



# KAMARAJ COLLEGE

(AUTONOMOUS)

Accredited with A+ Grade by NAAC

Among Top 150 Colleges in India - NIRF Ranking 2025

இந்து நாடார் சங்கங்களால் 1966-ல் தொடங்கப்பட்ட கல்லூரி

(Affiliated to Manonmaniam Sundaranar University, Tirunelveli)

THOOTHUKUDI - 628 003.



**B.Sc., Mathematics**

**Semester – I to VI**

**(for the students those who joined from the academic year 2025-2026)**



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## **B.Sc., Mathematics**

### **Semester – I to VI**

## **SYLLABUS**

**(for the students those who joined from the academic year 2025-2026)**

## Department Profile

|                              |                      |
|------------------------------|----------------------|
| <b>Name of the Programme</b> | - B.Sc., Mathematics |
| <b>Programme Code</b>        | - 03002              |
| <b>Year of Establishment</b> | -1966                |

### Vision

- To nurture curiosity and creativity in learning
- To develop student's ability to solve problems
- To contribute to the community through mathematical projects and initiatives
- To promote better living conditions for the underprivileged

### Mission

- Provide students with advanced mathematical content
- Prepare students to be global representatives
- Encourage students to appreciate the beauty of mathematics
- Apply mathematical knowledge to develop society

**College mail ID**            [kamarajcoll@gmail.com](mailto:kamarajcoll@gmail.com)

**College website**        [www.kamarajcollege.ac.in](http://www.kamarajcollege.ac.in)

## Under Graduate Degree Programme

### 1. Introduction

#### Programme Outcome, Programme Specific Outcomes and Course Outcomes

Students completing this programme will be able to present their core undergraduate discipline clearly and precisely, make abstract ideas precise by formulating them in the language of the specific discipline, describe related ideas from multiple perspectives and explain fundamental concepts. Completion of this programme will also enable the learners to join teaching profession, enhance their employability for government jobs, jobs in various other public and private enterprises.

**Eligibility:** Students who have completed +2 course with Mathematics, Physics, Chemistry and Biology (or) Mathematics, Computer Science, Physics and Chemistry.

|  |                           |
|--|---------------------------|
| <b>Learning outcomes- Based curriculum frame work guidelines based regulations for undergraduate programme</b> |                           |
| <b>Programme</b>   | <b>B.Sc.(Mathematics)</b> |
| <b>Programme Code:</b>   | <b>03002</b>              |
| <b>Duration:</b>   | <b>3 Years (UG)</b>       |

|                            |   |
|----------------------------|---|
| <b>Programme Outcomes:</b> |   |
| <b>P01</b>                 | <b>Disciplinary knowledge:</b> Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study.   |
| <b>P02</b>                 | <b>Communication Skills:</b> Ability to express thought and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.     |
| <b>P03</b>                 | <b>Critical thinking:</b> Capability to apply analytic thought to a body of knowledge; analyze and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development. |

|            |   |
|------------|---|
| <b>P04</b> | <b>Problem solving:</b> Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.   |
| <b>P05</b> | <b>Analytical reasoning:</b> Ability to evaluate their liability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.   |
| <b>P06</b> | <b>Research-related skills:</b> A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesizing and articulating; Ability to recognize cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyze, interpret and draw conclusions from data, establish hypotheses, predict cause-and- effect relationships; ability to plan, execute and report the results of an experiment or investigation |
| <b>P07</b> | <b>Cooperation/Team work:</b> Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team   |
| <b>P08</b> | <b>Scientific reasoning:</b> Ability to analyze, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.   |

### **Programme Specific Outcomes (PSOs)**

**PSO1:** Placement: To prepare the students who will demonstrate respectful engagement with others ideas, behaviour and beliefs. Also apply diverse frames of reference to decisions and actions.

**PSO2:** Entrepreneur: To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skills that will facilities start-ups and high potential organisations.

**PSO3:** Research and Development: Design and implement HR system and practices grounded in research that complies with employment laws, leading the organisation towards growth and development.

**PSO4:** Contribution to Business Words: To produce employability, ethical and innovative professionals to sustain in the dynamic business world.

**PSO5:** Contribution to the Society: To contribute to the development of the society by collaborating with stakeholders for mutual benefits.

| <b>Methods of Assessment</b>           |   |
|--|---|
| <b>Recall (K1)</b>                     | Simple definitions, MCQ, Recall steps, Concept definitions  |
| <b>Understand/<br/>Comprehend (K2)</b> | MCQ, True/False, Short essays, Concept explanations, Short summary or Overview                                  |
| <b>Application (K3)</b>                | Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain                          |
| <b>Analyze (K4)</b>                    | Problem-solving questions, Finish a procedure in many steps, Differentiate Between various ideas, Map knowledge |
| <b>Evaluate (K5)</b>                   | Longer essay/ Evaluation essay, Critique or justify with pros and cons  |
| <b>Create (K6)</b>                     | Check knowledge in specific or off beat situations, Discussion, Debating or Presentations                       |

| <b>Methods of Evaluation</b> |                                     | <b>Marks</b> |            |
|------------------------------|-------------------------------------|--------------|------------|
| <b>Internal Evaluation</b>   | Continuous Internal Assessment Test | 15           | 25         |
|                              | Assignment (PPT) and Seminar        | 5            |            |
|                              | Group Discussion and Viva           | 5            |            |
| <b>External Evaluation</b>   | End Semester Examination            |              | 75         |
| <b>Total</b>                 |                                     |              | <b>100</b> |

## Extra Credits

| Curricular Activities | Co-Curricular Activities | Extra-Curricular Activities |
|-----------------------|--------------------------|-----------------------------|
| Paper Presentation    | Cultural Competitions    | NCC                         |
| Paper Publication     | Domain Clubs             | NSS                         |
| Placement Training    |                          | Sports                      |
| Quiz                  |                          | YRC                         |
| Competitions          |                          | UBA                         |
| SWAYAM /NPTEL/MOOCs   |                          |                             |

| Level           | Credit        |           |          |         |
|-----------------|---------------|-----------|----------|---------|
|                 | Participation | III Prize | II Prize | I Prize |
| Intra college   | 1             | 2         | 3        | 4       |
| Intercollegiate | 2             | 3         | 4        | 5       |
| District        | 3             | 4         | 5        | 6       |
| University      | 4             | 5         | 6        | 7       |
| State           | 5             | 6         | 7        | 8       |
| National        | 6             | 7         | 8        | 9       |
| International   | 7             | 8         | 9        | 10      |

**\*\*Paper Presentation for each paper: 1credit**

## Total credits Under-Graduate Courses including Lab Hours – 2025 to 2026

| Semester     | Hours | Credits    | Additional Credits |
|--------------|-------|------------|--------------------|
| I            | 30    | 23         | 2                  |
| II           | 30    | 23         | 2                  |
| III          | 30    | 22         | 2                  |
| IV           | 30    | 24         | 2                  |
| V            | 30    | 25         | 3                  |
| VI           | 30    | 24         | 3                  |
| <b>Total</b> |       | <b>141</b> | <b>14</b>          |

\*\*Extra Credit will be given on the basis of student's performances

### Written Examination: Theory Paper (Bloom's Taxonomy based) Question paper Model Assessment Pattern

Continuous Internal Assessment (CIA) & End Semester Examination (ESE)

- CIA : 25
- ESE: 75

### Theory Course:

For theory courses there shall be two tests conducted by the faculty concerned and the average of the two can be taken as the Continuous Internal Assessment (CIA). CIA is for 30 marks max and will be converted in to 15 marks. The duration of each test shall be 1 ¼ hrs.

|  |          |
|--|----------|
| Continuous Internal Assessment (Writing) | 15 marks |
| Assignment (PPT) & Seminar               | 5 marks  |
| Viva & Group Discussion                  | 5 marks  |

### **For theory Papers:**

- Part A ( $10 \times 1 = 10$ ) Marks-Answer all questions (Multiple choice)
- Part B ( $5 \times 5 = 25$ ) Marks-Choosing either (a) or (b)
- Part C ( $5 \times 8 = 40$ ) Marks-Choosing either (a) or (b)

**Total =75 marks**

### **Laboratory Courses Assessment**

- CIA-40marks
- ESE-60marks
- Mandatory Record submission, attendance and class participation.
- Two CIA for 40 marks max. The average of the two can be taken as the Continuous Internal Assessment.
- The duration of each test shall be 3 hours. In order to avoid pull the score down of each PO, it is suggested that the usage L-Low (1) to the minimum. The S, M, L is based on the Course outcomes. The mapping is based on the revised Bloom's

### **Taxonomy Verbs used to describe your Course outcomes.**

- Remember and Understanding–Lower level
- Apply and Analyze– Medium Level
- Evaluate and Create–Strong Level

### **Pedagogy:**

- Technology Based Learning (PPT)
- Peer Teaching (Chalk & Talk)
- Virtual Lab
- Blended Learning (Online & Offline)
- Group Learning
- Self - Study
- Games Based Learning

**Course Structure for Science Stream**  
**First Year – Semester I**  
**B.Sc., Mathematics**  
(With effect from the academic year 2025 to 2026 onwards)

| Semester<br>I   | Course Code | Title of the Course  | Hours<br>/ Week<br>L/P                        | Credit    | Duration<br>of ESE<br>(Hrs.) | Marks Allotted |     |       |
|---|-------------|--|---|-----------|------------------------------|----------------|-----|-------|
|   |             |  |   |           |                              | CIA            | ESE | Total |
| Part - I  | 25ULTL11    | தமிழ் இலக்கிய<br>வரலாறு - I  | 6   | 3         | 3                            | 25             | 75  | 100   |
| Part - II   | 25ULEN11    | General English - I  | 6   | 3         | 3                            | 25             | 75  | 100   |
| Part - III<br>Core - I                                  | 25UMMA11    | Algebra and<br>Trigonometry  | 4   | 4         | 3                            | 25             | 75  | 100   |
| Core - II   | 25UMMA12    | Differential Calculus  | 4   | 4         | 3                            | 25             | 75  | 100   |
| EC - I<br>Discipline<br>/Generic<br>(Select<br>any one) | 25UEPH11    | 1. Allied Physics -I   | 6   | T-3       | 3                            | 25             | 75  | 100   |
|   | 25UEPHL1    | Allied Physics Lab<br>- I  |   |           |                              |                |     |       |
|   | 25UECS11    | (OR)<br>2. Allied Computer<br>Science<br>Programming<br>Language C | P-2   | 40        | 60                           | 100            |     |       |
|   | 25UECH11    | Allied Computer<br>Science Practical                               |   |           |                              |                |     |       |
| Part - IV<br>SEC - I                                    | 25USMA11    | Mathematics for<br>Competitive<br>Examinations-I                   | 2   | 2         | 3                            | 25             | 75  | 100   |
| FC  | 25UFMA11    | Bridge Mathematics   | 2   | 2         | 3                            | 25             | 75  | 100   |
|   |             | <b>Total</b>   | <b>30</b>                                     | <b>23</b> |                              |                |     |       |
| <b>**SEC - Skill Enhancement Course</b>                 |             |  | <b>**CIA – Continuous Internal Assessment</b> |           |                              |                |     |       |
| <b>**EC – Elective Course</b>                           |             |  | <b>**ESE – End Semester Examination</b>       |           |                              |                |     |       |
| <b>**FC - Foundation course</b>                         |             |  |   |           |                              |                |     |       |

**Course Structure for Science Stream**  
**First Year – Semester – II**  
**B.Sc., Mathematics**  
**(With effect from the academic year 2025 to 2026onwards)**

| Semester II                                     | Course Code | Title of the Course                                  | Hours /Week L/P | Credit  | Duration of ESE (Hrs.) | Marks Allotted |              |       |
|---|-------------|--|-----------------|---|------------------------|----------------|--------------|-------|
|   |             |  |                 |   |                        | CIA            | ESE          | Total |
| Part - I  | 25ULTL21    | தமிழ் இலக்கிய வரலாறு - II                            | 6               | 3   | 3                      | 25             | 75           | 100   |
| Part - II                                       | 25ULEN21    | General English – II                                 | 6               | 3   | 3                      | 25             | 75           | 100   |
| Part - III<br>Core - III                        | 25UMMA21    | Analytical Geometry (2 and 3 dimensions)             | 4               | 4   | 3                      | 25             | 75           | 100   |
| Core - IV                                       | 25UMMA22    | Integral Calculus                                    | 4               | 4   | 3                      | 25             | 75           | 100   |
| EC - II<br>Discipline /Generic (Select any one) | 25UEPH21    | 1. Allied Physics -II                                | 6               | T-3<br>P-2                                    | 3                      | T-25<br>P-40   | T-75<br>P-60 | 100   |
|   | 25UEPHL2    | 2. Allied Physics Lab - II                           |                 |   |                        |                |              |       |
|   | 25UECS21    | 3. Allied Computer Science Programming Language C ++ |                 |   |                        |                |              |       |
|   | 25UECSL2    | 4. Allied Computer Science - Practical               |                 |   |                        |                |              |       |
| Part - IV<br>SEC - II                           | 25USMA21    | Mathematics for Competitive Examinations – II        | 2               | 2   | 3                      | 25             | 75           | 100   |
| SEC - III                                       | 25USMA22    | LaTex  | 2               | 2   | 3                      | 25             | 75           | 100   |
| <b>Total</b>                                    |             |  | <b>30</b>       | <b>23</b>                                     |                        |                |              |       |
| <b>** SEC-Skill Enhancement Course</b>          |             |  |                 | <b>** CIA- Continuous Internal Assessment</b> |                        |                |              |       |
| <b>** EC –Elective Course</b>                   |             |  |                 | <b>** ESE- End Semester Examination</b>       |                        |                |              |       |

**Course Structure for Science Stream**  
**Second Year – III Semester**  
**B.Sc., Mathematics**  
**(With effect from the academic year 2025 to 2026 onwards)**

| Semester III                  | Course Code | Title of the Course                     | Hours /Week L/P | Credit    | Duration of ESE (Hrs.) | Marks Allotted |     |       |
|-------------------------------|-------------|---|-----------------|-----------|------------------------|----------------|-----|-------|
|                               |             |   |                 |           |                        | CIA            | ESE | Total |
| Part I                        | 25ULTL31    | தமிழக வரலாறும் பண்பாடும்                | 6               | 3         | 3                      | 25             | 75  | 100   |
| Part II                       | 25ULEN31    | General English - II                    | 6               | 3         | 3                      | 25             | 75  | 100   |
| Part III<br>Core V            | 25UMMA31    | Vector Calculus and Applications        | 5               | 5         | 3                      | 25             | 75  | 100   |
| Core VI                       | 25UMMA32    | Differential Equations and Applications | 5               | 5         | 3                      | 25             | 75  | 100   |
| EC III<br>Discipline /Generic | 25UEMA31    | *Statistics – I                         | 4               | 2         | 3                      | 25             | 75  | 100   |
|                               | 25UEMA32    | Difference Equations                    |                 |           |                        |                |     |       |
| Part-IV<br>SEC IV             | 25USMA31    | *Computational Mathematics              | 2               | 2         | 3                      | 25             | 75  | 100   |
| Part - IV                     | 25UYOG31    | Yoga, Culture & Heritage                | 2               | 2         | 1.5                    | 25             | 75  | 100   |
| <b>Total</b>                  |             |   | <b>30</b>       | <b>22</b> |                        |                |     |       |

**\*\* SEC-Skill Enhancement Course                      \*\* CIA- Continuous Internal Assessment**

**\*\* EC -Elective Course    \*\* ESE- End Semester Examination**

**\*For statistics –II Scientific calculator, Area table for standard normal distribution. Table for ordinated for the standard normal curve. Table for student's t-distribution. Table for  $\chi^2$ - distribution. Table for F – distribution, F- test 5% points.**

**Course Structure for Science Stream**  
**Second Year – Semester – IV**  
**B.Sc., Mathematics**  
**(With effect from the academic year 2025 – 2026 onwards)**

| Semester IV  | Course Code | Title of the Course                    | Hours /Week L/P | Credit    | Duration of ESE (Hrs.) | Marks Allotted |     |       |
|--|-------------|--|-----------------|-----------|------------------------|----------------|-----|-------|
|  |             |  |                 |           |                        | CIA            | ESE | Total |
| Part - I   | 25ULTL41    | தமிழும் அறிவியலும்                     | 6               | 3         | 3                      | 25             | 75  | 100   |
| Part - II  | 25ULEN41    | General English - IV                   | 6               | 3         | 3                      | 25             | 75  | 100   |
| Part - III<br>Core - VII                           | 25UMMA41    | Sequences and series                   | 5               | 5         | 3                      | 25             | 75  | 100   |
| Core - VIII  | 25UMMA42    | Fourier Series and Integral Transforms | 5               | 5         | 3                      | 40             | 60  | 100   |
| EC - IV<br>Discipline /Generic<br>(Select any one) | 25UEMA41    | *Statistics – II                       |                 |           |                        |                |     |       |
|  | 25UEMA42    | Numerical Methods                      | 4               | 3         | 3                      | 25             | 75  | 100   |
| Part-IV<br>SEC -V                                  | 25USMA41    | Geogebra                               | 2               | 2         | 3                      | 25             | 75  | 100   |
| Part - IV  | 25UEVS41    | Environmental Studies                  | 2               | 2         | 3                      | 25             | 75  | 100   |
| Part - V   | 25UEA41     | NCC/ NSS/ YRC/ SPORTS                  | -               | 1         | -                      | -              | -   | 100   |
|  |             | <b>Total</b>                           | <b>30</b>       | <b>24</b> |                        |                |     |       |

**\*\* SEC-Skill Enhancement Course**

**\*\* CIA- Continuous Internal Assessment**

**\*\* EC –Elective Course**

**\*\* ESE- End Semester Examination**

**\* For statistics –II Scientific calculator, Area table for standard normal distribution. Table for ordinated for the standard normal curve. Table for student's t- distribution. Table for  $\chi^2$ -distribution. Table for F – distribution, F- test 5% points.**

**Course Structure for Science Stream**  
**Third Year – Semester – V**  
**B.Sc., Mathematics**  
**(With effect from the academic year 2025– 2026 onwards)**

| Semester<br>V                     | Course<br>Code | Title of the Course                 | Hours<br>/Week<br>L/P | Credit    | Duration<br>of ESE<br>(Hrs.) | Marks<br>Allotted |     |       |
|-----------------------------------|----------------|-------------------------------------|-----------------------|-----------|------------------------------|-------------------|-----|-------|
|                                   |                |                                     |                       |           |                              | CIA               | ESE | Total |
| Core - IX                         | 25UMMA51       | Abstract Algebra                    | 5                     | 5         | 3                            | 25                | 75  | 100   |
| Core - X                          | 25UMMA52       | Real Analysis                       | 5                     | 5         | 3                            | 25                | 75  | 100   |
| Core - XI                         | 25UMMA53       | Graph Theory                        | 5                     | 5         | 3                            | 25                | 75  | 100   |
| Core – XII<br>(Select any<br>one) | 25UMMA54       | 1. Mathematical<br>Modelling        | 5                     | 4         | 3                            | 25                | 75  | 100   |
|                                   | 25UMMAP1       | 2. Group Project with<br>Viva -Voce | 5                     | 4         | 1.5                          | 50                | 50  | 100   |
| EC - V<br>(Select any<br>one)     | 25UEMA51       | 1. *Operations Research –I          |                       |           |                              |                   |     |       |
|                                   | 25UEMA52       | 2. Discrete Mathematics             | 5                     | 3         | 3                            | 25                | 75  | 100   |
| EC - VI<br>(Select any<br>one)    | 25UEMA53       | 1. Combinatorial<br>Mathematics     |                       |           |                              |                   |     |       |
|                                   | 25UEMA54       | 2. Fuzzy Sets and<br>Applications   | 5                     | 3         | 3                            | 25                | 75  | 100   |
| Part - IV<br>Training             | 25UINT51       | *Internship                         | -                     | 2         | 1.5                          | 50                | 50  | 100   |
| Part - V                          | 25UPDT51       | Personality Development             | 2                     | 2         | 3                            | 25                | 75  | 100   |
| <b>Total</b>                      |                |                                     | <b>30</b>             | <b>28</b> |                              |                   |     |       |

**\*\* SEC-Skill Enhancement Course**

**\*\* CIA- Continuous Internal Assessment**

**\*\* EC –Elective Course**

**\*\* ESE- End Semester Examination**

**\*For Operations Research - I, scientific calculator should be allowed.**

**\*Internship – course duration - 7 to14 days (Report should be submitted & Viva-Voce will be conducted for the report which is equivalent to the project Viva – Voce)**

**Course Structure for Science Stream**  
**Third Year – Semester – VI**  
**B.Sc., Mathematics**  
**(With effect from the academic year 2025- 2026 onwards)**

| Semester VI  | Course Code | Title of the Course          | Hours /Week L/P | Credit    | Duration of ESE (Hrs.) | Marks Allotted   |     |       |
|--|-------------|------------------------------|-----------------|-----------|------------------------|--|-----|-------|
|  |             |                              |                 |           |                        | CIA  | ESE | Total |
| Core - XIII  | 25UMMA61    | Linear Algebra               | 6               | 6         | 3                      | 25   | 75  | 100   |
| Core - XIV   | 25UMMA62    | Complex Analysis             | 6               | 6         | 3                      | 25   | 75  | 100   |
| Core - XV  | 25UMMA63    | Mechanics                    | 6               | 6         | 3                      | 25   | 75  | 100   |
| EC - VII<br>(Select any one)   | 25UEMA61    | 1. *Operations Research – II | 6               | 3         | 3                      | 25   | 75  | 100   |
|  | 25UEMA62    | 2. Financial Mathematics     |                 |           |                        |  |     |       |
| EC - VIII<br>(Select any one)  | 25UEMA63    | 1. Number Theory             | 6               | 3         | 3                      | 25   | 75  | 100   |
|  | 25UEMA64    | 2. Astronomy                 |                 |           |                        |  |     |       |
| <b>Total</b>   |             |                              | <b>30</b>       | <b>24</b> |                        |  |     |       |
| <b>** SEC-Skill Enhancement Course</b><br><b>** EC –Elective Course</b>        |             |                              |                 |           |                        | <b>** CIA- Continuous Internal Assessment</b><br><b>** ESE- End Semester Examination</b> |     |       |
| <b>*For Operations Research - II, scientific calculator should be allowed.</b> |             |                              |                 |           |                        |  |     |       |

