Fuzzy Intersection, Combinations of Operations, General Aggregation Operations. | 18 | Up to K4 | CLO2 |
| III | Crisp and Fuzzy Relations, Binary Relations, Binary Relations On a Single Set, Equivalence and Similarity Relations. | 18 | Up to K4 | CLO3 |
| IV | Compatibility or Tolerance Relations, Orderings | 18 | Up to K5 | CLO4 |
| V | Morphisms, Fuzzy Relation Equations | 18 | Up to K5 | CLO5 |

Book for Study:

Fuzzy Sets, Uncertainty and Information, George J.Klir,Tina A. Folger.

Chapters:

| UNIT | CHAPTER(S) | SECTIONS |
|------|------------|------------|
| I | 1 | 1.1 to 1.6 |
| II | 2 | 2.1 to 2.6 |
| III | 3 | 3.1 to 3.4 |
| IV | 3 | 3.5 & 3.6 |
| V | 3 | 3.7 & 3.8 |

Books for Reference:

- 1) Bhargava A.K *Fuzzy Set Theory Fuzzy Logic and Their Applications*, S.Chand& Company Pvt. Ltd.2013.
- 2) Chennakesava,R.Alavala, *Fuzzy Logic and Neural Network Basic Concepts & Applications*, New Age International Publishers 2008.
- 3) George J.Klir and Boyuan, *Fuzzy sets Fuzzy Logic, Theory and Applications*, Prentice Hall of India , 2002.
- 4) George Bojadziev and Maria Bojadziev, *Fuzzy Sets, Fuzzy Logic, Applications*, 1996.
- 5) Bhargava A.K.*Fuzzy Set Theory Fuzzy Logic and their Applications*, 2013.

Web Resources :

- 1.<https://cours.etsmtl.ca/sys843/REFS/Books/ZimmermannFuzzySetTheory2001.pdf>
2. <https://link.springer.com/book/10.1007/978-3-642-35221-8>
3. <https://www.b-farhadinia.ir/bfarhadiadmin/file/stdfile/Klir.pdf>

E-books :

1. <https://bookauthority.org/books/beginner-fuzzy-logic-ebooks>
2. <https://www.phindia.com/Books/ShowBooks/NzI/Fuzzy-Sets-and-Fuzzy-Logic>
3. <https://onlinelibrary.wiley.com/doi/book/10.1002/9781119193210>

Pedagogy :

Chalk and Talk, Group Discussion, Student Seminar, Spot Test, Assignments, Quiz.

Rationale for Nature of the Course:**Knowledge and Skill**

To understand the concept of fuzzy and its application in various field

Activities to be given:

We will be providing students with intellectual problems, theory application problems, group discussion and other practical works and also insist them to check the Books for References and web resource

Course Learning Outcomes (CLO):

On successful Completion of the course Students will be able to

| CLO | Course Learning Outcomes | Knowledge Level (According to Bloom's Taxonomy) |
|------------|---|--|
| CLO1 | Understand to Examine the Basic Concepts of Crisp sets and Fuzzy sets | Up to K4 |
| CLO2 | Describe Fuzzy Operations | Up to K4 |
| CLO3 | Understand the concept of Fuzzy Arithmetic | Up to K4 |
| CLO4 | Determine the difference between Crisp and Fuzzy Relation | Up to K5 |
| CLO5 | Use Fuzzy Relation as tools to Visualize and Simplify | Up to K5 |

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3– Application oriented – Solving Problems

K4 –Examining, analyzing, presentation and make inferences with evidences

K5- Evaluating, making Judgments based on criteria

Mapping of Course Learning Outcome(CLOs) with Program Outcomes(Pos)

| CLOs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-------------|------------|------------|------------|------------|------------|------------|
| CLO1 | 2 | 2 | 3 | 2 | 2 | 3 |
| CLO2 | 1 | 2 | 3 | 2 | 2 | 3 |
| CLO3 | 2 | 3 | 2 | 2 | 2 | 1 |
| CLO4 | 2 | 2 | 3 | 2 | 2 | 2 |
| CLO5 | 2 | 2 | 3 | 2 | 2 | 3 |