**Semester - I**  
**Algebra and Trigonometry**

|                                     |          |                                 |                 |                      |              |
|-------------------------------------|----------|---------------------------------|-----------------|----------------------|--------------|
| <b>Title of The Course</b>          |          | <b>Algebra And Trigonometry</b> |                 |                      |              |
| <b>Course Type</b>                  |          | <b>Core - I</b>                 |                 |                      |              |
| <b>Course Code</b>                  |          | <b>25UMMA11</b>                 |                 |                      |              |
| <b>Year</b>                         | <b>I</b> | <b>Semester</b>                 | <b>I</b>        | <b>Credits</b>       | <b>4</b>     |
| <b>Instructional Hours Per week</b> |          | <b>Lecture</b>                  | <b>Tutorial</b> | <b>Lab Practices</b> | <b>Total</b> |
|                                     |          | <b>4</b>                        | <b>--</b>       | <b>--</b>            | <b>4</b>     |

|  |   |
|--|---|
| <b>Learning Objectives</b>                     |   |
| Basic ideas on the theory of equations and to, |   |
| <b>L01</b>                                     | Understand the Basic ideas on the theory of equations   |
| <b>L02</b>                                     | Find numerical solution of an equation  |
| <b>L03</b>                                     | Find the summation of Series  |
| <b>L04</b>                                     | To gain Knowledge to find expansions of trigonometry functions  |
| <b>L05</b>                                     | Solve theoretical and applied problems.   |
| <b>Unit</b>                                    | <b>Contents</b>   |
| <b>I</b>                                       | Reciprocal Equations – Standard form–Increasing or decreasing the roots of a given equation – Removal of terms – Related problems.<br>(Chapter 6 : Sections - 16 to 19)   |
| <b>II</b>                                      | Symmetric function of roots – Sum of powers of the roots of an equation – Newton’s theorem –Approximate solutions of roots of polynomials– Horner’s method – General solutions of the cubic equation – Cardon’s method – Trigonometrical method – Related problems.<br>(Chapter 6: Sections-12 to 14, 30, 34) |
| <b>III</b>                                     | Summation of Series: Binomial – Exponential – Logarithmic Series (Theorems without proof) – Approximations–Related problems.<br>(Chapter 3 : Sections-10, 14 : Chapter 4 : Sections-3, 5, 7, 9, 11)   |

|           |   |
|-----------|---|
| <b>IV</b> | Expansions of $\sin n\theta$ , $\cos n\theta$ in powers of $\sin \theta$ , $\cos \theta$ Expansion of $\tan n\theta$ in terms of $\tan \theta$ , Expansions of $\cos^n \theta$ , $\sin^n \theta$ , $\cos^m \theta \sin^n \theta$ – Expansions of $\tan(\theta_1 + \theta_2 + \dots + \theta)$ – Expansions of $\sin \theta$ , $\cos \theta$ and $\tan \theta$ in terms of $\theta$ – related problems.<br>(Chapter 3) |
| <b>V</b>  | Hyperbolic functions – Relation between circular and hyperbolic functions Inverse hyperbolic functions, Logarithm of complex quantities – Related problems.<br>(Chapter 4, Chapter 5 : Section- 5)  |

|  |  |
|--|--|
| Extended Professional Component<br>(is a part of internal Component only not to be include in the External Examination question paper) | Questions related to the above topics from various competitive examinations UPSC / TNPSC / others to be solved<br>(To be discussed during the Tutorial hour) |
| Skills acquired from this Course   | Knowledge, Problem Solving, Analytical ability, Professional Competency, professional communication and transfer able skill.                                 |

| <b>Recommended Texts</b> |  |
|--------------------------|--|
| 1                        | T.K. Manicavachagom Pillay, T. Natarajan and K.S. Ganapathy, Algebra Voll, S. Viswanathan (Printers & Publishers) Pvt. Ltd., 2017. |
| 2                        | S. Narayanan and T.K. Manicavachagom Pillay, Trigonometry, S. Viswanathan (Printers & Publishers) Pvt. Ltd., 2009.                 |

**Web Resources** <https://nptel.ac.in>

| <b>Reference Books</b> |  |
|------------------------|--|
| 1                      | W.S. Burns's tine and A.W. Panton, Theory of equations.  |
| 2                      | C.V. Durrell and A.Robson, Advanced Trigonometry, Courier Corporation, 2003.                           |
| 3                      | J. Stewart, L. Redlin and S. Watson, Algebra and Trigonometry, C Engage Learning, 2012.                |
| 4                      | Calculus and Analytical Geometry, G.B. Thomas and R.L. Finny, Pearson Publication, 9thEdition, 2010.   |
| 5                      | David C.Lay, Linear Algebra and its Applications, 3rdEd., Pearson Education Asia, Indian Reprint, 2007 |
| 6                      | G.B. Thomas and R.L. Finney, Calculus, 9 <sup>th</sup> Ed. Pearson Education, Delhi, 2005.             |

### Course Outcomes

| <b>CO No.</b> | <b>On Completion of the course, students will be able to</b>                            |
|---------------|---|
| <b>CO1</b>    | Classify And Solve Reciprocal equations.  |
| <b>CO2</b>    | Find the sum of powers of the roots of an equation.                                     |
| <b>CO3</b>    | Find the sum of Binomial, exponential and logarithmic series.                           |
| <b>CO4</b>    | Expand the powers and multiples of trigonometric functions in terms of sine and cosine. |
| <b>CO5</b>    | Determine relationship between circular and hyperbolic functions.                       |

## Mapping With Programme Outcomes and Programme Specific Outcomes

| CO / PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 |
|---------|------|------|------|------|------|------|------|------|
| C01     | 3    | 3    | 2    | 3    | 3    | 2    | 3    | 3    |
| C02     | 2    | 3    | 3    | 3    | 2    | 3    | 3    | 2    |
| C03     | 3    | 3    | 3    | 2    | 3    | 3    | 3    | 2    |
| C04     | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |
| C05     | 3    | 2    | 3    | 3    | 2    | 3    | 3    | 2    |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO / PSO | PS01 | PS02 | PS03 | PS04 | PS05 |
|----------|------|------|------|------|------|
| C01      | 3    | 3    | 3    | 3    | 3    |
| C02      | 3    | 3    | 3    | 3    | 3    |
| C03      | 3    | 3    | 3    | 3    | 3    |
| C04      | 3    | 3    | 3    | 3    | 3    |
| C05      | 3    | 3    | 3    | 3    | 3    |

## Differential Calculus

|                                     |                              |                 |                 |                      |              |
|-------------------------------------|------------------------------|-----------------|-----------------|----------------------|--------------|
| <b>Title Of The Course</b>          | <b>Differential Calculus</b> |                 |                 |                      |              |
| <b>Course Type</b>                  | <b>Core - II</b>             |                 |                 |                      |              |
| <b>Course Code</b>                  | <b>25UMMA12</b>              |                 |                 |                      |              |
| <b>Year</b>                         | <b>I</b>                     | <b>Semester</b> | <b>I</b>        | <b>Credits</b>       | <b>4</b>     |
| <b>Instructional Hours Per week</b> |                              | <b>Lecture</b>  | <b>Tutorial</b> | <b>Lab Practices</b> | <b>Total</b> |
|                                     |                              | <b>3</b>        | <b>1</b>        | <b>--</b>            | <b>4</b>     |

|  |   |
|--|---|
| <b>Learning Objectives</b>                     |   |
| Basic ideas on the theory of equation sand to, |   |
| <b>L01</b>                                     | The basic skills of differentiation, successive differentiation.    |
| <b>L02</b>                                     | Basic Skills of Partial differential equations.                     |
| <b>L03</b>                                     | Basic knowledge on the notions of curvature, evaluates, involutes.  |
| <b>L04</b>                                     | Basic knowledge on polarco-ordinate sand insolving related problems |
| <b>L05</b>                                     | Improving knowledge on applications of differentiation.             |

| <b>Unit</b> | <b>Contents</b>   |
|-------------|---|
| <b>I</b>    | <b>Successive Differentiation:</b> Introduction (Review of basic concepts)<br>– The $n^{th}$ derivative – Standard results – Trigonometrically transformation – Formation of equations involving derivatives<br>Leibnitz formula for the $n^{th}$ derivative of a product.<br>(Chapter 3: Sections - 1.1 to 1.6, 2.1) |
| <b>II</b>   | <b>Partial Differentiation:</b> Partial derivatives – Successive partial derivatives – Function of a function rule – Total differential coefficient<br>– A special case – Implicit functions.<br>(Chapter 8: Sections - 1.1 to 1.5)   |

|            |  |
|------------|--|
| <b>III</b> | <b>Partial Differentiation (Continued):</b> Homogeneous functions – Partial derivatives of a function of two variables – Maxima and Minima of two variables.<br>(Chapter 8: Sections -1.6, 1.7, 4 and 5) |
| <b>IV</b>  | <b>Envelope:</b> Method of finding the envelope–Another definition of envelope – Envelope of family of curves which are quadratic in the parameter.<br>(Chapter 10: Sections - 1.1 to 1.4)               |
| <b>V</b>   | <b>Curvature:</b> Definition of Curvature – Circle, Radius and Centre of Curvature – Evaluates and Involutives – Radius of Curvature in Polar co-ordinates.<br>(Chapter 10: Sections - 2.1 to 2.6)       |

|   |   |
|---|---|
| Extended Professional Component<br>(is a part of intimal Component only not to be include in the External Examination question paper) | Questions related to the above topics from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour) |
| Skills acquired from this Course  | Knowledge, Problem Solving, Analytical ability, Professional Competency, professional communication and transfer able skill.                              |
| <b>Recommended Texts</b>  |   |
| <b>1</b>  | S.Narayanan and TK. Manicavachagom Pillay, Calculus, Vol1, S.Viswanathan (Printers &Publication) PVT. LID.2015.   |

**Web Resources** <https://nptel.ac.in>

| <b>Reference Books</b> |  |
|------------------------|--|
| <b>1</b>               | R. Courant and F. John, Introduction to Calculus and Analysis (Volumes I & II), Springer- Verlag, New York, Inc., 1989.                      |
| <b>2</b>               | T. Apostol, Calculus, Volumes I and II...  |
| <b>3</b>               | S. Goldberg, Calculus and mathematical analysis  |
| <b>4</b>               | H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002.   |
| <b>5</b>               | G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2010.  |
| <b>6</b>               | M.J. Strauss, G.L. Bradley and K.J. Smith, Calculus, 3 <sup>rd</sup> Ed., Dorling Kindersley (India)P. Ltd. (Pearson Education), Delhi, 2007 |

### Course Outcomes

| <b>CO No.</b> | <b>On Completion of the course, students will be able to</b>                                    |
|---------------|---|
| <b>CO1</b>    | Find the $n^{th}$ derivative, form equations involving derivatives and apply Leibnitz formula   |
| <b>CO2</b>    | Find the partial derivative and total derivative coefficient                                    |
| <b>CO3</b>    | Determine the maxima and minima of functions of two variables                                   |
| <b>CO4</b>    | Find the envelope of a given family of curves   |
| <b>CO5</b>    | Find the evaluate sand in volutes and to find the radius of curvature using polar co-ordinates. |

### Mapping With Programme Outcomes and Programme Specific Outcomes

| CO / PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 |
|---------|------|------|------|------|------|------|------|------|
| C01     | 3    | 3    | 2    | 3    | 3    | 2    | 3    | 3    |
| C02     | 2    | 3    | 3    | 3    | 2    | 3    | 3    | 3    |
| C03     | 3    | 3    | 3    | 2    | 3    | 3    | 3    | 2    |
| C04     | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |
| C05     | 3    | 2    | 3    | 3    | 2    | 3    | 3    | 2    |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO / PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|----------|------|------|------|------|------|
| C01      | 3    | 3    | 3    | 3    | 3    |
| C02      | 3    | 3    | 3    | 3    | 3    |
| C03      | 3    | 3    | 3    | 3    | 3    |
| C04      | 3    | 3    | 3    | 3    | 3    |
| C05      | 3    | 3    | 3    | 3    | 3    |

## Programming Language C

|                                     |                               |                 |                 |                      |              |
|-------------------------------------|-------------------------------|-----------------|-----------------|----------------------|--------------|
| <b>Title Of The Course</b>          | <b>Programming Language C</b> |                 |                 |                      |              |
| <b>Course Type</b>                  | <b>Elective - I</b>           |                 |                 |                      |              |
| <b>Course Code</b>                  | <b>25UECS11</b>               |                 |                 |                      |              |
| <b>Year</b>                         | <b>I</b>                      | <b>Semester</b> | <b>I</b>        | <b>Credits</b>       | <b>3</b>     |
| <b>Instructional Hours Per week</b> |                               | <b>Lecture</b>  | <b>Tutorial</b> | <b>Lab Practices</b> | <b>Total</b> |
|                                     |                               | <b>3</b>        | <b>-</b>        | <b>2</b>             | <b>5</b>     |

|  |   |
|--|---|
| <b>Learning Objectives</b>                     |   |
| Basic ideas on the theory of equations and to, |   |
| <b>L01</b>                                     | Study of constants and variables  |
| <b>L02</b>                                     | Know about operators and their uses   |
| <b>L03</b>                                     | Know about statements and looping   |
| <b>L04</b>                                     | Know about one, two and multi-dimensional arrays                              |
| <b>L05</b>                                     | Getting knowledge of functions and how to apply these functions in programme. |

| <b>Unit</b> | <b>Contents</b>  |
|-------------|--|
| <b>I</b>    | Introduction–Character set–C Tokens–Keywords and Identifiers – Constants – Variables – Data types.<br>(Chapter 2: Sections - 2.1 to 2.7)   |
| <b>II</b>   | Operators: Arithmetic – Relational –Logical – Assignment– Increment and Decrement – Conditional – Bitwise – Special – Precedence of Arithmetic operators – Managing input and output operation: Reading and writing a character – Formatted input and output.<br>(Chapters 3 and 4 : Sections - 3.1 to 3, 9, 3.12, 4.2 to 4.5) |
| <b>III</b>  | Decision making and branching: Statements: IF, IF ...ELSE, Nesting of IF ... ELSE, ELSE IF Ladder and Switch statements –The (conditional Operator) - The GO TO statement– Decision making and looping: The WHILE, DO and FOR statements –Jumps in loops.<br>(Chapters 5 & 6: Sections - 5.3 to 5.9, 6.2 to 6.5)               |

|           |  |
|-----------|--|
| <b>IV</b> | Array: One dimensional and two dimensional arrays- Declaration, Initialization of arrays – Multi dimensional arrays- Character arrays and strings: Declaring and initializing string variables – Reading and writing of strings – String and ling functions.<br>(Chapters 7 & 8: Sections 7.1to 7.7, 8.1 to 8.8) |
| <b>V</b>  | User defined functions: Definition of function –Return values and their types- Function calls-Function declaration-Category of functions – Nesting of functions – Recursion.<br>(Chapter 9: Sections 9.5 to 9. 9, 9.15, 9.16)  |

|  |   |
|--|---|
| Extended Professional Component (is a part of intimal Component only not to be include in the External Examination question paper) | Questions related to the above topics from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour) |
| Skills acquired from this Course   | Knowledge, Problem Solving, Analytical ability, Professional Competency, professional communication and transferable skill.                               |

| <b>Recommended Texts</b> |   |
|--------------------------|---|
| 1                        | E. Balaguruswamy – Programming in ANSIC – Tata McGraw Hill Publishing company limited – III Edition, 2017 |

| <b>Reference Books</b> |   |
|------------------------|---|
| 1                      | C.Reema Thareja, Programming in C-Oxford University Press, 2018                                     |
| 2                      | Ramasamyet.al.-Programming in C-Sec tech Publication (INDIA) Pvt. Ltd. II Edition, 2015.            |
| 3                      | Ashok N.Kamathane - Programming with Anise and Turbo C- Dorling Kindersley (India) Pvt. Ltd., 2009. |

## Web Resources

- <https://nptel.ac.in>

## Course Outcomes

| CO No. | On Completion of the course, students will be able to                        |
|--------|--|
| C01    | Identify the keywords, constants and variables                               |
| C02    | Classify different operators and their uses                                  |
| C03    | Apply suitable statements and looping  |
| C04    | Define one, two and multidimensional arrays and the use of string variables  |
| C05    | Define user defined functions and how to apply these functions in programme. |

## Mapping With Programme Outcomes and Programme Specific Outcomes

| CO / PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 |
|---------|------|------|------|------|------|------|------|------|
| C01     | 3    | 3    | 2    | 3    | 3    | 2    | 3    | 2    |
| C02     | 2    | 3    | 3    | 3    | 2    | 3    | 3    | 2    |
| C03     | 3    | 3    | 3    | 2    | 3    | 3    | 3    | 3    |
| C04     | 3    | 3    | 3    | 3    | 3    | 1    | 3    | 3    |
| C05     | 3    | 2    | 3    | 3    | 2    | 3    | 3    | 3    |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO / PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|----------|------|------|------|------|------|
| C01      | 3    | 3    | 3    | 3    | 3    |
| C02      | 3    | 3    | 3    | 3    | 3    |
| C03      | 3    | 3    | 3    | 3    | 3    |
| C04      | 3    | 3    | 3    | 3    | 3    |
| C05      | 3    | 3    | 3    | 3    | 3    |

## Programming Language C - Practicals

|                            |          |                                       |          |                |          |                    |                 |
|----------------------------|----------|---------------------------------------|----------|----------------|----------|--------------------|-----------------|
| <b>Title of the Course</b> |          | <b>Programming in C - Practicals</b>  |          |                |          |                    |                 |
| <b>Course Type</b>         |          | <b>Skill Enhancement Course - III</b> |          |                |          |                    |                 |
| <b>Year</b>                | <b>I</b> | <b>Semester</b>                       | <b>I</b> | <b>Credits</b> | <b>2</b> | <b>Course Code</b> | <b>25PSMAL1</b> |

### List of Practicals

1. Program to print the even numbers from 1 to 100.
2. Program to read three values using scan statement and print the following results:
  - a) Sum of the values
  - b) Average of the three values
  - c) Largest of the three
3. Program to read and display the following table of data: .

| Name  | Code  | Price   |
|-------|-------|---------|
| Fan   | 67831 | 1234.50 |
| Motor | 450   | 5786.70 |

The name and code must be left justified and price must be right justified.

4. Program to compute the real roots of a quadratic equation.
5. Program to evaluate the investment equation  $V = (1+r)^n$  and print the tables which would give the value of  $V$  for various combination of the following values of  $P, r$  and  $n$ .
 

P: 1000, 2000, ..., 10000

r: 0.10, 0.11, ..., 0.20

n: 1, 2, ..., 10
6. Program to print all integers that are not divisible by either 2 or 3 and lie between 1 and 100 and also should account the number of integers and print the result.
7. Program to merge two given one dimensional arrays A and B (which are sorted in ascending order) into a single sorted array C which is in ascending order.
8. Program to read a string from the keyboard and determine whether the string is a palindrome or not.