1 – Basic Level

2 – Intermediate Level

3- Advance Level

Lesson Plan:

| Units | Course Contents | 90 HRS | | Mode of Teaching |
|-------|--|--------|----|--|
| I | <ul style="list-style-type: none"> Introduction , Crisp Sets An Overview: The Notation of Fuzzy Sets. Basic Concepts: Fuzzy Sets, Classical Logic: An Overview, Fuzzy Logic. | 6 | 18 | Chalk & Talk |
| | | 6 | | |
| | | 6 | | |
| | | 6 | | |
| II | <ul style="list-style-type: none"> General Discussion, Fuzzy Complement, Fuzzy Union , Fuzzy Intersection Fuzzy Intersection, Combinations of Operations Combinations of Operations, General Aggregation Operations. | 6 | 18 | Chalk & Talk |
| | | 6 | | |
| | | 6 | | |
| III | <ul style="list-style-type: none"> Crisp and Fuzzy Relations Relations, Binary Relations On a Single Set Equivalence and Similarity Relations. | 6 | 18 | Chalk & Talk, Spot Test Group Discussion |
| | | 6 | | |
| | | 6 | | |
| IV | <ul style="list-style-type: none"> Compatibility Tolerance Relations Orderings | 6 | 18 | Chalk & Talk |
| | | 6 | | |
| | | 6 | | |
| V | <ul style="list-style-type: none"> Morphisms Fuzzy Relation and Equation | 9 | 18 | Chalk & Talk Students Seminar |
| | | 9 | | |

Course Designer: Mrs. K.Saranya, Assistant Professor of Mathematics

| Department of Mathematics | | | | | I M.Sc., | | | |
|---------------------------|----------|-------------|------------------------------------|---------|--------------------|-----|----|-------|
| Sem | Category | Course Code | Course Title | Credits | Contact Hours/week | CIA | SE | Total |
| II | DSEC | 22OPMADSE2B | Automata Theory & Formal Languages | 4 | 6 | 25 | 75 | 100 |

| Nature of the Course | | |
|------------------------------|------------------------|---------------------------|
| Knowledge and Skill Oriented | Employability Oriented | Entrepreneurship oriented |

Course Objectives

1. To identify different formal language classes and their notation strips.
2. To design grammars and recognizes for different formal languages.
3. To prove or disprove theories in automata theory using its properties
4. To understand the regular expression in UNIX.
5. To acquire the idea about regular languages and Pumping Lemma

| Unit | Course Content | 90 Hours | K Level | CLO |
|------|--|----------|----------|------|
| I | Inductive Proofs -Inductions on integers – Mutual inductions The Central Concept of Automata Theory Alphabets and strings-languages | 18 | Up to K4 | CLO1 |
| II | Finite Automata -An informal Picture of finite Automata-The ground Rules- Deterministic finite Automata: Definition of a Deterministic Finite automata-How a FDA Processes Strings. | 18 | Up to K4 | CLO2 |
| III | Regular Expressions and Languages -Building Regular Expressions Finite Automata and Regular Expressions-From DFA'S to Regular Expression-Converting DFA's to Regular Expressions by Eliminating States. | 18 | Up to K4 | CLO3 |
| IV | Applications of Regular Expressions -Regular Expressions in UNIX-Lexical Analysis-Finding Patterns in Text Discovering Laws for Regular Expressions-The Test for a Regular-Expressions Algebraic Law | 18 | Up to K5 | CLO4 |
| V | Properties of Regular Languages -Proving Languages not to be Regular-The Pumping Lemma for Regular Languages-Applications of the Pumping Lemma. Closure Properties of Regular Languages. | 18 | Up to K5 | CLO5 |

Book for study:

John.E.Hopcroft, Jeffrey D.Ullman.*Introduction to Automata Theory Languages and computation*, DorlingKindersley (India Pvt. Ltd.,) 2001.