## Mathematics for Competitive Examination - I

|                                     |  |                 |                 |                      |              |
|-------------------------------------|--|-----------------|-----------------|----------------------|--------------|
| <b>Title of The Course</b>          | <b>Mathematics for Competitive Examination - I</b> |                 |                 |                      |              |
| <b>Course Type</b>                  | <b>Skill Enhancement Course - I</b>                |                 |                 |                      |              |
| <b>Course Code</b>                  | <b>25USMA11</b>                                    |                 |                 |                      |              |
| <b>Year</b>                         | <b>I</b>   | <b>Semester</b> | <b>I</b>        | <b>Credits</b>       | <b>2</b>     |
| <b>Instructional Hours Per week</b> |  | <b>Lecture</b>  | <b>Tutorial</b> | <b>Lab Practices</b> | <b>Total</b> |
|                                     |  | <b>2</b>        | <b>--</b>       | <b>--</b>            | <b>2</b>     |

|  |   |
|--|---|
| <b>Learning Objectives</b>                 |   |
| Basic ideas on the theory of equations and |   |
| <b>L01</b>                                 | To Simplify an expression and to find average for given data. |
| <b>L02</b>                                 | To find solution of problems on numbers.                      |
| <b>L03</b>                                 | To find Profit and Loss.                                      |
| <b>L04</b>                                 | To find Ratio and Proportion.                                 |
| <b>L05</b>                                 | To find Percentages.  |

| <b>Unit</b> | <b>Contents</b>          |
|-------------|--------------------------|
| <b>I</b>    | Simplification–Averages. |
| <b>II</b>   | Problems on Numbers.     |
| <b>III</b>  | Profit and Loss.         |
| <b>IV</b>   | Ratio and Proportion.    |
| <b>V</b>    | Partnership–Percentages. |

|  |   |
|--|---|
| Extended Professional Component (is a part of intimal Component only not to be include in the External Examination question paper) | Questions related to the above topics from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour) |
| Skills acquired from this Course   | Knowledge, Problem Solving, Analytical ability, Professional Competency, professional communication and transferable skill.                               |

| <b>Recommended Texts</b> |   |
|--------------------------|---|
| 1                        | R.S. Agarwal –Objective arithmetic, Published by S. Chand &Colt., 2018. |

| <b>Reference Books</b> |  |
|------------------------|--|
| 1                      | R. S. Agarwal – Arithmetic subjective and Objective, Published by S. Chand & Co Ltd., Revised Edition, 2017. |
| 2                      | Rajesh Verma, Fast track Objective arithmetic, Arihant Publications India Limited Fourth Edition, 2018.      |

### Web Resources

- <https://nptel.ac.in>

### Course Outcomes

| <b>CO No.</b> | <b>On Completion of the course, students will be able to</b> |
|---------------|--|
| <b>CO1</b>    | Simplify an expression and to find average for given data.   |
| <b>CO2</b>    | Illustrate the solution of problems on numbers.              |
| <b>CO3</b>    | Solve and find Profit and Loss.                              |
| <b>CO4</b>    | Compare Ratio and Proportion.                                |
| <b>CO5</b>    | To explain Percentages.                                      |

## Mapping With Programme Outcomes and Programme Specific Outcomes

| CO / PO    | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 |
|------------|------|------|------|------|------|------|------|------|
| <b>C01</b> | 3    | 3    | 2    | 3    | 3    | 2    | 3    | 3    |
| <b>C02</b> | 2    | 3    | 3    | 3    | 2    | 3    | 3    | 2    |
| <b>C03</b> | 3    | 3    | 3    | 2    | 3    | 3    | 3    | 2    |
| <b>C04</b> | 3    | 3    | 3    | 3    | 3    | 2    | 3    | 3    |
| <b>C05</b> | 3    | 2    | 3    | 3    | 2    | 3    | 3    | 3    |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO / PSO   | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------|------|------|------|------|------|
| <b>C01</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C02</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C03</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C04</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C05</b> | 3    | 3    | 3    | 3    | 3    |

## Bridge Mathematics

|                                     |                           |                 |                 |                      |              |
|-------------------------------------|---------------------------|-----------------|-----------------|----------------------|--------------|
| <b>Title of the Course</b>          | <b>Bridge Mathematics</b> |                 |                 |                      |              |
| <b>Course Type</b>                  | <b>Foundation Course</b>  |                 |                 |                      |              |
| <b>Course Code</b>                  | <b>25UFMA11</b>           |                 |                 |                      |              |
| <b>Year</b>                         | <b>I</b>                  | <b>Semester</b> | <b>I</b>        | <b>Credits</b>       | <b>2</b>     |
| <b>Instructional Hours Per week</b> |                           | <b>Lecture</b>  | <b>Tutorial</b> | <b>Lab Practices</b> | <b>Total</b> |
|                                     |                           | <b>2</b>        | <b>--</b>       | <b>--</b>            | <b>2</b>     |

|  |   |
|--|---|
| <b>Learning Objectives</b>                 |   |
| Basic ideas on the theory of equations and |   |
| <b>L01</b>                                 | To prove the binomial theorem and solve the related problems.   |
| <b>L02</b>                                 | To find the various sequences and explain the principle of counting.                                    |
| <b>L03</b>                                 | To find the number of permutations and combinations in different cases.                                 |
| <b>L04</b>                                 | To explain various trigonometric ratios and solve the problems using the transformations.               |
| <b>L05</b>                                 | To find the limit and derivative of a function at a point and find the points of min/max of a function. |

| <b>Unit</b> | <b>Contents</b>  |
|-------------|--|
| <b>I</b>    | Algebra: Binomial theorem, General term, middle term, problems based on these concepts   |
| <b>II</b>   | Sequences and series (Progressions). Fundamental principle of counting. Factorial $n$ .  |
| <b>III</b>  | Permutations and combinations, Derivation of formulae and their connections, simple applications, combinations with repetitions, arrangements with in groups, formation of groups.                                   |
| <b>IV</b>   | Sets – Union, intersection, difference and symmetric difference.<br>Functions – Type of functions, bijective function and inverse of a function. Relation – Reflexive, Symmetric, Transitive Equivalence.            |
| <b>V</b>    | Calculus: Limits, standard formulae and problems, differentiation, first principle, $uv$ rule, $u/v$ rule, methods of differentiation, application of derivatives, integration-product Rule and substitution method. |

|  |   |
|--|---|
| Extended Professional Component (is a part of intimal Component only not to be include in the External Examination question paper) | Questions related to the above topics from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour) |
| Skills acquired from this Course   | Knowledge, Problem Solving, Analytical ability, Professional Competency, professional communication and transfer able skill.                              |

| Recommended Texts |   |
|-------------------|---|
| 1                 | NCERT class XI and XII text books.                                  |
| 2                 | Any State Board Mathematics text books of class XI and XII          |
| 3                 | S. Arumugam and A. Thangapandi Issac, Modern Algebra, Scitech 2014. |

### Web Resources

- <https://nptel.ac.in>

### Course Outcomes

| CO No.     | On Completion of the course, students will be able to   |
|------------|---|
| <b>CO1</b> | Prove the binomial theorem and apply it to find the expansions of any $(x+ y)$ also, solve the related problems.  |
| <b>CO2</b> | Find the various sequences and series and solve the problems related to them. Explain the principle of counting.  |
| <b>CO3</b> | Find the number of permutations and combinations in different cases. Apply the principle of counting to solve the problems on permutations and combinations         |
| <b>CO4</b> | Understand the basic concepts of sets, various operations on sets and relations and types of relations. Also, they can solve the problems using sets and relations. |
| <b>CO5</b> | Find the limit and derivative of a function at a point, the definite and in definite integral of a function. Find the points of min/max of a function.              |

## Mapping With Programme Outcomes and Programme Specific Outcomes

| CO / PO    | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 |
|------------|------|------|------|------|------|------|------|------|
| <b>C01</b> | 3    | 3    | 2    | 3    | 3    | 2    | 3    | 3    |
| <b>C02</b> | 2    | 3    | 3    | 3    | 2    | 3    | 3    | 2    |
| <b>C03</b> | 3    | 3    | 3    | 2    | 3    | 3    | 3    | 3    |
| <b>C04</b> | 3    | 3    | 2    | 3    | 3    | 2    | 3    | 2    |
| <b>C05</b> | 3    | 2    | 3    | 3    | 2    | 3    | 3    | 3    |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO / PSO   | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------|------|------|------|------|------|
| <b>C01</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C02</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C03</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C04</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C05</b> | 3    | 3    | 3    | 3    | 3    |

**Allied Mathematics**  
**Algebra and Differential Equations**  
**(For B.Sc., Physics & Chemistry)**

|                                     |   |                 |                 |                      |              |
|-------------------------------------|---|-----------------|-----------------|----------------------|--------------|
| <b>Title of the Course</b>          | <b>Algebra and Differential Equations</b> |                 |                 |                      |              |
| <b>Course Type</b>                  | <b>Elective - I</b>                       |                 |                 |                      |              |
| <b>Course Code</b>                  | <b>25UEMA11</b>                           |                 |                 |                      |              |
| <b>Year</b>                         | <b>I</b>                                  | <b>Semester</b> | <b>I</b>        | <b>Credits</b>       | <b>5</b>     |
| <b>Instructional Hours Per week</b> |   | <b>Lecture</b>  | <b>Tutorial</b> | <b>Lab Practices</b> | <b>Total</b> |
|                                     |   | <b>6</b>        | <b>--</b>       | <b>--</b>            | <b>6</b>     |

|  |  |
|--|--|
| <b>Learning Objectives</b>                 |  |
| Basic ideas on the theory of equations and |  |
| <b>L01</b>                                 | Formation of equation, relation between the roots and coefficients and solving reciprocal equations.           |
| <b>L02</b>                                 | Approximate the roots of the equation through Horner's method.   |
| <b>L03</b>                                 | Find eigen values and eigen vectors for given square matrix and find inverse by using Cayley-Hamilton theorem. |
| <b>L04</b>                                 | Solving differential equations and partial differential equations.   |
| <b>L05</b>                                 | Knowing Laplace transformation and inverse Laplace transformation for a given function.                        |

| <b>Unit</b> | <b>Contents</b>   |
|-------------|---|
| <b>I</b>    | Theory of Equations - Formation of equations –Relation between roots and coefficients – Reciprocal equations.   |
| <b>II</b>   | Transformation of equations – Approximate solutions to Equations – Newton’s method and Horner’s method.   |
| <b>III</b>  | Matrices – Characteristics equations of a matrix – Eigen values and Eigen vectors – Cayley Hamilton theorem and simple problem.   |
| <b>IV</b>   | Differential equation of first order but of higher degree – Equations solvable for p, x, y, - Partial differential equations – formations – solutions – standard form $Pp + Qq = R$ . |
| <b>V</b>    | Laplace transformation – Inverse Laplace transform.   |

|  |   |
|--|---|
| Extended Professional Component (is a part of intimal Component only not to be include in the External Examination question paper) | Questions related to the above topics from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour) |
| Skills acquired from this Course   | Knowledge, Problem Solving, Analytical ability, Professional Competency, professional communication and transfer able skill.                              |
| <b>Recommended Texts</b>   |   |
| Dr.S.Arumuganm and A. Thangapandi Isaac – Allied Mathematics Paper I, New Gamma Publishing House, 2012.                            |   |

| <b>Reference Books</b> |   |
|------------------------|---|
| 1                      | I.S.Narayanan and T.K.Manikavachagom Pillay – Differential Equation and its applications, S.Viswanathan Printers PVT.LTD, 2006. |
| 2                      | T.Veerarajan – Algebra and Trigonometry – Yes Dee Publishing PVT.LTD, 2009  |

**Web Resources**     <https://nptel.ac.in>

### Course Outcomes

| <b>CO No.</b> | <b>On Completion of the course, students will be able to</b>  |
|---------------|---|
| <b>CO1</b>    | Form the equation, relation between the roots and classify and solve reciprocal equations.                          |
| <b>CO2</b>    | Find approximate solution to equation by Horner's method Find approximate solution to equations by Horner's method. |
| <b>CO3</b>    | Find eigen values and eigen vectors for given square matrix and find inverse by using Cayley – Hamilton theorem.    |
| <b>CO4</b>    | Find solution of differential equations and partial differential equations.   |
| <b>CO5</b>    | Find Laplace transformation and inverse Laplace transformation for a given function.                                |

## Mapping with Programme Outcomes and Programme Specific Outcomes

| CO / PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 |
|---------|------|------|------|------|------|------|------|------|
| C01     | 3    | 3    | 2    | 3    | 3    | 3    | 3    | 3    |
| C02     | 2    | 3    | 3    | 3    | 2    | 3    | 3    | 3    |
| C03     | 3    | 3    | 3    | 2    | 3    | 2    | 3    | 2    |
| C04     | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |
| C05     | 3    | 2    | 3    | 3    | 2    | 3    | 3    | 2    |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO / PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|----------|------|------|------|------|------|
| C01      | 3    | 3    | 3    | 3    | 3    |
| C02      | 3    | 3    | 3    | 3    | 3    |
| C03      | 3    | 3    | 3    | 3    | 3    |
| C04      | 3    | 3    | 3    | 3    | 3    |
| C05      | 3    | 3    | 3    | 3    | 3    |

## Semester - II

### Analytical Geometry (2 & 3 Dimensions)

|                                     |   |   |                 |                     |          |                    |                 |
|-------------------------------------|---|---|-----------------|---------------------|----------|--------------------|-----------------|
| <b>Title of the Course</b>          |   | <b>Analytical Geometry (2 &amp; 3 Dimensions)</b> |                 |                     |          |                    |                 |
| <b>Course Type</b>                  |   | <b>Core - III</b>                                 |                 |                     |          |                    |                 |
| <b>Year</b>                         | <b>I</b>  | <b>Semester</b>                                   | <b>II</b>       | <b>Credits</b>      | <b>4</b> | <b>Course Code</b> | <b>25UMMA21</b> |
| <b>Instructional Hours per week</b> |   | <b>Lecture</b>                                    | <b>Tutorial</b> | <b>Lab Practice</b> |          | <b>Total</b>       |                 |
|                                     |   | <b>4</b>  | <b>--</b>       | <b>--</b>           |          | <b>4</b>           |                 |
| <b>Learning Objectives</b>          |   |   |                 |                     |          |                    |                 |
| <b>L01</b>                          | Necessary skills to analyze characteristics of two- and three-dimensional geometric shapes  |   |                 |                     |          |                    |                 |
| <b>L02</b>                          | Develop the skills to analyze properties of two- and three-dimensional geometric shapes   |   |                 |                     |          |                    |                 |
| <b>L03</b>                          | To present mathematical arguments about geometric relationships   |   |                 |                     |          |                    |                 |
| <b>L04</b>                          | Basic knowledge on straight lines, planes and spheres.  |   |                 |                     |          |                    |                 |
| <b>L05</b>                          | To solve real world problems on geometry and its applications.  |   |                 |                     |          |                    |                 |
| <b>Unit</b>                         | <b>Contents</b>   |   |                 |                     |          |                    |                 |
| <b>I</b>                            | Pole, Polar- conjugate points and conjugate lines – diameters – conjugate diameters of an ellipse – Semi diameters – Conjugate diameters of hyperbola – Related problems only.<br>(Chapters: 9 and 10)                                  |   |                 |                     |          |                    |                 |
| <b>II</b>                           | Polar coordinates: General polar equation of straight line – Polar equation of a circle given a diameter, Equation of a straight line, circle, conic–Equation of chord, tangent, normal.<br>(Chapter 9: Sections - 1 to 3, 5 to 10, 12) |   |                 |                     |          |                    |                 |
| <b>III</b>                          | System of Planes – Length of the perpendicular–Orthogonal projection.<br>(Chapter 2: Sections - 1 to 11)  |   |                 |                     |          |                    |                 |
| <b>IV</b>                           | Representation of line– Angle between a line and a plane – coplanar lines– Shortest distance between two skew lines– Length of the perpendicular.<br>(Chapter 3: Sections - 1 to 8)   |   |                 |                     |          |                    |                 |
| <b>V</b>                            | Equation of a sphere- General equation – Section of a sphere by a plane<br>Equation of the circle –Tangent plane –Angle of intersection of two spheres –Condition for the orthogonality.<br>(Chapter 4: Sections - 1 to 8)              |   |                 |                     |          |                    |                 |

|   |   |
|---|---|
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved<br>(To be discussed during the Tutorial hour) |
| Skills acquired from this Course  | Knowledge, Problem Solving, Analytical ability, Professional Competency, professional communication and transferable skill.                                   |
| <b>Recommended Texts:</b>   |   |
| <b>1</b>  | P. R. Vittal and V. Malini, Analytical Geometry & Trigonometry, Margam Publications, 2018.  |
| <b>2</b>  | T.K. Manicavachagom Pillay and T. Natarajan, Analytical Geometry (Part I - Two dimensions), S.Viswanathan Printers and Publishers Pvt. Ltd., 2012.            |
| <b>3</b>  | T.K. Manicavachagom Pillay and T. Natarajan, Analytical Geometry (Part II - Three dimensions), S.Viswanathan (Printers and Publishers) Pvt. Ltd., 2012.       |
| <b>Reference Books:</b>   |   |
| <b>1</b>  | S.L.Loney, Co-ordinate Geometry.  |
| <b>2</b>  | T. Robert J. T. Bell, Co-ordinate Geometry of Three Dimensions.   |
| <b>3</b>  | William F. Osgood and William C. Graustein, Plane and Solid Analytic Geometry, Macmillan Company, New York, 2016.   |
| <b>4</b>  | Calculus and Analytical Geometry, G.B.Thomas and R.L.Finny, Pearson Publication, 9 <sup>th</sup> Edition, 2010  |
| <b>5</b>  | Robert C.Yates, Analytic Geometry with Calculus, Prentice Hall, Inc., New York, 1961.   |
| <b>6</b>  | Earl W. Swokowski and Jeffery A. Cole, Algebra and Trigonometry with Analytic Geometry, Twelfth Edition, Brooks/Cole, CEng age Learning, CA, USA, 2010        |
| <b>7</b>  | William H. McCrea, Analytical Geometry of Three Dimensions, Dover Publications, Inc., New York, 2006.   |
| <b>8</b>  | John F.Randolph, Calculus and Analytic Geometry, Wadsworth Publishing Company, CA, USA, 1969.   |
| <b>9</b>  | Ralph Palmer Agnew, Analytic Geometry and Calculus with Vectors, McGraw-Hill Book Company, Inc. New York, 1962.   |

|                       |   |
|-----------------------|---|
| <b>Web Resources:</b> |   |
| <b>1</b>              | <a href="https://nptel.ac.in">https://nptel.ac.in</a> |

| <b>Course outcomes</b> | <b>On completion of this course, students will be able to:</b>   |
|------------------------|--|
| <b>C01</b>             | To define the concepts of pole, types of diameters, the equation of chord, tangent and normal, the length of the perpendicular, the angle between a line and a plane, coplanar lines, shortest distance between two skew lines.  |
| <b>C02</b>             | To classify the types of diameters and find the regulation of a straight line, circle and conic, the equation of the chord, tangent and normal, the angle between a line and a plane formula for shortest distance between two skew lines find the equation of a sphere & the condition for orthogonal of two spheres. |
| <b>C03</b>             | To identify the various types of diameters, the types of curves like straight line, circle, and conic, to construct the orthogonal projection, to verify the given lines are coplanar or not, to find the angle of intersection of two spheres. Construct the condition for the orthogonality.                         |
| <b>C04</b>             | To analyze the conjugate diameters of hyperbola the equation of straight line, circle and conic, to the shortest distance between two skew lines, check the orthogonal condition of two spheres.   |
| <b>C05</b>             | To compare the various diameters of hyperbola and ellipse determine the polar apply of a straight line, circle and conic, to explain the system of places, to explain coplanar lines and shortest distance between two skew lines.   |

### Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|
| <b>C01</b> | 3   | 3   | 2   | 3   | 3   | 3   | 3   | 3   |
| <b>C02</b> | 2   | 3   | 3   | 3   | 2   | 3   | 3   | 3   |
| <b>C03</b> | 3   | 3   | 3   | 2   | 3   | 3   | 3   | 2   |
| <b>C04</b> | 3   | 3   | 3   | 3   | 3   | 2   | 3   | 3   |
| <b>C05</b> | 3   | 2   | 3   | 3   | 2   | 3   | 3   | 3   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/ PSO    | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------|------|------|------|------|------|
| <b>C01</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C02</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C03</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C04</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C05</b> | 3    | 3    | 3    | 3    | 3    |

## Integral Calculus

|                                     |          |  |                 |                |                     |                    |                 |
|-------------------------------------|----------|--|-----------------|----------------|---------------------|--------------------|-----------------|
| <b>Title of the Course</b>          |          | <b>Integral Calculus</b>                                   |                 |                |                     |                    |                 |
| <b>Course Type</b>                  |          | <b>Core - IV</b>   |                 |                |                     |                    |                 |
| <b>Year</b>                         | <b>I</b> | <b>Semester</b>  | <b>II</b>       | <b>Credits</b> | <b>4</b>            | <b>Course Code</b> | <b>25UMMA22</b> |
| <b>Instructional Hours per week</b> |          | <b>Lecture</b>   | <b>Tutorial</b> |                | <b>Lab Practice</b> |                    | <b>Total</b>    |
|                                     |          | <b>4</b>   | <b>--</b>       |                | <b>--</b>           |                    | <b>4</b>        |
| <b>Learning Objectives</b>          |          |  |                 |                |                     |                    |                 |
| <b>L01</b>                          |          | Knowledge on integration and its geometrical applications. |                 |                |                     |                    |                 |
| <b>L02</b>                          |          | Skill on double, triple integrals and improper integrals.  |                 |                |                     |                    |                 |
| <b>L03</b>                          |          | Knowledge about Beta and Gamma functions.                  |                 |                |                     |                    |                 |
| <b>L04</b>                          |          | Applications of Beta and Gamma functions.                  |                 |                |                     |                    |                 |
| <b>L05</b>                          |          | Skills to Determine Fourier series expansions              |                 |                |                     |                    |                 |

|                        |  |
|------------------------|--|
| <b>Course outcomes</b> | <b>On completion of this course, students will be able to:</b>   |
| <b>C01</b>             | Know the integrals of algebraic, trigonometric and logarithmic functions and to find the reduction formulae. |
| <b>C02</b>             | Evaluate double and triple integrals and problems using change of order of integration.                      |
| <b>C03</b>             | Solve multiple integrals and to find the areas of curved surfaces and volumes of solids of revolution.       |
| <b>C04</b>             | Explain beta and gamma functions and to use them in solving problems of integration.                         |
| <b>C05</b>             | Explain Geometric applications of integral calculus.   |

| <b>Unit</b> | <b>Contents</b>  |
|-------------|--|
| <b>I</b>    | Reduction formulae – Types, integration of product of powers of algebraic and trigonometric functions, integration of product of powers of algebraic and logarithmic functions–Bernoulli’s formula. (Chapter 1: Sections -13.1 to 13.9, 14 , 15.1) |
| <b>II</b>   | Geometrical Applications of Integral calculus: Area – Volume – Length of a curve – Area of surface of revolution. (Chapter 2: Sections -1.1 to 1.4, 3, 4 and 5)  |
| <b>III</b>  | Multiple Integrals–Definition of double integrals– Evaluation of double integrals – Double integrals in polar coordinates – Change of order of integration. (Chapter 5: Sections - 1, 2.1, 2.2, 3.1, 3.2)  |
| <b>IV</b>   | Triple integrals –Applications of multiple integrals – Areas of curved surfaces–Change of variables– Jacobian. (Chapter 5: Sections - 4, 5.1 to 5.4 ; Chapter 6: Sections – 1 and 2)   |
| <b>V</b>    | Beta and Gamma functions – infinite integral –Definitions– Recurrence formula of Gamma functions – Properties of Beta and Gamma functions- Relation between Beta and Gamma functions - Applications. (Chapter 7: Sections - 2.1 to 2.3 and 3 to 6) |

|  |   |
|--|---|
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper). | Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour). |
| Skills acquired from this Course   | Knowledge, Problem Solving, Analytical ability, Professional Competency, professional communication and transferable skill.                                 |
| <b>Recommended Texts:</b>  |   |
| <b>1</b>   | S.Narayanan and T.K.Manicavachagom Pillay, Calculus Vol II, S.Viswanathan (Printers and Publishers) Pvt. Ltd., 2012.  |

| <b>Reference Books:</b> |  |
|-------------------------|--|
| <b>1</b>                | H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002.   |
| <b>2</b>                | G.B.Thomas and R.L. Finney, Calculus, Pearson Education, 2007.   |
| <b>3</b>                | D. Chatterjee, Integral Calculus and Differential Equations, Tata-McGraw Hill Publishing Company Ltd.  |
| <b>4</b>                | P. Dyke, An Introduction to Laplace Transforms and Fourier Series, Springer Undergraduate Mathematics Series, 2 <sup>nd</sup> Edition, 2001. |
| <b>Web Resources:</b>   |  |
| <b>1</b>                | <a href="https://nptel.ac.in">https://nptel.ac.in</a>  |

### Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|
| <b>C01</b> | 3   | 3   | 2   | 3   | 3   | 2   | 3   | 2   |
| <b>C02</b> | 2   | 3   | 3   | 3   | 2   | 3   | 3   | 3   |
| <b>C03</b> | 3   | 3   | 3   | 2   | 3   | 3   | 3   | 3   |
| <b>C04</b> | 3   | 3   | 3   | 3   | 3   | 1   | 3   | 2   |
| <b>C05</b> | 3   | 2   | 3   | 3   | 2   | 3   | 3   | 2   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/PSO     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------|------|------|------|------|------|
| <b>C01</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C02</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C03</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C04</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C05</b> | 3    | 3    | 3    | 3    | 3    |

## Allied Computer Science - Programming Language C ++

|                                     |  |                 |                 |                |                     |                    |                 |
|-------------------------------------|--|-----------------|-----------------|----------------|---------------------|--------------------|-----------------|
| <b>Title of the Course</b>          | <b>Allied Computer Science - Programming Language C ++</b>     |                 |                 |                |                     |                    |                 |
| <b>Course Type</b>                  | <b>Elective - II</b>   |                 |                 |                |                     |                    |                 |
| <b>Year</b>                         | <b>I</b>   | <b>Semester</b> | <b>II</b>       | <b>Credits</b> | <b>2</b>            | <b>Course Code</b> | <b>25UECS21</b> |
| <b>Instructional Hours per week</b> | <b>Lecture</b>   |                 | <b>Tutorial</b> |                | <b>Lab Practice</b> |                    | <b>Total</b>    |
|                                     | <b>4</b>   |                 | <b>--</b>       |                | <b>2</b>            |                    | <b>6</b>        |
| <b>Learning Objectives</b>          |  |                 |                 |                |                     |                    |                 |
| <b>L01</b>                          | Know what tokens, keywords, constants, variables is.           |                 |                 |                |                     |                    |                 |
| <b>L02</b>                          | Know basic data types, functions and their usage in programme. |                 |                 |                |                     |                    |                 |
| <b>L03</b>                          | Familiarize different constructors.                            |                 |                 |                |                     |                    |                 |
| <b>L04</b>                          | Know the overloading operator of unary and binary.             |                 |                 |                |                     |                    |                 |
| <b>L05</b>                          | Know the types of inheritance.                                 |                 |                 |                |                     |                    |                 |

| <b>Unit</b> | <b>Contents</b>  |
|-------------|--|
| <b>I</b>    | Introduction, Tokens, Keywords, Identifiers and constants, Basic data types, User defined data types, storage classes, Derived data types, Symbolic constants.   |
| <b>II</b>   | Introduction, The main function, function prototyping, Call by reference, Return by reference, Inline functions, Default arguments, constant Arguments, Recursion, Function overloading, Friend and virtual functions, Math library functions, Specifying a class, Defining member functions, C++ program with class, Making an outside functions inline, Nesting member functions, Private member functions, Arrays within a class, Memory allocation for objects, Static member functions, Array of objects, objects as function arguments, Friend functions, Returning objects. |
| <b>III</b>  | Introduction, Constructors, Parameterized constructors, Multiple constructors in a class, Constructors with default arguments, Dynamic initialization of objects, Copy constructor, Constructing Two- dimensional arrays, constant objects, Destructors.   |

|           |  |
|-----------|--|
| <b>IV</b> | Introduction, Defining operator overloading, Overloading unary operator, Overloading Binary operator, Overloading Binary operators using Friends, Manipulation of strings using operators, Some other operator overloading examples, Rules for Overloading Operators |
| <b>V</b>  | Introduction, Defining Derived classes, Single inheritance, Making a private member inheritable, Multilevel inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance.   |

|   |   |
|---|---|
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour) |
| Skills acquired from this Course  | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill   |
| <b>Recommended Texts</b>  | E. Balagurusamy, Object Oriented Programming with C++, Tata Mc Graw Hill Education Private Limited, New Delhi (Fifth Print 2012).   |
| <b>Reference books:</b>   | Reema Thareja, Object Oriented Programming with C++, Oxford University Press(January 2018)  |
| <b>Web Resources</b>  | <a href="https://nptel.ac.in">https://nptel.ac.in</a>   |

**Course outcomes:**

| <b>Course outcomes:<br/>CO</b> | <b>On completion of this course, the students will be able to:</b>       |
|--------------------------------|--|
| <b>C01</b>                     | Identify the tokens, keywords, constants, variables and basic data types |
| <b>C02</b>                     | Know functions and how to use them in programme                          |
| <b>C03</b>                     | Know different constructors  |
| <b>C04</b>                     | Define the overloading operator of unary and binary                      |
| <b>C05</b>                     | Know various types of inheritance.                                       |

### Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| C01   | 3   | 3   | 2   | 3   | 3   | 3   | 3   | 3   |
| C02   | 2   | 3   | 3   | 3   | 2   | 3   | 3   | 2   |
| C03   | 3   | 3   | 3   | 2   | 3   | 2   | 3   | 3   |
| C04   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 2   |
| C05   | 3   | 2   | 3   | 3   | 2   | 3   | 3   | 3   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/ PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------|------|------|------|------|------|
| C01     | 3    | 3    | 3    | 3    | 3    |
| C02     | 3    | 3    | 3    | 3    | 3    |
| C03     | 3    | 3    | 3    | 3    | 3    |
| C04     | 3    | 3    | 3    | 3    | 3    |
| C05     | 3    | 3    | 3    | 3    | 3    |

## Programming Language C ++ - Practicals

|                            |          |   |           |                |          |                    |                 |
|----------------------------|----------|---|-----------|----------------|----------|--------------------|-----------------|
| <b>Title of the Course</b> |          | <b>Programming Language C ++ - Practicals</b> |           |                |          |                    |                 |
| <b>Course Type</b>         |          | <b>Skill Enhancement Course - III</b>         |           |                |          |                    |                 |
| <b>Year</b>                | <b>I</b> | <b>Semester</b>                               | <b>II</b> | <b>Credits</b> | <b>2</b> | <b>Course Code</b> | <b>25PSMAL2</b> |

### List of Practical's:

1. Programs to evaluate  $\sin x$ ,  $\cos x$ ,  $e^{-x}$  to 0.0001% accuracy.
2. Program to calculate the variance and standard deviation of a set of numbers.
3. Program to find Product of matrices, inverse of a matrix using functions. Macro that obtains largest of three numbers.
4. Define a class of students and prepare a statement containing name, total marks of Ranks (using functions).
5. Program to check whether a number/ string is a palindrome without using the corresponding standard function.
6. Write a program to conversion between polar and rectangle co-ordinates
7. Define a class string and exhibit the use of string manipulations.
8. Write a program to finding area of 2 different shapes
9. Create a class FLOAT that contains one float data. Overload all the four arithmetic.
10. Write a C++ program implement a class 'Complex' of complex numbers. The class could be include member functions to add and subtract two complex numbers.
11. Write a C ++ program to implement a class for complex numbers with add and multiply as member functions. Overload ++ operator to increment a complex number.
12. Write a program in C++ to demonstrate friend function.

## Mathematics for Competitive Examinations - II

|                                     |          |   |                 |                     |          |                    |                 |
|-------------------------------------|----------|---|-----------------|---------------------|----------|--------------------|-----------------|
| <b>Title of the Course</b>          |          | <b>Mathematics for Competitive Examination - II</b> |                 |                     |          |                    |                 |
| <b>Course Type</b>                  |          | <b>Skill Enhancement Course</b>                     |                 |                     |          |                    |                 |
| <b>Year</b>                         | <b>I</b> | <b>Semester</b>                                     | <b>II</b>       | <b>Credits</b>      | <b>2</b> | <b>Course Code</b> | <b>25USMA21</b> |
| <b>Instructional Hours per week</b> |          | <b>Lecture</b>                                      | <b>Tutorial</b> | <b>Lab Practice</b> |          | <b>Total</b>       |                 |
|                                     |          | <b>2</b>  | <b>--</b>       | <b>--</b>           |          | <b>2</b>           |                 |

| <b>Learning Objectives:</b> |   |
|-----------------------------|---|
| <b>L01</b>                  | To know about Chain Rule.   |
| <b>L02</b>                  | To practice problems on Time and Work.                                      |
| <b>L03</b>                  | To learn about Pipes and Cistern.   |
| <b>L04</b>                  | To practice problems on Time and Distance.                                  |
| <b>L05</b>                  | To understand the difference between Simple interest and Compound interest. |

| <b>Unit</b> | <b>Contents</b>                        |
|-------------|--|
| <b>I</b>    | Chain Rule.                            |
| <b>II</b>   | Time and work.                         |
| <b>III</b>  | Pipes and Cistern.                     |
| <b>IV</b>   | Time and Distance.                     |
| <b>V</b>    | Simple interest and Compound interest. |

|   |  |
|---|--|
| Extended Professional Component (is a part of internal component only, not to be included in the External Examination Question paper) | Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved.<br><br>(To be discussed during the Tutorial hour)   |
| Skills acquired from this course  | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill  |
| <b>Recommended Text</b>   | R.S. Agarwal – Objective Arithmetic, Published by S. Chand & Co, Ltd., Edition (2018).   |
| <b>Reference Books</b>  | <ol style="list-style-type: none"> <li>1. Rajesh Verma – Fast track Objective arithmetic, Arihant Publications (India) Limited. Fourth Edition 1<sup>st</sup> January 2018.</li> <li>2. R. S. Aggarwal, Arithmetic Subjective and objective, Published by S. Chand and Co. Ltd. Revised Edition. 1<sup>st</sup> April 2017.</li> </ol> |
| <b>Web resource</b>   | <a href="https://nptel.ac.in">https://nptel.ac.in</a>  |

### Course Outcome

| Course outcomes CO | On completion of this course, the students will be able to:  |
|--------------------|--|
| <b>CO1</b>         | To define direct proportion and indirect proportion. To tell the facts about inlet and outlet. To list out of the formulas of speed time and distance. To recall the formula of simple interest and compound interest.   |
| <b>CO2</b>         | To classify the direct proportion and indirect proportion. To compare time and work. To illustrate problems on pipes and cistern. To relate time and distance. To compare simple interest and compound interest.   |
| <b>CO3</b>         | To identify the problems whether it is indirect proportion and indirect proportion. To solve the problems regarding time and work. To apply the formula in inlet and outlet problems. To plan how to do the problems related with time and distance. To identify the problems and solve simple interest and compound interest. |

|            |   |
|------------|---|
| <b>C04</b> | To categorize the proportion indirect and direct. To classify the types of time and work categorized the problems with inlet or outlet. To know the relationship between time and work. To compare simple interest and compound interest. |
| <b>C05</b> | To decide whether it is a direct proportion or indirect proportion. To explain time and work. To justify whether it is inlet or outlet. To evaluate problems in time and distance. To explain simple interest and compound interest.      |

### Mapping with Programme Outcomes and Programme Specific Outcomes

| <b>CO/PO</b> | <b>P01</b> | <b>P02</b> | <b>P03</b> | <b>P04</b> | <b>P05</b> | <b>P06</b> | <b>P07</b> | <b>P08</b> |
|--------------|------------|------------|------------|------------|------------|------------|------------|------------|
| <b>C01</b>   | 3          | 3          | 2          | 3          | 3          | 2          | 3          | 3          |
| <b>C02</b>   | 2          | 3          | 3          | 3          | 2          | 3          | 3          | 2          |
| <b>C03</b>   | 3          | 3          | 3          | 2          | 3          | 3          | 3          | 2          |
| <b>C04</b>   | 3          | 3          | 3          | 3          | 3          | 3          | 3          | 3          |
| <b>C05</b>   | 3          | 2          | 3          | 3          | 2          | 3          | 3          | 2          |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| <b>CO/PSO</b> | <b>PS01</b> | <b>PS02</b> | <b>PS03</b> | <b>PS04</b> | <b>PS05</b> |
|---------------|-------------|-------------|-------------|-------------|-------------|
| <b>C01</b>    | 3           | 3           | 3           | 3           | 3           |
| <b>C02</b>    | 3           | 3           | 3           | 3           | 3           |
| <b>C03</b>    | 3           | 3           | 3           | 3           | 3           |
| <b>C04</b>    | 3           | 3           | 3           | 3           | 3           |
| <b>C05</b>    | 3           | 3           | 3           | 3           | 3           |

## LaTeX

|                            |          |   |                 |                     |          |                    |                 |
|----------------------------|----------|---|-----------------|---------------------|----------|--------------------|-----------------|
| <b>Title of the Course</b> |          | <b>LaTeX</b>  |                 |                     |          |                    |                 |
| <b>Course Type</b>         |          | <b>Skill Enhancement Course - III</b>   |                 |                     |          |                    |                 |
| <b>Year</b>                | <b>I</b> | <b>Semester</b>   | <b>II</b>       | <b>Credits</b>      | <b>2</b> | <b>Course Code</b> | <b>25USMA22</b> |
| <b>Instructional</b>       |          | <b>Lecture</b>  | <b>Tutorial</b> | <b>Lab Practice</b> |          | <b>Total</b>       |                 |
| <b>Hours per week</b>      |          | <b>2</b>  | <b>--</b>       | <b>--</b>           |          | <b>2</b>           |                 |
| <b>Learning Objectives</b> |          | To introduce coding and decoding concepts. Also to develop the students in the field of coding theory |                 |                     |          |                    |                 |

| <b>Unit</b> | <b>Contents</b>   |
|-------------|---|
| <b>I</b>    | LaTeX – Sample Files, Editing Cycle, Three productivity tools, Typing text, Typing Math, Anatomy of an article, Sectioning, Invoking proclamations, Inserting references, LaTeX error messages.<br>(Chapter 1: Sections - 1.2 to 1.4; Chapter 2: Sections - 2.1 to 2.4; Chapter 3: Sections - 3.1 to 3.4; Chapter 4: Sections - 4.1, 4.2.2 to 4.2.4, 4.3.1) |
| <b>II</b>   | Typing Text: The keyboard, Word Sentences and paragraphs, Symbols not on the keyboard (Quotation marks, Dashes, Special Characters only), Comments and foot notes.<br>(Chapter 5: Sections - 5.1, 5.2, 5.4.1, 5.4.2, 5.4.4, 5.5)  |
| <b>III</b>  | Typing Text: Changing Font Characteristics, Lines paragraphs and pages.<br>(Chapter 5: Sections - 5.6, 5.7)   |
| <b>IV</b>   | Text Environments: Some general rules for displayed text environments, Lists environments, Style and size environments, Proclamations (theorem-like structures), Proof environments, Tabular environments.<br>(Chapter 6: Sections - 6.1 to 6.6)  |
| <b>V</b>    | Typing Math: Math environments, Spacing Rules, Equations, Basic Constructs, Delimiters, and Operators.<br>(Chapter 7: Sections - 7.1 to 7.6)  |

|   |  |
|---|--|
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination Question paper) | Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)   |
| Skills acquired from this course  | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill  |
| <b>Recommended Text</b>   | George Gratzer, More Mathin to Latex, 4 <sup>th</sup> Edition, Springer, 2007.   |
| <b>Reference Books</b>  | <ol style="list-style-type: none"> <li>1. Helmut Kopka and Patric W. Daly, Aguideto Latex, Fourth edition, Addison-Wesley.</li> <li>2. DavidR. Wilkins, Getting started with Latex, Second Edition.</li> </ol> |
| <b>Web Resource</b>   | <a href="https://nptel.ac.in">https://nptel.ac.in</a>  |

### Course Outcomes

| <b>Course outcomes:<br/>CO</b> | <b>On completion of this course, the students will be able to:</b> |
|--------------------------------|--|
| <b>C01</b>                     | Explain to type text and anatomy of an article.                    |
| <b>C02</b>                     | Explain the different comments and foot notes.                     |
| <b>C03</b>                     | Explain the changing of font characteristic.                       |
| <b>C04</b>                     | Explain the different text environments.                           |
| <b>C05</b>                     | Know the spacing rules and operators.                              |

## Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|
| <b>C01</b> | 3   | 3   | 2   | 3   | 3   | 3   | 3   | 3   |
| <b>C02</b> | 2   | 3   | 3   | 3   | 2   | 3   | 3   | 2   |
| <b>C03</b> | 3   | 3   | 3   | 2   | 3   | 1   | 3   | 3   |
| <b>C04</b> | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   |
| <b>C05</b> | 3   | 2   | 3   | 3   | 2   | 3   | 3   | 3   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/PSO     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------|------|------|------|------|------|
| <b>C01</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C02</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C03</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C04</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C05</b> | 3    | 3    | 3    | 3    | 3    |

**Allied Mathematics**  
**Vector Calculus and Fourier series**  
 (For first year Physics / Chemistry)

|                                     |   |                 |                 |                |                     |                    |                 |
|-------------------------------------|---|-----------------|-----------------|----------------|---------------------|--------------------|-----------------|
| <b>Title of the Course</b>          | <b>Vector Calculus and Fourier series</b>   |                 |                 |                |                     |                    |                 |
| <b>Course Type</b>                  | <b>Elective - I</b>   |                 |                 |                |                     |                    |                 |
| <b>Year</b>                         | <b>I</b>  | <b>Semester</b> | <b>II</b>       | <b>Credits</b> | <b>5</b>            | <b>Course Code</b> | <b>25UEMA21</b> |
| <b>Instructional Hours per week</b> | <b>Lecture</b>  |                 | <b>Tutorial</b> |                | <b>Lab Practice</b> | <b>Total</b>       |                 |
|                                     | <b>6</b>  |                 | <b>--</b>       |                | <b>--</b>           | <b>6</b>           |                 |
| <b>Learning Objectives</b>          |   |                 |                 |                |                     |                    |                 |
| <b>L01</b>                          | Know about derivative of vector and to find gradient, divergence and curl of a vector |                 |                 |                |                     |                    |                 |
| <b>L02</b>                          | Use of double and triple integrals  |                 |                 |                |                     |                    |                 |
| <b>L03</b>                          | Know about line, surface and volume integrals   |                 |                 |                |                     |                    |                 |
| <b>L04</b>                          | Know about theorems of Gauss, Stoke's and Green's                                     |                 |                 |                |                     |                    |                 |
| <b>L05</b>                          | Finding Fourier series of even and odd functions and half-range Fourier series.       |                 |                 |                |                     |                    |                 |

| <b>Unit</b> | <b>Contents</b>   |
|-------------|---|
| <b>I</b>    | Vector differentiation–Gradient–Divergence and curl.                      |
| <b>II</b>   | Evaluation of double and triple integrals                                 |
| <b>III</b>  | Vector integration–Line, surface and volume integrals.                    |
| <b>IV</b>   | Green's, Stoke's and Divergence theorems (without Proof)–Simple problems. |
| <b>V</b>    | Fourier series–Even and odd functions–Half range Fourier series.          |

|   |   |
|---|---|
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved<br>(To be discussed during the Tutorial hour)  |
| Skills acquired from this Course  | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill   |
| <b>Recommended Texts</b>  | <ol style="list-style-type: none"> <li>1. S. Arumugam and A. Thangapandi Isaac, Allied Mathematics Paper-II, New Gamma Publishing House, Palayamkottai, 2012.</li> <li>2. T. K. Manicavachagom Pillay, Calculus (Vol - III), S.Vishvanathan Printer and Publisher PVT.LTD, 2012.</li> </ol>   |
| <b>Reference books:</b>   | <ol style="list-style-type: none"> <li>1. S. Arumugam and others, Analytical Geometry 3D &amp; Vector Calculus, New Gamma Publishing House, Palayamkottai, 2017.</li> <li>2. J. C. Susan, Vector Calculus (4<sup>th</sup> Edition), Pearson Education, Boston, 2012.</li> <li>3. Murray Spiegel, Vector analysis, Schaum Publishing company, New York, 2009.</li> </ol> |
| <b>Web Resources</b>  | <a href="https://nptel.ac.in">https://nptel.ac.in</a>   |

### Course Outcomes

| Course outcomes CO | On completion of this course, the students will be able to:                         |
|--------------------|---|
| <b>C01</b>         | Find the derivative of vector and to find gradient, divergence and curl of a vector |
| <b>C02</b>         | Evaluate double and triple integrals  |
| <b>C03</b>         | Find line, surface and volume integrals   |
| <b>C04</b>         | Verify the theorems of Gauss, Stoke's and Green's                                   |
| <b>C05</b>         | Find Fourier series of even and odd functions and half-range Fourier series.        |

## Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|
| <b>C01</b> | 3   | 3   | 2   | 3   | 3   | 2   | 3   | 3   |
| <b>C02</b> | 2   | 3   | 3   | 3   | 2   | 3   | 3   | 2   |
| <b>C03</b> | 3   | 3   | 3   | 2   | 3   | 3   | 3   | 3   |
| <b>C04</b> | 3   | 3   | 3   | 3   | 3   | 2   | 3   | 3   |
| <b>C05</b> | 3   | 2   | 3   | 3   | 2   | 3   | 3   | 2   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/ PSO    | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------|------|------|------|------|------|
| <b>C01</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C02</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C03</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C04</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C05</b> | 3    | 3    | 3    | 3    | 3    |

## Vector Calculus and Its Applications

|                                     |   |                 |                      |                |          |
|-------------------------------------|---|-----------------|----------------------|----------------|----------|
| <b>Title of the Course</b>          | <b>Vector Calculus And Its Applications</b>                         |                 |                      |                |          |
| <b>Course Type</b>                  | <b>Core - V</b>   |                 |                      |                |          |
| <b>Course Code</b>                  | <b>25UMMA31</b>   |                 |                      |                |          |
| <b>Year</b>                         | <b>II</b>   | <b>Semester</b> | <b>III</b>           | <b>Credits</b> | <b>4</b> |
| <b>Instructional Hours Per week</b> | <b>Lecture</b>  | <b>Tutorial</b> | <b>Lab Practices</b> | <b>Total</b>   |          |
|                                     | <b>4</b>  | <b>-</b>        | <b>-</b>             | <b>4</b>       |          |
| <b>Learning Objectives</b>          |   |                 |                      |                |          |
| <b>L01</b>                          | To understand about the vectors, scalars and their sum and products |                 |                      |                |          |
| <b>L02</b>                          | Know about solenoidal and irrotational vectors                      |                 |                      |                |          |
| <b>L03</b>                          | Evaluation of line integrals  |                 |                      |                |          |
| <b>L04</b>                          | Evaluation of surface integrals                                     |                 |                      |                |          |
| <b>L05</b>                          | Evaluation of volume integrals                                      |                 |                      |                |          |

| <b>Unit</b> | <b>Contents</b>   |
|-------------|---|
| <b>I</b>    | Vector point function - Scalar point function - Derivative of a vector and derivative of a sum of vectors - Derivative of a product of a scalar and a vector point function - Derivative of a scalar product and vector product.<br>(Chapter 1: Sections -1.1 to 1.5) |
| <b>II</b>   | The vector operator 'del', The gradient of a scalar point function - Divergence of a vector - Curl of a vector - solenoidal and irrotational vectors – simple applications.<br>(Chapter 2: Sections -2.1 to 2.7)  |
| <b>III</b>  | Laplacian operator, Vector identities – Line integral - simple problems.<br>(Chapter 2: Section - 2.8 and Chapter 3: Sections - 3.1 to 3.4)   |
| <b>IV</b>   | Surface integral – Volume integral – Applications.<br>(Chapter 3: Sections - 3.5, 3.6)  |
| <b>V</b>    | Gauss Divergence Theorem, Stoke's Theorem, Green's Theorem in two dimensions – Applications to real life situations.<br>(Chapter 4: Sections - 4.1 to 4.5)  |

|   |   |
|---|---|
| Extended Professional Component (Is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved<br>(To be discussed during the Tutorial hour)  |
| Skills acquired from this course  | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill   |
| <b>Recommended Text</b>   | P. Duraipandian and Laxmi Duraipandian, Vector Analysis, Emerald Publishers, 2005. Ref  |
| <b>Reference Books</b>  | J. C. Susan, Vector Calculus, (4 <sup>th</sup> Edition) Pearson Education, Boston, 2012.<br>A. Gorguis, Vector Calculus for College Students, Xilbius Corporation, 2014.<br>J. E. Marsden and A. Tromba, Vector Calculus, (5 <sup>th</sup> Edition), W. H. Freeman, New York, 1988.<br><b>NOTE: Latest Edition of Textbooks May be Used</b> |
| <b>Web Resources</b>  | <a href="https://nptel.ac.in">https://nptel.ac.in</a>   |

### Course Outcomes

| <b>Course Outcomes</b> | <b>On completion of this course, the students will be able to</b>  |
|------------------------|--|
| <b>C01</b>             | To define vector point function and scalar point function, vector operator the gradient of a scalar point function. List out of the properties of laplacian operator. To know how to define surface integral and volume integral. To tell the statement of gauss divergence theorem, Stokes theorem and Green's theorem. |
| <b>C02</b>             | To classify the derivations. To understand the concepts of the gradient of a scalar point function- divergence of a vector and cure of a vector. To classify vector identities, compare causes divergence theorem, stokes theorem, and Green theorem.  |
| <b>C03</b>             | To apply the rule of finding derivatives. Find whether the given vector is r rotational and irrotational. To solve the line integral and surface integral. To apply gauss divergence theorem and stokes theorem.   |

|            |   |
|------------|---|
| <b>C04</b> | To find the derivative of a sum of vectors. To analyse the type of vectors, evaluate the line integral and surface integral. To apply greens theorem.   |
| <b>C05</b> | To explain derivatives of scalar products and vector product. To determine the divergences of vector and scale of the vector. To evaluate volume integral and to know how to apply it. To justify Greens theorem in 2 dimensions. |

### Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|
| <b>C01</b> | 3   | 3   | 2   | 3   | 3   | 2   | 3   | 3   |
| <b>C02</b> | 2   | 3   | 3   | 3   | 2   | 3   | 3   | 2   |
| <b>C03</b> | 3   | 3   | 3   | 2   | 3   | 3   | 3   | 2   |
| <b>C04</b> | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   |
| <b>C05</b> | 3   | 2   | 3   | 3   | 2   | 2   | 3   | 3   |

**S-Strong (3) M-Medium (2) L-Low**

| CO/PSO     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------|------|------|------|------|------|
| <b>C01</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C02</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C03</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C04</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C05</b> | 3    | 3    | 3    | 3    | 3    |

## Differential equations and applications

|                                     |  |                 |                 |                      |              |
|-------------------------------------|--|-----------------|-----------------|----------------------|--------------|
| <b>Title of the Course</b>          | <b>Differential equations and applications</b> |                 |                 |                      |              |
| <b>Course Type</b>                  | <b>Core - VI</b>                               |                 |                 |                      |              |
| <b>Course Code</b>                  | <b>25UMMA32</b>                                |                 |                 |                      |              |
| <b>Year</b>                         | <b>II</b>                                      | <b>Semester</b> | <b>III</b>      | <b>Credits</b>       | <b>4</b>     |
| <b>Instructional Hours Per week</b> |  | <b>Lecture</b>  | <b>Tutorial</b> | <b>Lab Practices</b> | <b>Total</b> |
|                                     |  | <b>4</b>        | <b>-</b>        | <b>-</b>             | <b>4</b>     |

| <b>Learning Objectives</b> |   |
|----------------------------|---|
| <b>L01</b>                 | Finding solutions of homogeneous and non-homogeneous equations of degree one in two variables. Solving Bernoulli's equation and exact differential equations. |
| <b>L02</b>                 | Understand particular integrals of algebraic, exponential, trigonometric functions and their products.  |
| <b>L03</b>                 | To know about linear equations of second order and its applications.  |
| <b>L04</b>                 | Formation of PDE by eliminating arbitrary constants and arbitrary functions. Find complete, singular and general integrals, to solve Lagrange's equations.    |
| <b>L05</b>                 | To know about standard forms of PDE and finding solutions.  |

| <b>Unit</b> | <b>Contents</b>   |
|-------------|---|
| <b>I</b>    | Ordinary Differential Equations: Variable separable – Homogeneous Equation – Non-Homogeneous Equations of first degree in two variables – Linear Equation – Bernoulli's Equation – Exact differential equations.<br>(Chapter 2: Sections – 1 to 6)  |
| <b>II</b>   | Equation of first order but of higher degree: Equation solvable for $dy/dx$ - Equation solvable for $y$ -Equation solvable for $x$ - Clairaut's form – Linear Equations with constant coefficients: Definition – The operator $D$ – Complete solution – Particular integrals of algebraic, exponential, trigonometric functions and their products.<br>(Chapter 4: Sections -1 to 3 and Chapter 5: Sections – 1 to 4)                 |
| <b>III</b>  | Linear equations of second order: Complete solution in terms of a known integral – Reduction to normal form – Change of independent variable - Applications of first order equations: Flow of water from an orifice – Falling bodies and other rate problems, Free fall under gravity – The Brachistochrone problem – Fermat and Bernoulli – Simple electric circuits.<br>(Chapter 3: Sections - 2 to 6 Chapter 8: Sections - 1 to 3) |
| <b>IV</b>   | Partial differential equation: Formation of PDE by Eliminating arbitrary constants and arbitrary functions – Complete integral – Singular integral – General integral – Lagrange's Linear Equations.<br>(Chapter 12: Sections - 1 to 4)   |
| <b>V</b>    | Special methods – Standard forms.<br>(Chapter 12: Sections - 5.1 to 5.5)  |

|   |  |
|---|--|
| Extended Professional Component (Is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved<br>(To be discussed during the Tutorial hour) |
| Skills acquired from this course  | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill  |

| <b>Recommended Texts</b> |   |
|--------------------------|---|
| 1                        | S. Narayanan and T. K. Manicavachagom Pillay, Differential equations and its application, S. Viswananthan Printers Pvt. Ltd., 2012. |

| <b>Reference Books</b>                               |  |
|--|--|
| 1  | Shepley L. Ross, Differential Equations, 3rd Edition, John Wiley and Sons, 1984.   |
| 2  | I. Sneddon, Elements of Partial Differential Equations, Mc Graw - Hill, International Edition, 1967.                                 |
| 3  | G. F. Simmons, Differential equations with applications and historical notes, 2ndEd, Tata Mc Graw Hill Publications, 1991.           |
| 4  | H. T. H. Piaggio, Elementary Treaties on Differential Equations and their applications, C.B.S Publisher & Distributors, Delhi, 1985. |
| 5  | Horst R. Beyer, Calculus and Analysis, Wiley, 2010.  |
| 6  | M. Braun, Differential Equations and their Applications. (3rdEdition), Springer- Verlag, New York, 1983.                             |
| 7  | S. Arumugam, A. Thangapandi Isaac and A. Somasundarua, Differential Equations and Applications, Yes Dee Publishing, 2020.            |
| 8  | V. Sundrapandian, Ordinary and Partial Differential Equations, Tata Mc Graw Hill Education Pvt. Ltd. New Delhi, 2013.                |
| <b>NOTE: Latest Edition of Textbooks May be Used</b> |  |

| <b>Web Resources</b> |   |
|----------------------|---|
| 1                    | <a href="https://nptel.ac.in">https://nptel.ac.in</a> |

| <b>Course Outcomes</b> | <b>On completion of this course, the students will be able to</b>   |
|------------------------|---|
| <b>C01</b>             | Determine solutions of homogeneous equations, non-homogeneous equations of degree one in two variables, solve Bernoulli's equation and exact differential equations                 |
| <b>C02</b>             | Find the solutions of equations of first order but not of higher degree and to Determine particular integrals of algebraic, exponential, trigonometric functions and their products |
| <b>C03</b>             | Find solutions linear equations of second order and know some applications  |
| <b>C04</b>             | Form a PDE by eliminating arbitrary constants and arbitrary functions, find complete, singular and general integrals, to solve Lagrange's equations                                 |
| <b>C05</b>             | Explain standard forms of PDE and find solutions.   |

### Mapping With Programme Outcomes and Programme Specific Outcomes

| <b>CO/PO</b> | <b>P01</b> | <b>P02</b> | <b>P03</b> | <b>P04</b> | <b>P05</b> | <b>P06</b> | <b>P07</b> | <b>P08</b> |
|--------------|------------|------------|------------|------------|------------|------------|------------|------------|
| <b>C01</b>   | 3          | 3          | 2          | 3          | 3          | 2          | 3          | 3          |
| <b>C02</b>   | 2          | 2          | 3          | 3          | 2          | 1          | 3          | 3          |
| <b>C03</b>   | 3          | 3          | 3          | 2          | 3          | 3          | 3          | 3          |
| <b>C04</b>   | 2          | 3          | 3          | 3          | 3          | 3          | 3          | 3          |
| <b>C05</b>   | 3          | 3          | 3          | 3          | 2          | 3          | 3          | 2          |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| <b>CO/PSO</b> | <b>PS01</b> | <b>PS02</b> | <b>PS03</b> | <b>PS04</b> | <b>PS05</b> |
|---------------|-------------|-------------|-------------|-------------|-------------|
| <b>C01</b>    | 3           | 3           | 3           | 3           | 3           |
| <b>C02</b>    | 3           | 3           | 3           | 3           | 3           |
| <b>C03</b>    | 3           | 3           | 3           | 3           | 3           |
| <b>C04</b>    | 3           | 3           | 3           | 3           | 3           |
| <b>C05</b>    | 3           | 3           | 3           | 3           | 3           |

## Statistics - I

|                                     |                       |                 |                 |                      |              |
|-------------------------------------|-----------------------|-----------------|-----------------|----------------------|--------------|
| <b>Title of the Course</b>          | <b>Statistics I</b>   |                 |                 |                      |              |
| <b>Course Type</b>                  | <b>Elective - III</b> |                 |                 |                      |              |
| <b>Course Code</b>                  | <b>25UEMA31</b>       |                 |                 |                      |              |
| <b>Year</b>                         | <b>II</b>             | <b>Semester</b> | <b>III</b>      | <b>Credits</b>       | <b>4</b>     |
| <b>Instructional Hours Per week</b> | <b>Lecture</b>        |                 | <b>Tutorial</b> | <b>Lab Practices</b> | <b>Total</b> |
|                                     | 4                     |                 | -               | -                    | 4            |

| <b>Learning Objectives</b> |  |
|----------------------------|--|
| <b>L01</b>                 | Understanding of coefficient of dispersion, moments, skewness and kurtosis |
| <b>L02</b>                 | Acquiring knowledge on correlation and rank correlation                    |
| <b>L03</b>                 | Acquiring knowledge on regression lines and regression coefficients        |
| <b>L04</b>                 | Understand theory of attributes and to analyze consistency of data         |
| <b>L05</b>                 | Finding the Index number and analyzing its usage                           |

| <b>Unit</b> | <b>Contents</b>  |
|-------------|--|
| <b>I</b>    | Measures of Dispersion - Moments - Skewness - Kurtosis.<br>(Chapter 3: Section 3.0 to 3.1, Chapter - 4, 4.0 to 4.2)  |
| <b>II</b>   | Curve Fitting - Correlation - Rank Correlation.<br>(Chapter 5: Sections - 5.0-5.1, Chapter 6: Section 6.0 to 6.2)  |
| <b>III</b>  | Regression - Correlation Coefficient for a bivariate frequency distributions<br>(Chapter 6: Section 6.2 to 6.3)  |
| <b>IV</b>   | Attributes - Consistency of Data - Independence and Association of Data.<br>(Chapter 8 : Sections 8.0 to 8.3)  |
| <b>V</b>    | Index Numbers - Consumer Price Index Numbers - Conversion of Chain Base Index Number into Fixed Base Index and conversely.<br>(Chapter 9: Sections 9.0 to 9.3) |

|   |  |
|---|--|
| Extended Professional Component (Is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved<br>(To be discussed during the Tutorial hour) |
| Skills acquired from this course  | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill  |

| <b>Recommended Texts</b>                              |  |
|---|--|
| <b>1</b>  | S. Arumugam and A. Thangapandi Isaac, Statistics, New Gamma Publishing House, 2016.  |
| <b>Reference Books</b>                                |  |
| <b>1</b>  | P. R. Vittal, Mathematical Statistics, Margham Publications, 2004.   |
| <b>2</b>  | D.C. Sacheti and V. K. Kapoor, Statistics, Sultan Chand & Sons, New Delhi, 2017.   |
| <b>3</b>  | S. G. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, 12th Edition, Sultan Chand & Sons, New Delhi, 2021. |
| <b>NOTE: Latest Edition of Textbooks May be Used</b>  |  |
| <b>Web Resources</b>                                  |  |
| <a href="https://nptel.ac.in">https://nptel.ac.in</a> |  |

| <b>Course Outcomes</b> | <b>On completion of this course, the students will be able to</b>   |
|------------------------|---|
| <b>C01</b>             | Find coefficient of dispersion, moments, skewness and kurtosis.   |
| <b>C02</b>             | Find Karl Pearson's correlation and rank correlation.   |
| <b>C03</b>             | Fit a straight line and parabolic curve by the method of least squares and find the regression lines and regression coefficients. |
| <b>C04</b>             | Develop the statistical techniques used in the theory of attributes and to analyze consistency of data.                           |
| <b>C05</b>             | Find the Index number.  |

### Mapping With Programme Outcomes and Programme Specific Outcomes

| <b>CO/PO</b> | <b>P01</b> | <b>P02</b> | <b>P03</b> | <b>P04</b> | <b>P05</b> | <b>P06</b> | <b>P07</b> | <b>P08</b> |
|--------------|------------|------------|------------|------------|------------|------------|------------|------------|
| <b>C01</b>   | 3          | 3          | 2          | 3          | 3          | 2          | 3          | 2          |
| <b>C02</b>   | 2          | 3          | 3          | 3          | 2          | 3          | 3          | 2          |
| <b>C03</b>   | 3          | 3          | 3          | 2          | 3          | 3          | 3          | 3          |
| <b>C04</b>   | 2          | 3          | 2          | 3          | 3          | 3          | 3          | 3          |
| <b>C05</b>   | 3          | 2          | 3          | 3          | 2          | 3          | 3          | 3          |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| <b>CO/PSO</b> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|---------------|-------------|-------------|-------------|-------------|-------------|
| <b>C01</b>    | 3           | 3           | 3           | 3           | 3           |
| <b>C02</b>    | 3           | 3           | 3           | 3           | 3           |
| <b>C03</b>    | 3           | 3           | 3           | 3           | 3           |
| <b>C04</b>    | 3           | 3           | 3           | 3           | 3           |
| <b>C05</b>    | 3           | 3           | 3           | 3           | 3           |

## Difference Equations

|                                     |                             |                 |                 |                      |              |
|-------------------------------------|-----------------------------|-----------------|-----------------|----------------------|--------------|
| <b>Title of the Course</b>          | <b>Difference Equations</b> |                 |                 |                      |              |
| <b>Course Type</b>                  | <b>Elective - III</b>       |                 |                 |                      |              |
| <b>Course Code</b>                  | <b>25UEMA32</b>             |                 |                 |                      |              |
| <b>Year</b>                         | <b>II</b>                   | <b>Semester</b> | <b>III</b>      | <b>Credits</b>       | <b>2</b>     |
| <b>Instructional Hours Per week</b> |                             | <b>Lecture</b>  | <b>Tutorial</b> | <b>Lab Practices</b> | <b>Total</b> |
|                                     |                             | <b>4</b>        | -               | -                    | <b>4</b>     |

| <b>Learning Objectives</b> |   |
|----------------------------|---|
| <b>L01</b>                 | Utilization of difference operators.                                  |
| <b>L02</b>                 | Acquiring knowledge for first order equations and linear equations.   |
| <b>L03</b>                 | To know about the equations with variable coefficients.               |
| <b>L04</b>                 | Practical understanding on initial value problems for linear systems. |
| <b>L05</b>                 | Practice of the Fundamental Matrices                                  |

| <b>Unit</b> | <b>Contents</b>   |
|-------------|---|
| <b>I</b>    | The Difference Calculus: The Difference operator –Summation<br>Generating functions and approximate summation.<br>(Chapter 2: Sections - 2.1 to 2.3)                    |
| <b>II</b>   | Linear Difference Equations: First order equations – General results for<br>linear equations – Solving linear equations.<br>(Chapter 3: Sections - 3.1 to 3.3)          |
| <b>III</b>  | Linear Difference Equations: Applications – Equations with variable<br>coefficients – Nonlinear equations that can be linearized.<br>(Chapter 3: Sections - 3.4 to 3.6) |
| <b>IV</b>   | Stability Theory: Initial value problems for linear systems – Stability of<br>linear systems.<br>(Chapter 4: Sections - 4.1, 4.2)                                       |
| <b>V</b>    | Stability Theory: Phase plane Analysis for Linear Systems,<br>Fundamental Matrices and Floquet Theory.<br>(Chapter 4: Sections - 4.3, 4.4)                              |

|   |   |
|---|---|
| Extended Professional Component (Is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour) |
| Skills acquired from this course  | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill   |

| <b>Recommended Texts</b> |   |
|--------------------------|---|
| <b>1</b>                 | W. G. Kelley and A. C. Peterson, Difference Equations, 2nd Edition, Academic Press, New York, 2012. |

| <b>Reference Books</b>                               |  |
|--|--|
| <b>1</b>   | R. P. Agarwal, Difference Equations and Inequalities, 2nd Edition, Marcel Dekker, New York, 2000.      |
| <b>2</b>   | S. N. Elaydi, An Introduction to Difference Equations, 3 <sup>rd</sup> Edition, Springer, India, 2008. |
| <b>3</b>   | R. E. Mickens, Difference Equations, 3 <sup>rd</sup> Edition, CRC Press, 2015.                         |
| <b>NOTE: Latest Edition of Textbooks May be Used</b> |  |

| <b>Web Resources</b> |   |
|----------------------|---|
| <b>1</b>             | <a href="https://nptel.ac.in">https://nptel.ac.in</a> |

| <b>Course Outcomes</b> | <b>On completion of this course, the students will be able to</b>  |
|------------------------|--|
| <b>C01</b>             | Learn the basics of ratio, proportion, indices and logarithm   |
| <b>C02</b>             | Familiarize with calculations of simple and compound interest and arithmetic, geometric and harmonic progressions. |
| <b>C03</b>             | Determine the various measures of central tendency   |
| <b>C04</b>             | Calculate the correlation and regression co-efficient.   |
| <b>C05</b>             | Assess problems on time series analysis  |

### Mapping With Programme Outcomes and Programme Specific Outcomes

| <b>CO/PO</b> | <b>P01</b> | <b>P02</b> | <b>P03</b> | <b>P04</b> | <b>P05</b> | <b>P06</b> | <b>P07</b> | <b>P08</b> |
|--------------|------------|------------|------------|------------|------------|------------|------------|------------|
| <b>C01</b>   | 3          | 3          | 2          | 3          | 3          | 3          | 3          | 3          |
| <b>C02</b>   | 2          | 3          | 3          | 2          | 2          | 3          | 3          | 2          |
| <b>C03</b>   | 3          | 3          | 3          | 2          | 3          | 2          | 3          | 3          |
| <b>C04</b>   | 3          | 3          | 2          | 3          | 3          | 3          | 3          | 3          |
| <b>C05</b>   | 3          | 2          | 3          | 3          | 2          | 3          | 3          | 2          |

| <b>CO/PSO</b> | <b>PS01</b> | <b>PS02</b> | <b>PS03</b> | <b>PS04</b> | <b>PS05</b> |
|---------------|-------------|-------------|-------------|-------------|-------------|
| <b>C01</b>    | 3           | 3           | 3           | 3           | 3           |
| <b>C02</b>    | 3           | 3           | 3           | 3           | 3           |
| <b>C03</b>    | 3           | 3           | 3           | 3           | 3           |
| <b>C04</b>    | 3           | 3           | 3           | 3           | 3           |
| <b>C05</b>    | 3           | 3           | 3           | 3           | 3           |

## Computational Mathematics

|                                     |                                    |                 |                      |                |          |
|-------------------------------------|------------------------------------|-----------------|----------------------|----------------|----------|
| <b>Title of the Course</b>          | <b>Computational Mathematics</b>   |                 |                      |                |          |
| <b>Course Type</b>                  | <b>Skill Enhancement Course IV</b> |                 |                      |                |          |
| <b>Course Code</b>                  | <b>25USMA31</b>                    |                 |                      |                |          |
| <b>Year</b>                         | <b>II</b>                          | <b>Semester</b> | <b>III</b>           | <b>Credits</b> | <b>2</b> |
| <b>Instructional Hours Per week</b> | <b>Lecture</b>                     | <b>Tutorial</b> | <b>Lab Practices</b> | <b>Total</b>   |          |
|                                     | <b>2</b>                           | <b>-</b>        | <b>-</b>             | <b>2</b>       |          |

| <b>Learning Objectives</b> |   |
|----------------------------|---|
| <b>L01</b>                 | Finding the roots of algebraic equations using different methods  |
| <b>L02</b>                 | Bisection method, Newton-Raphson method and Horner's method.  |
| <b>L03</b>                 | Solving a given system of simultaneous equation   |
| <b>L04</b>                 | Usage of substitution, elimination and iteration method   |
| <b>L05</b>                 | Find numerical solutions of partial differential equations  |
| <b>Unit</b>                | <b>Contents</b>   |
| <b>I</b>                   | Algebraic and Transcendental Equations: Errors in Numerical Computation – Iteration method – Regula Falsie method.<br>(Chapter 3: Sections - 3.1, 3.2, 3.4)   |
| <b>II</b>                  | Algebraic and Transcendental Equations: Bisection method – Newton-Raphson method – Horner's method.<br>(Chapter 3: Sections - 3.3, 3.5, 3.6)  |
| <b>III</b>                 | Simultaneous Equations: Simultaneous equations – Back substitution – Gauss Elimination method – Gauss-Jordan Elimination method – Calculation of inverse of a matrix.<br>(Chapter 4: Sections - 4.1 to 4.5)               |
| <b>IV</b>                  | Simultaneous equations: Iterative Methods – Gauss Jacobi iteration method – Gauss-Seidel Iteration method – Relaxation method – Newton- Raphson method for simultaneous equations.<br>(Chapter 4: Sections - 4.7 to 4.10) |

|   |  |  |
|---|--|--|
| <b>V</b>  | Numerical Solutions of Partial Differential Equations: Classification of partial differential equations of second order – Finite Difference Approximations to Derivatives – Laplace equation – Poisson’s equation. (Chapter 11: Sections - 11.0 to 11.4) |  |
| Extended Professional Component (Is a part Of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved<br>(To be discussed during the Tutorial hour)   |  |
| Skills acquired from this course  | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill  |  |
| <b>Recommended Texts</b>  |  |  |
| 1   | S. Arumugam, A. Thangapandi Isaac and A. Somasundaram, Numerical Methods, Scitech, 2017.   |  |
| <b>Web Resources</b>  |  |  |
| 1   | <a href="https://nptel.ac.in">https://nptel.ac.in</a>  |  |

## Course Outcomes

| Course Outcomes | On completion of this course, the students will be able to  |
|-----------------|---|
| <b>C01</b>      | Describe the roots of algebraic different methods like method and Regula Falsie method            |
| <b>C02</b>      | Find the real root of an equation by Bisection method, Newton-Raphson method and Horner's method. |
| <b>C03</b>      | Solve a given system of simultaneous equation by using substitution and elimination methods       |
| <b>C04</b>      | Solve a given system of simultaneous equation by using iteration method                           |
| <b>C05</b>      | Find numerical solutions of partial differential equations  |

## Mapping With Programme Outcomes and Programme Specific Outcomes

| CO /PO     | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|
| <b>C01</b> | 3   | 3   | 2   | 3   | 3   | 2   | 3   | 3   |
| <b>C02</b> | 2   | 3   | 3   | 3   | 2   | 3   | 3   | 3   |
| <b>C03</b> | 3   | 3   | 3   | 2   | 3   | 3   | 3   | 2   |
| <b>C04</b> | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   |
| <b>C05</b> | 3   | 2   | 3   | 3   | 2   | 3   | 3   | 2   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/ PSO    | PS01 | PS02 | PS03 | PS04 | PS05 |
|------------|------|------|------|------|------|
| <b>C01</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C02</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C03</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C04</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C05</b> | 3    | 3    | 3    | 3    | 3    |

## Semester – IV

### Sequences and Series

|                                     |   |                             |                 |                |                     |                    |                 |
|-------------------------------------|---|-----------------------------|-----------------|----------------|---------------------|--------------------|-----------------|
| <b>Title of the Course</b>          |   | <b>Sequences and Series</b> |                 |                |                     |                    |                 |
| <b>Course Type</b>                  |   | <b>Core - VII</b>           |                 |                |                     |                    |                 |
| <b>Year</b>                         | <b>II</b>   | <b>Semester</b>             | <b>IV</b>       | <b>Credits</b> | <b>5</b>            | <b>Course Code</b> | <b>25UMMA41</b> |
| <b>Instructional Hours per week</b> |   | <b>Lecture</b>              | <b>Tutorial</b> |                | <b>Lab Practice</b> | <b>Total</b>       |                 |
|                                     |   | <b>5</b>                    | <b>-</b>        |                | <b>-</b>            | <b>5</b>           |                 |
| <b>Learning Objectives</b>          |   |                             |                 |                |                     |                    |                 |
| <b>L01</b>                          | Explain Sequences and Subsequence of real numbers and to find the limit of sequence to test for convergent, divergent and bounded sequences.  |                             |                 |                |                     |                    |                 |
| <b>L02</b>                          | Know the behaviour of monotonic sequences and the Cauchy sequence   |                             |                 |                |                     |                    |                 |
| <b>L03</b>                          | Explain series and to verify convergent of series by using comparison test  |                             |                 |                |                     |                    |                 |
| <b>L04</b>                          | Understand Kummer's test and Ratio test   |                             |                 |                |                     |                    |                 |
| <b>L05</b>                          | Classify the series of real numbers and the alternating series and their convergence and divergence, the conditional convergence and absolute convergence and solve problems on convergence of the sequences. |                             |                 |                |                     |                    |                 |
| <b>Unit</b>                         | <b>Contents</b>   |                             |                 |                |                     |                    |                 |
| <b>I</b>                            | Sequences - Bounded sequences - Monotonic Sequences – Convergent Sequences –Divergent and Oscillating Sequences – The Algebra of limits.<br>(Chapter 3: Sections - 3.1 to 3.7)                                |                             |                 |                |                     |                    |                 |
| <b>II</b>                           | Behaviour of Monotonic Sequences – Some theorems on limits – Sub sequences –Limit points – Cauchy sequence.<br>(Chapter 3:Sections - 3.8 to 3.12)   |                             |                 |                |                     |                    |                 |
| <b>III</b>                          | Series of positive terms: Infinite series – Comparison test.<br>(Chapter 4: Sections -4.1, 4.2)   |                             |                 |                |                     |                    |                 |
| <b>IV</b>                           | Kummer's test – Root test – Integral Test.<br>(Chapter 4: Sections - 4.3 to 4.5)  |                             |                 |                |                     |                    |                 |
| <b>V</b>                            | Series of arbitrary terms: Alternative series – Absolute convergence – Tests for convergence of series of arbitrary terms.<br>(Chapter 5: Sections - 5.1 to 5.3)  |                             |                 |                |                     |                    |                 |

|   |  |
|---|--|
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)  |
| Skills acquired from this course  | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill  |
| <b>Recommended Texts</b>  | Recommended Text 1. S. Arumugam, A. Thangapandi Isaac and A. Somasundaram, Sequence and Series, Yes Dee Publications, 2021.  |
| <b>Reference books:</b>   | <ul style="list-style-type: none"> <li>• Reference Books 1. Richard R. Goldberg ,Methods of Real Analysis</li> <li>• Oxford and IBH Publishing, 2020.</li> <li>• Ethan D.Bloch, the Real Numbers and Real Analysis, Springer, 2011.</li> <li>• G. M. Fikhtengol'ts the Fundamentals of Mathematical Analysis, Vol I. Pergamon Press, New York, 1965.</li> <li>• T.M. Apostol, Calculus (Vol. I), John Wiley and Sons (Asia) P. Ltd., 2002.</li> <li>• R. G. Bartle and D. R Sherbert, Introduction to Real Analysis, John Wiley and Sons (Asia) P. Ltd., 2000.</li> <li>• E .Fischer, Intermediate Real Analysis, Springer Verlag, 1983.</li> <li>• K. A. Ross, Elementary Analysis - The Theory of Calculus Series - Undergraduate Texts in Mathematics, Springer Verlag 2003.</li> </ul> |
| <b>Web Resources</b>  | 1. <a href="https://nptel.ac.in">https:// nptel. ac.in</a>   |

| <b>Course outcomes:<br/>CO</b> | <b>On completion of this course, the students will be able to:</b>   |
|--------------------------------|--|
| <b>CO1</b>                     | To define the sequences and classify their types. Define monotonic sequence and series of positive terms and series of arbitrary terms.  |
| <b>CO2</b>                     | To illustrate the sequence classify the Bounded and monotonic sequence compare the series and Alternative series.  |
| <b>CO3</b>                     | To identify the convergent, divergent and oscillating sequence. To construct the behaviour of monotonic sequence. To identify the convergence of the series.   |
| <b>CO4</b>                     | To determine the convergence of the sequence by using the behaviour of monotonic sequence list out of the Kummer's test, Root test & Integral test to analyse the convergence of the series.   |
| <b>CO5</b>                     | Recommended some theorem for sequences which are very useful in calculating limits of sequences. Identify the application of (Kummer's test, Root test, integral test) compare the convergent and absolutely convergent of the series. |

### Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO      | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|
| <b>C01</b> | 3   | 3   | 2   | 3   | 3   | 2   | 3   | 2   |
| <b>C02</b> | 2   | 3   | 3   | 3   | 2   | 3   | 3   | 3   |
| <b>C03</b> | 3   | 2   | 3   | 2   | 3   | 2   | 3   | 3   |
| <b>C04</b> | 3   | 3   | 2   | 3   | 3   | 3   | 3   | 3   |
| <b>C05</b> | 3   | 2   | 3   | 3   | 2   | 3   | 3   | 2   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/ PSO    | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------|------|------|------|------|------|
| <b>C01</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C02</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C03</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C04</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C05</b> | 3    | 3    | 3    | 3    | 3    |

## Fourier series and Integral Transformation

|                                     |   |   |                |                 |                     |                    |                 |
|-------------------------------------|---|---|----------------|-----------------|---------------------|--------------------|-----------------|
| <b>Title of the Course</b>          |   | <b>Fourier series and Integral Transformation</b> |                |                 |                     |                    |                 |
| <b>Course Type</b>                  |   | <b>Core - VIII</b>                                |                |                 |                     |                    |                 |
| <b>Year</b>                         | <b>II</b>   | <b>Semester</b>                                   | <b>IV</b>      | <b>Credits</b>  | <b>5</b>            | <b>Course Code</b> | <b>25UMMA42</b> |
| <b>Instructional Hours per week</b> |   |   | <b>Lecture</b> | <b>Tutorial</b> | <b>Lab Practice</b> | <b>Total</b>       |                 |
|                                     |   |   | <b>5</b>       | <b>-</b>        | <b>-</b>            | <b>5</b>           |                 |
| <b>Learning Objectives</b>          |   |   |                |                 |                     |                    |                 |
| <b>L01</b>                          | Determine the Fourier coefficients and Fourier series for a given periodic Function.            |   |                |                 |                     |                    |                 |
| <b>L02</b>                          | Determine the Half range Fourier series and the complex form of Fourier series.                 |   |                |                 |                     |                    |                 |
| <b>L03</b>                          | Find the Fourier transform of a given function and to know the properties of FT.                |   |                |                 |                     |                    |                 |
| <b>L04</b>                          | Find the Laplace transform of periodic functions and evaluation of certain integrals.           |   |                |                 |                     |                    |                 |
| <b>L05</b>                          | Find the inverse Laplace transform and to solve differential equations using Laplace transform. |   |                |                 |                     |                    |                 |

| <b>Unit</b> | <b>Contents</b>   |
|-------------|---|
| <b>I</b>    | Fourier Series–Definition – Fourier coefficients and Fourier series for a given periodic function with period $2\pi$ and $2l$ , odd and even functions – Convergence of Fourier series.<br>(Chapter 1: Sections - 1.4 to 1)                                     |
| <b>II</b>   | Half range Fourier series – Parseval’s theorem – Root - Mean square value of a function – Harmonic analysis – Complex form of Fourier series.<br>(Chapter 1: Sections - 1.9 to 1.12)  |
| <b>III</b>  | Fourier Transforms – Fourier Integral theorem – Fourier sine and cosine transforms – Properties of Fourier transform – Convolution theorem – Parseval’s identity.<br>(Chapter 2: Sections - 2.2 to 2.6)   |
| <b>IV</b>   | Laplace Transforms – Definition – Results – Laplace transform of periodic functions – Some general Theorems –Evaluation of certain integrals.<br>(Chapter 9: Sections - 1 to 5)   |
| <b>V</b>    | The Inverse Transform – Results – Solving ordinary differential equations with constant coefficients, simultaneous linear differential equations and differential equations with variable coefficients by Laplace Transform.<br>(Chapter 9: Sections - 6 to 10) |

|   |   |
|---|---|
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved  |
| Skills acquired from this Course  | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill   |
| <b>Recommended Texts</b>  | <ul style="list-style-type: none"> <li>• T. Veerarajan, Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2001.</li> <li>• S. Narayanan and T. K. Manicavachagom Pillay, Differential equations and its application, S. Viswanathan Printers Pvt. Ltd., 2012.</li> </ul>  |
| <b>Reference books:</b>   | <ul style="list-style-type: none"> <li>• M.K. Venkataraman and Manorama Sridhar, Vector Calculus and Fourier Series, The National Publishing company, Chennai-1, 2002</li> <li>• J. Ray Hanna Fourier Series, Transforms and Boundary value Problems, Dover Publications, New York, 2008.</li> <li>• P. R. Mittal, Differential Equations, Fourier and Laplace Transforms, Probability, Margham Publications, Chennai, 2012.</li> <li>• S. Arumugam A. Thangapandi Issac, Trigonometry and Fourier series.</li> </ul> |
| <b>Web Resources</b>  | <a href="https://nptel.ac.in">https://nptel.ac.in</a>   |

| <b>Course outcomes:<br/>CO</b> | <b>On completion of this course, the students will be able to:</b>                             |
|--------------------------------|--|
| <b>C01</b>                     | Determine the Fourier coefficients and Fourier series for a given periodic function            |
| <b>C02</b>                     | Determine the Half range Fourier series and the complex form of Fourier series.                |
| <b>C03</b>                     | Find the Fourier transform of a given function and to know the properties of FT                |
| <b>C04</b>                     | Find the Laplace transform of periodic functions and evaluation of certain integrals           |
| <b>C05</b>                     | Find the inverse Laplace transform and to solve differential equations using Laplace transform |

## Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|
| <b>C01</b> | 3   | 3   | 2   | 3   | 3   | 3   | 3   | 3   |
| <b>C02</b> | 2   | 3   | 3   | 3   | 2   | 3   | 3   | 3   |
| <b>C03</b> | 3   | 3   | 3   | 2   | 3   | 3   | 3   | 3   |
| <b>C04</b> | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   |
| <b>C05</b> | 3   | 2   | 3   | 3   | 2   | 1   | 3   | 2   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/ PSO    | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------|------|------|------|------|------|
| <b>C01</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C02</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C03</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C04</b> | 3    | 3    | 3    | 3    | 3    |
| <b>C05</b> | 3    | 3    | 3    | 3    | 3    |

## Statistics - II

|                                     |   |                        |                 |                     |              |                    |                 |
|-------------------------------------|---|------------------------|-----------------|---------------------|--------------|--------------------|-----------------|
| <b>Title of the Course</b>          |   | <b>Statistics - II</b> |                 |                     |              |                    |                 |
| <b>Course Type</b>                  |   | <b>Elective - IV</b>   |                 |                     |              |                    |                 |
| <b>Year</b>                         | <b>II</b>   | <b>Semester</b>        | <b>IV</b>       | <b>Credits</b>      | <b>2</b>     | <b>Course Code</b> | <b>25UEMA41</b> |
| <b>Instructional Hours per week</b> |   | <b>Lecture</b>         | <b>Tutorial</b> | <b>Lab Practice</b> | <b>Total</b> |                    |                 |
|                                     |   | <b>4</b>               | <b>-</b>        | <b>-</b>            | <b>4</b>     |                    |                 |
| <b>Learning Objectives</b>          |   |                        |                 |                     |              |                    |                 |
| <b>L01</b>                          | Define Random variables, Probability mass function, probability density function, and Distribution functions. |                        |                 |                     |              |                    |                 |
| <b>L02</b>                          | Compute Expectation and Variance.   |                        |                 |                     |              |                    |                 |
| <b>L03</b>                          | Know about Moment Generating functions and Characteristic functions.  |                        |                 |                     |              |                    |                 |
| <b>L04</b>                          | Solve problems involving the concepts of theoretical discrete distributions.                                  |                        |                 |                     |              |                    |                 |
| <b>L05</b>                          | Solve problems involving the concepts of theoretical continuous distributions                                 |                        |                 |                     |              |                    |                 |

| <b>Unit</b> | <b>Contents</b>   |
|-------------|---|
| <b>I</b>    | Random variables - Discrete random variable - Continuous random variable- Mathematical Expectations - Moment Generating functions - Characteristic function.<br>(Chapter 12: Sections - 12.0 to 12.6)   |
| <b>II</b>   | Binomial Distribution - Poisson Distribution<br>(Chapter 13: Sections - 13.0 to 13.2 )  |
| <b>III</b>  | Normal distribution - Some more Continuous Distributions.<br>(Chapter 13: Sections - 13.3 to 13.4)  |
| <b>IV</b>   | Sampling – Sampling Distribution – Testing of Hypothesis – Procedure for testing of Hypothesis large samples - Tests of Significance for large samples - Test of Significance for means - - Test of Significance for difference of samples means.<br>(Chapter 14: Section 14.0 to 14.5)   |
| <b>V</b>    | Test of Significance based on t-distribution - Test of Significance based on F-distribution - Test of Significance of an observed sample correlation $\chi^2$ -test for population variance - $\chi^2$ -test to test the goodness of fit- Test for Independence of attributes.<br>(Chapter 15 Section 15.0 to 15.3, Chapter 16: Section 16.0 to 16.3) |

|   |   |
|---|---|
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved  |
| Skills acquired from this course  | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill   |
| <b>Recommended Texts</b>  | <ul style="list-style-type: none"> <li>• S. Arumugam and A. Thangapandi Isaac, Statistics, New Gamma Publication, 2016.</li> </ul>  |
| <b>Reference books:</b>   | <ul style="list-style-type: none"> <li>• S. C. Gupta and V. K. Kapoor, Elements of Mathematical Statistics, 3rd Edition, Sultan Chand &amp; Sons, New Delhi, 2001.</li> <li>• P. R. Vittal, Mathematical Statistics, Margham Publications, Chennai, 2020.</li> <li>• S. C. Gupta S.C. and V. K. Kapoor V.K, Fundamentals of Mathematical Statistics, 12th Edition, Sultan Chand &amp; Sons, New Delhi, 2021.</li> </ul> |
| <b>Web Resources</b>  | <a href="http://NPTEL.co.in">http:// NPTEL.co.in</a>  |

| <b>Course outcomes:<br/>CO</b> | <b>On completion of this course, the students will be able to:</b>   |
|--------------------------------|--|
| <b>CO1</b>                     | Know Random variables, Probability mass function, probability density function, and Distribution functions |
| <b>CO2</b>                     | Compute Expectation, Variance and Covariance   |
| <b>CO3</b>                     | Know about Moment Generating functions and Characteristic functions  |
| <b>CO4</b>                     | Solve problems involving the concepts of theoretical discrete distributions                                |
| <b>CO5</b>                     | Solve problems involving the concepts of theoretical continuous distributions                              |

### Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| C01   | 3   | 3   | 2   | 3   | 3   | 3   | 3   | 3   |
| C02   | 2   | 3   | 3   | 3   | 2   | 3   | 3   | 2   |
| C03   | 3   | 3   | 3   | 2   | 3   | 2   | 3   | 2   |
| C04   | 2   | 3   | 3   | 3   | 3   | 3   | 3   | 3   |
| C05   | 3   | 2   | 3   | 3   | 3   | 3   | 3   | 3   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/PSO | PS01 | PS02 | PS03 | PS04 | PS05 |
|--------|------|------|------|------|------|
| C01    | 3    | 3    | 3    | 3    | 3    |
| C02    | 3    | 3    | 3    | 3    | 3    |
| C03    | 3    | 3    | 3    | 3    | 3    |
| C04    | 3    | 3    | 3    | 3    | 3    |
| C05    | 3    | 3    | 3    | 3    | 3    |

## Numerical Methods

|                                     |   |                          |                 |                |                     |                    |                 |
|-------------------------------------|---|--------------------------|-----------------|----------------|---------------------|--------------------|-----------------|
| <b>Title of the Course</b>          |   | <b>Numerical Methods</b> |                 |                |                     |                    |                 |
| <b>Course Type</b>                  |   | <b>Elective - IV</b>     |                 |                |                     |                    |                 |
| <b>Year</b>                         | <b>II</b>   | <b>Semester</b>          | <b>IV</b>       | <b>Credits</b> | <b>2</b>            | <b>Course Code</b> | <b>25UEMA42</b> |
| <b>Instructional Hours per week</b> |   | <b>Lecture</b>           | <b>Tutorial</b> |                | <b>Lab Practice</b> | <b>Total</b>       |                 |
|                                     |   | <b>4</b>                 | <b>-</b>        |                | <b>-</b>            | <b>4</b>           |                 |
| <b>Learning Objectives</b>          |   |                          |                 |                |                     |                    |                 |
| <b>L01</b>                          | Describe the roots of algebraic equations using different methods like, Bisection Method, False Method, Newton- Raphson method, Ramanujan's Method etc. |                          |                 |                |                     |                    |                 |
| <b>L02</b>                          | Find the real root of an equation and to find a quadratic factor of a polynomial.   |                          |                 |                |                     |                    |                 |
| <b>L03</b>                          | Find the missing term a given series  |                          |                 |                |                     |                    |                 |
| <b>L04</b>                          | Solve a given algebraic equation using direct and iterative methods.  |                          |                 |                |                     |                    |                 |
| <b>L05</b>                          | Find a polynomial for given data  |                          |                 |                |                     |                    |                 |

| <b>Unit</b> | <b>Contents</b>   |
|-------------|---|
| <b>I</b>    | Finite Differences: Difference Operators – Other Difference Operators – Error propagation in a difference table.<br>(Chapter 6: Sections - 6.1 to 6.3)  |
| <b>II</b>   | Interpolation: Newton's Interpolation Formulae – Central Difference Interpolation Formulae: Gauss Forward and Backward and Sterling's (only) –Lagrange's Interpolation Formula– Divided Differences – Newton's Divided Differences formula.<br>(Chapter 7: Sections - 7.1 to 7.5) [Except Bessel's and Laplace Everett's formulae in 7.2) |
| <b>III</b>  | Numerical Differentiation and Integration: Derivatives using Newton's forward difference formula –Derivatives using Newton's backward difference formula –Derivatives using central difference formula – Maxima and Minima of the Interpolating polynomial – Numerical Integration.<br>(Chapter 8: Sections - 8.1 to 8.5)                 |
| <b>IV</b>   | Numerical Solutions of Ordinary Differential Equations: Taylor's Series Method – Picard's method – Euler's method – Runge - Kutta method.<br>(Chapter 10: 10.1 to 10.4)   |
| <b>V</b>    | Numerical Solutions of Ordinary Differential Equations: Predictor Corrector method – Milne's Method – Adams-Bashforth method.<br>(Chapter 10: Sections – 10.5 to 10.7)  |

|   |  |
|---|--|
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved<br>(To be discussed during the Tutorial hour)  |
| Skills acquired from this course  | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill  |
| <b>Recommended Texts</b>  | S. Arumugam, A. Thangapandi Isaac and A. Somasundaram, Numerical Methods, Scitech, 2017.   |
| <b>Reference books:</b>   | <ol style="list-style-type: none"> <li>1. R.M. Somasundaram and R.M. Chandrasekaran, Numerical Methods with C++ Programming, Prentice Hall India Pvt.Ltd., New Delhi, 2005.</li> <li>2. S. S. Sastry, Introductory Methods of Numerical Analysis, Fourth Edition, PHI Learning Private Limited, New Delhi-1, 2009.</li> <li>3. Pallab Ghosh, Numerical Methods with Computer Programs in C++, Prentice Hall India Pvt. Ltd., New Delhi, 2009.</li> <li>4. T. Veerarajan and T. Ramachandran, Numerical Methods with Programs in C, Second Edition, McGraw Hill Education Pvt. Ltd, New Delhi, 2006.</li> </ol> |
| <b>Web Resources</b>  | <a href="http://nptl.ac.in">http://nptl.ac.in</a>  |

| <b>Course outcomes: CO</b> | <b>On completion of this course, the students will be able to:</b>  |
|----------------------------|---|
| <b>C01</b>                 | Describe the roots of algebraic equations using different methods like, Bisection Method, False Method, Newton- Raphson method, Ramanujan"s Method etc. |
| <b>C02</b>                 | Find the real root of an equation and to find a quadratic factor of a polynomial.   |
| <b>C03</b>                 | Find the missing term a given series  |
| <b>C04</b>                 | Solve a given algebraic equation using direct and iterative methods.  |
| <b>C05</b>                 | Find a polynomial for given data  |

## Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| C01   | 3   | 2   | 2   | 3   | 3   | 2   | 3   | 3   |
| C02   | 2   | 3   | 3   | 3   | 2   | 3   | 2   | 3   |
| C03   | 3   | 3   | 3   | 2   | 3   | 3   | 3   | 3   |
| C04   | 3   | 3   | 3   | 3   | 3   | 2   | 3   | 2   |
| C05   | 3   | 2   | 3   | 3   | 2   | 3   | 3   | 2   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/ PSO | PS01 | PS02 | PS03 | PS04 | PS05 |
|---------|------|------|------|------|------|
| C01     | 3    | 3    | 3    | 3    | 3    |
| C02     | 3    | 3    | 3    | 3    | 3    |
| C03     | 3    | 3    | 3    | 3    | 3    |
| C04     | 3    | 3    | 3    | 3    | 3    |
| C05     | 3    | 3    | 3    | 3    | 3    |

## Geogebra

|                                     |  |                                      |                 |                |                     |                    |                 |
|-------------------------------------|--|--------------------------------------|-----------------|----------------|---------------------|--------------------|-----------------|
| <b>Title of the Course</b>          |  | <b>Geogebra</b>                      |                 |                |                     |                    |                 |
| <b>Course Type</b>                  |  | <b>Skill Enhancement Course - IV</b> |                 |                |                     |                    |                 |
| <b>Year</b>                         | <b>II</b>  | <b>Semester</b>                      | <b>IV</b>       | <b>Credits</b> | <b>2</b>            | <b>Course Code</b> | <b>25USMA41</b> |
| <b>Instructional Hours per week</b> |  | <b>Lecture</b>                       | <b>Tutorial</b> |                | <b>Lab Practice</b> | <b>Total</b>       |                 |
|                                     |  | <b>2</b>                             | <b>--</b>       |                | <b>-</b>            | <b>2</b>           |                 |
| <b>Learning Objectives</b>          |  |                                      |                 |                |                     |                    |                 |
| <b>L01</b>                          | Install the Geogebra App and draw geometrical figures                          |                                      |                 |                |                     |                    |                 |
| <b>L02</b>                          | Know the commands and functions used in Geogebra                               |                                      |                 |                |                     |                    |                 |
| <b>L03</b>                          | Export of Pictures to the Clipboard and Insert Pictures into the Graphics View |                                      |                 |                |                     |                    |                 |
| <b>L04</b>                          | Insert Text into the Graphics View   |                                      |                 |                |                     |                    |                 |
| <b>L05</b>                          | Combine Spreadsheet View & Graphics View.                                      |                                      |                 |                |                     |                    |                 |

| <b>Unit</b> | <b>Contents</b>  |
|-------------|--|
| <b>I</b>    | Installation and Introduction of Geogebra - Drawing versus Geometric Construction.<br>(Chapters: 1 and 2)  |
| <b>II</b>   | Practice Block I – Basic Algebraic Input, Commands and Functions.<br>(Chapters: 3 and 4)   |
| <b>III</b>  | Export of Pictures to the Clipboard – Practice Block II – Inserting Pictures into the Graphics View.<br>(Chapters: 5, 6 and 7)                   |
| <b>IV</b>   | Inserting Text into the Graphics View – Practice Block III.<br>(Chapters: 8 and 9)   |
| <b>V</b>    | Combining Spreadsheet View & Graphics View - Creating Static Instructional Materials – Creating Dynamic Worksheets.<br>(Chapters: 10, 11 and 12) |

|   |  |
|---|--|
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved |
| Skills acquired from this course  | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill                    |
| <b>Recommended Texts</b>  | <ul style="list-style-type: none"> <li>1. Judith and Markus Hohenwarter, Introduction to GeoGebra, 2011.</li> </ul>                            |
| <b>Reference books:</b>   | <ul style="list-style-type: none"> <li>Reference Books 1. Steve Phelps, an Introduction to GeoGebra, 2011.</li> </ul>                          |
| <b>Web Resources</b>  | <ul style="list-style-type: none"> <li><a href="https://NPTEL.co.in">https://NPTEL.co.in</a></li> </ul>  |

| <b>Course outcomes:<br/>CO</b> | <b>On completion of this course, the students will be able to:</b>              |
|--------------------------------|---|
| <b>C01</b>                     | Install the GeoGebra App and draw geometrical figures.                          |
| <b>C02</b>                     | Know the commands and functions used in GeoGebra.                               |
| <b>C03</b>                     | Export of Pictures to the Clipboard and Insert Pictures into the Graphics View. |
| <b>C04</b>                     | Insert Text into the Graphics View.   |
| <b>C05</b>                     | Combine Spreadsheet View & Graphics View.                                       |

## Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| C01   | 3   | 3   | 2   | 3   | 3   | 2   | 3   | 3   |
| C02   | 2   | 3   | 3   | 3   | 2   | 2   | 3   | 2   |
| C03   | 3   | 2   | 3   | 2   | 3   | 3   | 3   | 2   |
| C04   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   |
| C05   | 3   | 2   | 3   | 3   | 2   | 3   | 3   | 2   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/PSO | PS01 | PS02 | PS03 | PS04 | PS05 |
|--------|------|------|------|------|------|
| C01    | 3    | 3    | 3    | 3    | 3    |
| C02    | 3    | 3    | 3    | 3    | 3    |
| C03    | 3    | 3    | 3    | 3    | 3    |
| C04    | 3    | 3    | 3    | 3    | 3    |
| C05    | 3    | 3    | 3    | 3    | 3    |

**Semester – V**  
**Abstract Algebra**

|                                     |  |                 |                 |                |                     |                    |                 |
|-------------------------------------|--|-----------------|-----------------|----------------|---------------------|--------------------|-----------------|
| <b>Title of the Course</b>          | <b>Abstract Algebra</b>  |                 |                 |                |                     |                    |                 |
| <b>Course Type</b>                  | <b>Core – IX</b>   |                 |                 |                |                     |                    |                 |
| <b>Year</b>                         | <b>III</b>   | <b>Semester</b> | <b>V</b>        | <b>Credits</b> | <b>5</b>            | <b>Course Code</b> | <b>25UMMA51</b> |
| <b>Instructional Hours per week</b> | <b>Lecture</b>   |                 | <b>Tutorial</b> |                | <b>Lab Practice</b> |                    | <b>Total</b>    |
|                                     | <b>5</b>   |                 | <b>-</b>        |                | <b>-</b>            |                    | <b>5</b>        |
| <b>Learning Objectives</b>          |  |                 |                 |                |                     |                    |                 |
| <b>L01</b>                          | Learning about groups, sub groups, cosets, normal subgroup and quotient groups |                 |                 |                |                     |                    |                 |
| <b>L02</b>                          | Learn to apply Lagrange’s theorem for a given finite group has a subgroup      |                 |                 |                |                     |                    |                 |
| <b>L03</b>                          | Learning Cayley’s theorem and functions for homomorphism                       |                 |                 |                |                     |                    |                 |
| <b>L04</b>                          | Learn about Rings and its properties   |                 |                 |                |                     |                    |                 |
| <b>L05</b>                          | Learn about the quotient ring and to discuss about the field                   |                 |                 |                |                     |                    |                 |

| <b>UNIT</b> | <b>CONTENTS</b>   |
|-------------|---|
| <b>I</b>    | Groups: Definition and Examples – Properties – Permutation Groups – Subgroups – Cyclic Groups.<br>(Chapter 3: Sections-3.1, 3.2, 3.4 to 3.6)                            |
| <b>II</b>   | Order of an element – Cosets and Lagrange’s Theorem – Normal subgroups and Quotient groups.<br>(Chapter3: Sections-3.7 to 3.9)  |
| <b>III</b>  | Isomorphism– Cayley’s Theorem–Homomorphisms- Fundamental Theorem<br>(Chapter3: Sections-3.10 and 3.11)  |
| <b>IV</b>   | Definition and examples –Properties – Types of rings – Characteristic of a ring – Subrings – Ideals.<br>(Chapter4: Section-4.1, 4.2, 4.4 to 4.7)                        |
| <b>V</b>    | Quotient Rings – Maximal and Prime Ideals –Homomorphism and Isomorphism of Ring – The field of quotients of an Integral Domain.<br>(Chapter4: Section-4.3, 4.8 to 4.11) |

|   |   |
|---|---|
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the tutorial hour)  |
| Skills acquired from this course  | Knowledge, Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill   |
| <b>Recommended Texts</b>  | S. Arumugam and A. Thangapandi Isaac, Modern Algebra, Sci tech Publications, 2014.  |
| <b>Reference books</b>  | <ol style="list-style-type: none"> <li>1. N. Herstein, Topics in Algebra, Wiley Eastern Ltd. Second Edition, 2006.</li> <li>2. John B. Fraleigh, a First Course in Abstract Algebra, 7<sup>th</sup> Ed., Pearson, 2002.</li> <li>3. M. Artin, Abstract Algebra, 2<sup>nd</sup> Ed., Pearson, 2011.</li> <li>4. Joseph A Gallian, Contemporary Abstract Algebra, 4th Edition, Narosa, 1999.</li> </ol> |
| <b>Web Resources</b>  | <a href="https://nptel.ac.in">https://nptel.ac.in</a>   |

| <b>Course outcomes CO</b> | <b>On completion of this course, the students will be able to</b>  |
|---------------------------|--|
| <b>CO1</b>                | Understand and explain the fundamental concepts of group theory including groups, subgroups, cyclic groups, and permutation groups.                      |
| <b>CO2</b>                | Apply the concepts of cosets, order of elements, Lagrange's theorem, normal subgroups, and quotient groups to solve algebraic problems.                  |
| <b>CO3</b>                | Analyze algebraic structures using homomorphisms, isomorphisms, Cayley's theorem, and the fundamental theorem of homomorphism.                           |
| <b>CO4</b>                | Understand and classify ring structures including types of rings, subrings, ideals, characteristics of rings, and special classes of rings.              |
| <b>CO5</b>                | Apply the concepts of quotient rings, maximal and prime ideals, ring homomorphisms, and fields of quotients to theoretical and problem-solving contexts. |

## Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|
| <b>C01</b> | 3   | 3   | 2   | 3   | 3   | 2   | 3   | 3   |
| <b>C02</b> | 2   | 3   | 3   | 3   | 2   | 3   | 3   | 2   |
| <b>C03</b> | 3   | 2   | 3   | 2   | 3   | 3   | 3   | 3   |
| <b>C04</b> | 3   | 3   | 3   | 3   | 3   | 2   | 3   | 3   |
| <b>C05</b> | 3   | 2   | 3   | 3   | 2   | 3   | 3   | 2   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/PSO     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------|------|------|------|------|------|
| <b>C01</b> | 2    | 1    | 1    | 2    | 1    |
| <b>C02</b> | 2    | 3    | 1    | 3    | 1    |
| <b>C03</b> | 3    | 3    | 3    | 3    | 1    |
| <b>C04</b> | 2    | 1    | 3    | 3    | 1    |
| <b>C05</b> | 3    | 3    | 3    | 3    | 1    |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

## Real Analysis

|                                     |   |                 |                 |                |                     |                    |                 |
|-------------------------------------|---|-----------------|-----------------|----------------|---------------------|--------------------|-----------------|
| <b>Title of the Course</b>          | <b>Real Analysis</b>  |                 |                 |                |                     |                    |                 |
| <b>Course Type</b>                  | <b>Core - X</b>   |                 |                 |                |                     |                    |                 |
| <b>Year</b>                         | <b>III</b>  | <b>Semester</b> | <b>V</b>        | <b>Credits</b> | <b>5</b>            | <b>Course Code</b> | <b>25UMMA52</b> |
| <b>Instructional Hours per week</b> | <b>Lecture</b>  |                 | <b>Tutorial</b> |                | <b>Lab Practice</b> | <b>Total</b>       |                 |
|                                     | <b>5</b>  |                 | <b>-</b>        |                | <b>-</b>            | <b>5</b>           |                 |
| <b>Learning Objectives</b>          |   |                 |                 |                |                     |                    |                 |
| <b>L01</b>                          | To learn about the concepts of open sets closed sets interior and closure of sets               |                 |                 |                |                     |                    |                 |
| <b>L02</b>                          | To explain the concepts of limit point and complete metric space                                |                 |                 |                |                     |                    |                 |
| <b>L03</b>                          | To define and verify continuous, uniform continuous and discontinuous function on $R$           |                 |                 |                |                     |                    |                 |
| <b>L04</b>                          | To know the concept of connected and continuity   |                 |                 |                |                     |                    |                 |
| <b>L05</b>                          | To explain the concept of compact subset of $R$ and equivalent characterization of compactness. |                 |                 |                |                     |                    |                 |

| <b>UNIT</b> | <b>CONTENTS</b>   |
|-------------|---|
| <b>I</b>    | Metric spaces: Definition and Examples – Bounded sets – Open ball– Open sets – Subspaces– Interior of a set.<br>(Chapter 2: Section - 2.1to 2.7)  |
| <b>II</b>   | Closed sets– Closure– Limit point– Dense set– Complete metric space: Completeness –Cantor’s Intersection Theorem– Baire’s Category Theorem.<br>(Chapter 2: Sections – 2.8 to 2.11 and Chapter 3: Sections – 3.1, 3.2 & 3.3) |
| <b>III</b>  | Continuity: Continuity –Homeomorphism–Uniform Continuity – Discontinuous functions on $R$ .<br>(Chapter 4: Sections- 4.1 to 4.5)  |
| <b>IV</b>   | Connectedness: Definition and Examples –Connected subsets of $R$ –Connectedness and Continuity–Contraction mapping theorem.<br>(Chapter 5: Sections-5.1 to 5.4 and Chapter 8: Section - 8.2)                                |
| <b>V</b>    | Compactness: Compact metric spaces–Compact subsets of $R$ – Equivalent characterizations for compactness–Compactness and Continuity.<br>(Chapter 6: Sections- 6.1 to 6.5)   |

|   |  |
|---|--|
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the tutorial hour)   |
| Skills acquired from this course  | Knowledge, Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill  |
| <b>Recommended Texts</b>  | S. Arumugam and A. Thangapandi Issac, Modern Analysis, New Gamma Publishing House, Palayamkottai, 2015   |
| <b>Reference books</b>  | <ol style="list-style-type: none"> <li>1. Richard R.Goldberg, Methods of Real Analysis, (John Wiley &amp;sons, 2nd Edition) (Indian edition –Oxford and IBH Publishing Co, New Delhi, 1st January 2020)</li> <li>2. Walter Rudin, Principles of Mathematical Analysis, Tata McGraw Hill Education, Third Edition (1 July 2017).</li> <li>3. Tom M Apostol, Mathematical Analysis, Narosa Publishing House, 2<sup>nd</sup> edition (1974), Addison-Wesley publishing company, New Delhi.</li> </ol> |
| <b>Web Resources</b>  | <a href="https://nptel.ac.in">https://nptel.ac.in</a>  |

| <b>Course outcomes CO</b> | <b>On completion of this course, the students will be able to</b>                                     |
|---------------------------|---|
| <b>CO1</b>                | Explain the concepts of bounded, open and closed sets and to find interior and closure of a given set |
| <b>CO2</b>                | Explain the concepts of limit point and dense set and define complete metric space                    |
| <b>CO3</b>                | Define and verify continuous, uniform continuous and discontinuous function on $R$                    |
| <b>CO4</b>                | Explain the concept of connected and theorems on connected and continuity                             |
| <b>CO5</b>                | Explain the concept of compact, compact subset of $R$ and equivalent characterization of compactness  |

### Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| C01   | 3   | 3   | 2   | 3   | 3   | 2   | 3   | 3   |
| C02   | 2   | 3   | 3   | 3   | 2   | 3   | 3   | 3   |
| C03   | 3   | 3   | 3   | 2   | 3   | 3   | 3   | 2   |
| C04   | 3   | 3   | 3   | 3   | 3   | 2   | 3   | 3   |
| C05   | 3   | 2   | 3   | 3   | 2   | 3   | 3   | 2   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/ PSO | PS01 | PS02 | PS03 | PS04 | PS05 |
|---------|------|------|------|------|------|
| C01     | 3    | 3    | 3    | 1    | 3    |
| C02     | 3    | 3    | 3    | 3    | 1    |
| C03     | 3    | 3    | 3    | 3    | 2    |
| C04     | 3    | 3    | 3    | 1    | 2    |
| C05     | 3    | 3    | 3    | 3    | 3    |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