Chapters:

| UNIT | CHAPTER(S) | SECTIONS |
|------|------------|-----------|
| I | 1 | 1.4 & 1.5 |
| II | 2 | 2.1 & 2.2 |
| III | 3 | 3.1 & 3.2 |
| IV | 3 | 3.3 & 3.4 |
| V | 4 | 4.1 & 4.2 |

Books for Reference:

- 1.Alexander Meduna, *Automata and Languages* Springer (2000).
2. .Kohavi, ZVI, *Switching And Finite Automata Theory*, Tata McGraw-Hill, 2006.
3. ShyamalenduKandar, *Automata Theory and Formal Languages* Dorling Kindersley(India) Pvt.Ltd(2000)
4. Debidas gosh, *Introduction to Theory Of Automata, formal languages and computation*, PHI Learning; 21 August 2013
- 5.Pandey,*An Introduction to Automata Theory and Formal languages*, S.K.Kataria& Sons, 2010

Web Resources:

1. <https://youtube.com/playlist?list=PLLOxZwkBK52CTVrHjYa7-SpXlEtef1TqL>
2. https://youtube.com/playlist?list=PLN2vKr_NwAR7PpXMNRq1C3JnCu3e6hwJI

E-books:

1. <https://www.iitg.ac.in/dgoswami/Flat-Notes.pdf>
2. <https://www.gopalancolleges.com/gcem/course-material/computer-science/course-plan/sem-V/formal-languages-and-automata-theory-10CS56.pdf>

Pedagogy:

- Chalk and Talk, Power point presentations, Group Discussions, Quiz, Assignment and Seminar

Rationale for nature of Course:

Knowledge and Skill: Acquire in fundamental understanding of the core concepts in automata theory and formal languages .An ability to design grammars and automata for different languages classes.

Activities to be given:

We will be providing students with intellectual problems, theory application problems, group discussion and other practical works and also insist them to check the Books for References and web resource.

Course Learning Outcome (CLOs)

On completion of the course, behind the students would be able to:

| CLO | Course Learning Outcomes | Knowledge Level (According to Bloom's Taxonomy) |
|------------|---|--|
| CLO1 | Understanding the basic properties of formal languages. | UptoK3 |
| CLO2 | Utilize the two way finite Automata | Up to K3 |
| CLO3 | Analyze the properties of regular sets | Up to K3 |
| CLO4 | Present the context free grammars | Up to K4 |
| CLO5 | Build the algorithm of DFA's | Up to K4 |

K1- Remembering facts with specific answers

K2- Basic understanding of facts.

K3- Application oriented

K4- Analyzing, examining and making presentations with evidence.

K5- Evaluating, making Judgments based on criteria

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-------------|------------|------------|------------|------------|------------|------------|
| CLO1 | 3 | 3 | 3 | 2 | 2 | 3 |
| CLO2 | 3 | 3 | 3 | 2 | 1 | 3 |
| CLO3 | 3 | 3 | 3 | 1 | 2 | 3 |
| CLO4 | 3 | 2 | 3 | 2 | 2 | 3 |
| CLO5 | 3 | 2 | 3 | 2 | 1 | 3 |

1-Basic Level 2- Intermediate Level 3- Advanced Level

Lesson Plan

| Unit | Course Content | 90 Hours | | Mode of Teaching |
|------|--|-------------|----|--------------------|
| I | Inductive Proofs -Inductions on integers– Mutual inductions The Central Concept of Automata Theory Alphabets and strings –languages | 6 6 6 | 18 | Lecture, Quiz, PPT |
| II | Finite Automata: An informal Picture of finite Automata Deterministic finite Automata: Definition of a Deterministic Finite automata The ground Rules- -How a FDA Processes Strings. | 6 6 6 | 18 | Lecture, Quiz, PPT |
| III | Regular Expressions and Languages -Building Regular Expressions Finite Automata and Regular Expressions From DFA'S to Regular Expression Converting DFA's to Regular Expressions by Eliminating States. | 6 6 6 | 18 | Lecture, Quiz, |
| IV | Applications of Regular Expressions: Regular Expressions in UNIX-Lexical Analysis Finding Patterns in Text Discovering Laws for Regular Expressions The Test for a Regular Expressions Algebraic Law | 6 6 6 | 18 | PPT, Lecture |
| V | Prosperities of Regular Languages: Proving Languages not to be Regular The Pumping Lemma for Regular Languages Applications of the Pumping Lemma. Closure Properties of Regular Languages. | 6 6 6 | 18 | Lecture, Tutorial |

Course Designer: Mrs.Ponnulakshmi, Assistant Professor of Mathematics