## Graph Theory

|                                     |   |                     |           |                 |          |                     |                 |
|-------------------------------------|---|---------------------|-----------|-----------------|----------|---------------------|-----------------|
| <b>Title of the Course</b>          |   | <b>Graph Theory</b> |           |                 |          |                     |                 |
| <b>Course Type</b>                  |   | <b>Core - XI</b>    |           |                 |          |                     |                 |
| <b>Year</b>                         | <b>III</b>  | <b>Semester</b>     | <b>VI</b> | <b>Credits</b>  | <b>5</b> | <b>Course Code</b>  | <b>25UMMA53</b> |
| <b>Instructional Hours per week</b> |   | <b>Lecture</b>      |           | <b>Tutorial</b> |          | <b>Lab Practice</b> | <b>Total</b>    |
|                                     |   | 5                   |           | --              |          | --                  | 5               |
| <b>Learning Objectives</b>          |   |                     |           |                 |          |                     |                 |
| <b>L01</b>                          | Learn about Graph, Subgraph, Walks, Paths, and Cycles.                                    |                     |           |                 |          |                     |                 |
| <b>L02</b>                          | Learn about Connected, Disconnected graphs, Eulerian graphs, Hamiltonian Paths and Trees. |                     |           |                 |          |                     |                 |
| <b>L03</b>                          | Give Matrix Representations of Graphs.  |                     |           |                 |          |                     |                 |
| <b>L04</b>                          | Know about Planar Graphs, Chromatic number and Chromatic Polynomial of a Graph            |                     |           |                 |          |                     |                 |
| <b>L05</b>                          | Know Matching and to describe about digraph and Euler diagram.                            |                     |           |                 |          |                     |                 |

| <b>UNIT</b> | <b>CONTENTS</b>  |
|-------------|--|
| <b>I</b>    | Definition and examples of graphs –degrees- subgraphs–isomorphism– independent sets and coverings–matrices–operations of graphs.<br>(Chapter 2: Section- 2.0 to 2.4, 2.6, 2.8 & 2.9) |
| <b>II</b>   | Degree sequences– graphic sequences– walks–trails and paths –connectedness and components–connectivity<br>(Chapter 3: Section – 3.0 to 3.2 and Chapter 4: Section- 4.0 to 4.2 & 4.4) |
| <b>III</b>  | Eulerian graphs–Hamiltonian graphs, Trees and its characterization–centre of a tree.<br>(Chapter 5 and 6)  |
| <b>IV</b>   | Planar graphs-Definition and properties–chromatic number and chromatic index<br>(Chapter 8: Section-8.0 to 8.2 and Chapter 9: Section - 9.0 & 9.1)                                   |
| <b>V</b>    | Chromatic polynomials, definition and basic properties of digraphs, paths and connectedness in digraphs.<br>(Chapter 9: Section - 9.4 and Chapter 10: Section - 10.0 to10.3)         |

|   |  |
|---|--|
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)  |
| Skills acquired from this Course  | Knowledge Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill   |
| <b>Recommended Texts</b>  | S. Arumugam and S. Ramachandran, Invitation to Graph Theory, Scitech Publications, Chennai, 2001   |
| <b>Reference books</b>  | <ol style="list-style-type: none"> <li>1. Frank Harary, Graph Theory, Narosa Publishing House Pvt Ltd, New Delhi, 2001.</li> <li>2. Narsingh Deo, Graph Theory with Applications to Engineering &amp; Computer Science, Prentice Hall of India, New Delhi, 1974.</li> <li>3. S. P. Rajagopalan and R. Sattanathan, Graph Theory, Margham Publications, Chennai.</li> <li>4. Neeraj Pant and Shahab Faruqi, Graph Theory, CBS Publisher, 2017.</li> </ol> |
| <b>Web Resources</b>  | <a href="https://nptel.ac.in">https://nptel.ac.in</a>  |

| <b>Course outcomes CO</b> | <b>On completion of this course, the students will be able to</b>   |
|---------------------------|---|
| <b>CO1</b>                | Define and explain fundamental concepts of graph theory, including graphs, degrees, subgraphs, isomorphism, independent sets, coverings, graph matrices, and graph operations.  |
| <b>CO2</b>                | Analyze degree sequences and graphic sequences, and apply concepts of walks, trails, paths, connectedness, components, and connectivity in solving graph-theoretic problems.    |
| <b>CO3</b>                | Identify and characterize special classes of graphs such as Eulerian graphs, Hamiltonian graphs, and trees, and determine structural properties including the center of a tree. |
| <b>CO4</b>                | Explain and apply the concepts of planar graphs, graph coloring, chromatic number, and chromatic index to theoretical and practical graph problems.                             |
| <b>CO5</b>                | Evaluate chromatic polynomials and analyze directed graphs (digraphs) with respect to paths, connectivity, and structural properties.   |

### Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| C01   | 3   | 2   | 2   | 3   | 3   | 2   | 3   | 3   |
| C02   | 3   | 1   | 3   | 3   | 2   | 3   | 3   | 3   |
| C03   | 3   | 1   | 3   | 2   | 3   | 3   | 3   | 2   |
| C04   | 3   | 1   | 3   | 3   | 3   | 2   | 3   | 3   |
| C05   | 3   | 2   | 3   | 3   | 2   | 3   | 3   | 2   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/ PSO | PS01 | PS02 | PS03 | PS04 | PS05 |
|---------|------|------|------|------|------|
| C01     | 3    | 3    | 3    | 3    | 2    |
| C02     | 3    | 3    | 3    | 3    | 2    |
| C03     | 3    | 3    | 3    | 3    | 2    |
| C04     | 3    | 3    | 3    | 3    | 2    |
| C05     | 3    | 3    | 3    | 3    | 2    |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

## Mathematical Modelling

|                                     |   |                               |                 |                |                     |                    |                 |
|-------------------------------------|---|-------------------------------|-----------------|----------------|---------------------|--------------------|-----------------|
| <b>Title of the Course</b>          |   | <b>Mathematical Modelling</b> |                 |                |                     |                    |                 |
| <b>Course Type</b>                  |   | <b>Core - XII</b>             |                 |                |                     |                    |                 |
| <b>Year</b>                         | <b>III</b>  | <b>Semester</b>               | <b>V</b>        | <b>Credits</b> | <b>4</b>            | <b>Course Code</b> | <b>25UMMA54</b> |
| <b>Instructional Hours per week</b> |   | <b>Lecture</b>                | <b>Tutorial</b> |                | <b>Lab Practice</b> | <b>Total</b>       |                 |
|                                     |   | <b>5</b>                      | <b>-</b>        |                | <b>-</b>            | <b>5</b>           |                 |
| <b>Learning Objectives</b>          |   |                               |                 |                |                     |                    |                 |
| <b>L01</b>                          | To explain simple mathematical modelling  |                               |                 |                |                     |                    |                 |
| <b>L02</b>                          | To know model using differential equations in-terms of linear growth and decay models |                               |                 |                |                     |                    |                 |
| <b>L03</b>                          | To discuss about various models under the categories Epidemic's and Medicine          |                               |                 |                |                     |                    |                 |
| <b>L04</b>                          | To explain in detail about difference equations                                       |                               |                 |                |                     |                    |                 |
| <b>L05</b>                          | To evaluate model using difference equations  |                               |                 |                |                     |                    |                 |

| <b>UNIT</b> | <b>CONTENTS</b>   |
|-------------|---|
| <b>I</b>    | Mathematical modelling: Simple situations requiring mathematical modelling, characteristics of mathematical models.<br>(Chapter 1: Sections -1.1 and 1.4)   |
| <b>II</b>   | Mathematical modelling through differential equations: Linear growth and decay models, Non-linear growth and decay models, Compartment models.<br>(Chapter 2: Sections -2.1 to 2.4)   |
| <b>III</b>  | Mathematical modelling through system of ordinary differential equations of first order: Prey-predator models, Competition models, Model with removal and model with immigrations, Epidemics: simple epidemic model, Susceptible-infected- susceptible (SIS) model, SIS model with constant number of carriers, Medicine: Model for diabetes mellitus.<br>(Chapter 3: Sections -3.1.1,3.1.2, 3.2.1 to 3.2.4,3.2.6, 3.5.1) |
| <b>IV</b>   | Introduction to difference equations.<br>(Chapter 5: Sections -5.1, 5.2.1 to 5.2.3)   |
| <b>V</b>    | Mathematical modelling through difference equations: Harrod Model, cob web model application to Actuarial Science.<br>(Chapter 5: Sections - 5.3.1,5.3.2, 5.3.4)  |

|  |  |
|--|--|
| Extended Professional Component<br>(is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved<br>(To be discussed during the Tutorial hour)  |
| Skills acquired from this course   | Knowledge, Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill  |
| <b>Recommended Texts</b>   | JN Kapur, Mathematical Modelling, New Age International Publishers, 2009.  |
| <b>Reference books</b>   | <ol style="list-style-type: none"> <li>1. Bimal K. Mishra and Dipak K. Satpathi, Mathematical Modeling, Ane Books India, 2007.</li> <li>2. Sandip Banerjee, Mathematical Modeling Models, Analysis and Applications, CRC Press, Taylor &amp; Francis group, 2014.</li> <li>3. Mathematical Modeling applications with Geogebra by Jonas Hall &amp; Thomas Ligeftard, John Wiley &amp; Sons, 2017</li> <li>4. Mark M. Meerschaert: Mathematical Modeling, Elsevier Publ., 2007.</li> <li>5. Edward A. Bender: An introduction to Mathematical Modeling, CRC Press,2002</li> <li>6. Walter J. Meyer, Concepts of Mathematical Modeling, Dover Publ., 2000</li> </ol> |
| <b>Web Resources</b>   | <a href="https://nptel.ac.in">https://nptel.ac.in</a>  |

| <b>Course outcomes CO</b> | <b>On completion of this course, the students will be able to</b>   |
|---------------------------|---|
| <b>CO1</b>                | Explain simple situations requiring Mathematical Modelling and to determine the characteristics of such models                                      |
| <b>CO2</b>                | Model using differential equation sin-terms of linear growth and decay models   |
| <b>CO3</b>                | Model using systems of ordinary differential equations of first order, to discuss about various models under the categories Epidemic's and Medicine |
| <b>CO4</b>                | Explain in detail about difference equations  |
| <b>CO5</b>                | Model using difference equations  |

## Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| C01   | 3   | 3   | 2   | 3   | 3   | 2   | 3   | 3   |
| C02   | 2   | 3   | 3   | 3   | 2   | 3   | 3   | 3   |
| C03   | 3   | 3   | 3   | 2   | 3   | 3   | 3   | 2   |
| C04   | 3   | 3   | 3   | 3   | 3   | 2   | 3   | 3   |
| C05   | 3   | 2   | 3   | 3   | 2   | 3   | 3   | 2   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/ PSO | PS01 | PS02 | PS03 | PS04 | PS05 |
|---------|------|------|------|------|------|
| C01     | 3    | 3    | 2    | 3    | 2    |
| C02     | 3    | 3    | 3    | 3    | 2    |
| C03     | 3    | 2    | 3    | 3    | 2    |
| C04     | 3    | 3    | 3    | 3    | 2    |
| C05     | 3    | 3    | 3    | 2    | 2    |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

## Project with Viva-Voce

|                                     |            |   |                 |                     |          |                    |                 |
|-------------------------------------|------------|---|-----------------|---------------------|----------|--------------------|-----------------|
| <b>Title of the Course</b>          |            | <b>Project with Viva Voce</b>   |                 |                     |          |                    |                 |
| <b>Course Type</b>                  |            | <b>Project</b>  |                 |                     |          |                    |                 |
| <b>Year</b>                         | <b>III</b> | <b>Semester</b>   | <b>V</b>        | <b>Credits</b>      | <b>4</b> | <b>Course Code</b> | <b>25UMMAP1</b> |
| <b>Instructional Hours per week</b> |            | <b>Lecture</b>  | <b>Tutorial</b> | <b>Lab Practice</b> |          | <b>Total</b>       |                 |
|                                     |            | <b>5</b>  | <b>-</b>        | <b>-</b>            |          | <b>5</b>           |                 |
| <b>Objectives of the Course</b>     |            | <ul style="list-style-type: none"> <li>• <b>Motivate the students to get thorough idea on a specific topic and an idea for doing research.</b></li> </ul> |                 |                     |          |                    |                 |

### Project Viva-Voce Examination:

- Internal: 50 Marks and External: 50 Marks (Total: 100 Marks)
- Group (Maximum five students)

Project report should be submitted. External 50 marks will be evaluated by external examiners

## Operations Research - I

|                                     |            |   |          |                 |          |                     |                 |
|-------------------------------------|------------|---|----------|-----------------|----------|---------------------|-----------------|
| <b>Title of the Course</b>          |            | <b>Operations Research - I</b>  |          |                 |          |                     |                 |
| <b>Course Type</b>                  |            | <b>Elective - V</b>   |          |                 |          |                     |                 |
| <b>Year</b>                         | <b>III</b> | <b>Semester</b>   | <b>V</b> | <b>Credits</b>  | <b>3</b> | <b>Course Code</b>  | <b>25UEMA51</b> |
| <b>Instructional Hours per week</b> |            | <b>Lecture</b>  |          | <b>Tutorial</b> |          | <b>Lab Practice</b> | <b>Total</b>    |
|                                     |            | <b>5</b>  |          | <b>-</b>        |          | <b>-</b>            | <b>5</b>        |
| <b>Learning Objectives</b>          |            |   |          |                 |          |                     |                 |
| <b>L01</b>                          |            | Provide a strong foundation in linear programming and optimization techniques.                            |          |                 |          |                     |                 |
| <b>L02</b>                          |            | Develop the ability to formulate managerial decision problems into mathematical models.                   |          |                 |          |                     |                 |
| <b>L03</b>                          |            | Enable students to apply simplex, duality, transportation, and assignment methods to real-world problems. |          |                 |          |                     |                 |
| <b>L04</b>                          |            | Enhance analytical reasoning and quantitative decision-making skills.                                     |          |                 |          |                     |                 |
| <b>L05</b>                          |            | Promote scientific and research-oriented thinking in business optimization problems.                      |          |                 |          |                     |                 |

| <b>UNIT</b> | <b>CONTENTS</b>  |
|-------------|--|
| <b>I</b>    | Linear Programming: Linear Programming Problem: Mathematical formulation of the problem- Illustration on mathematical formulation of LPP - Graphical solution method-Some exceptional cases-General Linear Programming Problem-Canonical and Standard forms of LPP.<br>(Chapter 2: Sections - 2.1 to 2.4, Chapter 3: Section - 3.1 to 3.5) |
| <b>II</b>   | Simplex Method: The computational procedure – Use of artificial variable-Degeneracy in Linear Programming<br>(Chapter 4: Section - 4.3 to 4.5)   |
| <b>III</b>  | Duality in LPP: General Primal-Dual pair – Formulating a Dual problem – Primal-Dual pair in matrix form-Duality Theorems– Duality and Simplex method – Dual Simplex method.<br>(Chapter 5: Sections - 5.2 to 5.5, 5.7, 5.9)  |
| <b>IV</b>   | Transportation Problem (TP): Formulation of the TP- Existence of solution in TP – Duality in TP –Solution of a TP – Finding an initial basic feasible solution-Degeneracy in TP – Transportation Algorithm(MODI method).<br>(Chapter 10: Sections – 10.2 to 10.4, 10.8, 10.9, 10.12, 10.13)  |

|          |  |
|----------|--|
| <b>V</b> | Assignment Problem (AP): Mathematical formulation of an AP – Solution methods of AP - Hungarian assignment method– Special case in AP - Dual of the AP.<br>(Chapter 11: Sections – 11.1 to 11.3, 11.4, 11.6) |
|----------|--|

|   |  |
|---|--|
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved<br>(To be discussed during the Tutorial hour)  |
| Skills acquired from this course  | Knowledge, Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill  |
| <b>Recommended Texts</b>  | Kanti Swarup, P. K. Gupta and Man Mohan, Operations Research, [19th Revised Edition], Sultan Chand & Sons, New Delhi, 2018.  |
| <b>Reference books</b>  | P. K. Gupta, and D. S. Hira, Operations Research, Sultan Chand & Sons, New Delhi, 2020.<br>P. K. Gupta and Man Mohan. Problems in Operations Research [Ninth Edition], Sultan Chand and Sons, New Delhi, 2014.<br>S. Kalavathy, Operations Research [Fourth Edition], Vikas Publishing House, Chennai, 2012. |
| <b>Web Resources</b>  | <a href="https://nptel.ac.in">https://nptel.ac.in</a>  |

| <b>Course outcomes<br/>CO</b> | <b>On completion of this course, the students will be able to</b>   |
|-------------------------------|---|
| <b>C01</b>                    | Formulate linear programming problems (LPP) from real-life situations and solve the using graphical methods.              |
| <b>C02</b>                    | Apply the Simplex method, including artificial variable techniques, to obtain optimal solutions and interpret degeneracy. |
| <b>C03</b>                    | Analyze and construct primal-dual relationships and solve problems using duality concepts and the Dual Simplex method.    |
| <b>C04</b>                    | Formulate and solve Transportation Problems using initial basic feasible solutions and the MODI method.                   |
| <b>C05</b>                    | Develop and solve Assignment Problems using the Hungarian method and analyze special cases including dual formulations.   |

## Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| C01   | 3   | 3   | 2   | 3   | 3   | 2   | 3   | 3   |
| C02   | 2   | 3   | 3   | 3   | 2   | 3   | 3   | 3   |
| C03   | 3   | 3   | 3   | 2   | 3   | 3   | 3   | 2   |
| C04   | 3   | 3   | 3   | 3   | 3   | 2   | 3   | 3   |
| C05   | 3   | 2   | 3   | 3   | 2   | 3   | 3   | 2   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/ PSO | PS01 | PS02 | PS03 | PS04 | PS05 |
|---------|------|------|------|------|------|
| C01     | 3    | 3    | 3    | 3    | 1    |
| C02     | 3    | 2    | 3    | 2    | 1    |
| C03     | 3    | 3    | 3    | 3    | 1    |
| C04     | 3    | 3    | 2    | 3    | 1    |
| C05     | 3    | 3    | 3    | 3    | 1    |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

## Discrete Mathematics

|                                     |  |                             |                 |                |                     |                    |                 |
|-------------------------------------|--|-----------------------------|-----------------|----------------|---------------------|--------------------|-----------------|
| <b>Title of the Course</b>          |  | <b>Discrete Mathematics</b> |                 |                |                     |                    |                 |
| <b>Course Type</b>                  |  | <b>Elective - V</b>         |                 |                |                     |                    |                 |
| <b>Year</b>                         | <b>III</b>   | <b>Semester</b>             | <b>V</b>        | <b>Credits</b> | <b>3</b>            | <b>Course Code</b> | <b>25UEMA52</b> |
| <b>Instructional Hours per week</b> |  | <b>Lecture</b>              | <b>Tutorial</b> |                | <b>Lab Practice</b> | <b>Total</b>       |                 |
|                                     |  | <b>5</b>                    |                 |                | <b>-</b>            | <b>5</b>           |                 |
| <b>Learning Objectives</b>          |  |                             |                 |                |                     |                    |                 |
| <b>L01</b>                          | To learn about mathematical logic statement and notations  |                             |                 |                |                     |                    |                 |
| <b>L02</b>                          | To know about tautology and contradiction                  |                             |                 |                |                     |                    |                 |
| <b>L03</b>                          | To find the theory of inference for the predicate calculus |                             |                 |                |                     |                    |                 |
| <b>L04</b>                          | To define relations, ordering and types of functions       |                             |                 |                |                     |                    |                 |
| <b>L05</b>                          | To define lattice and study the properties of lattice      |                             |                 |                |                     |                    |                 |

| <b>UNIT</b> | <b>CONTENTS</b>   |
|-------------|---|
| <b>I</b>    | Mathematical logic: Statements and Notations – Connectives– Negation – Conjunction –Disjunction –Statement formulas and truth table – Conditional and Biconditional–Well-formed Formulas–Tautologies.<br>(Chapter 1: Sections- 1.1,1.2.1 to 1.2.4, 1.2.6 to 1.2.8)  |
| <b>II</b>   | Normal forms–Disjunctive Normal forms– Conjunctive Normal forms – Principal Disjunctive Normal forms – Principal conjunctive Normal forms – Ordering and Uniqueness of Normal forms – Validity using truth tables – Rules of inference.<br>(Chapter 1: Sections- 1.3.1 to1.3.5,1.4.1,1.4.2)                               |
| <b>III</b>  | The Predicate calculus–Predicates –The Statement function, Variables and quantifiers –Predicate formulas–Free and bound variables – The Universe of discourse.<br>(Chapter 1: Sections -1.5.1 to 1.5.5)   |
| <b>IV</b>   | Relations and Ordering–Relations –Properties of Binary relations in a set– Partial ordering– Partially ordered set: Representation and Associated terminology - Functions: Definition and Introduction–Composition of functions – Inverse functions.<br>(Chapter 2: Sections -2.3.1, 2.3.2, 2.3.8, 2.3.9, 2.4.1 to 2.4.3) |
| <b>V</b>    | Lattices as partially ordered sets: Definition and examples–Some properties of Lattices–Sub lattices, Direct product and Homomorphism – Boolean algebra: Definition and examples – Sub Algebra, Direct product and Homomorphism.<br>(Chapter4: Sections -4.1.1, 4.1.2, 4.1.4, 4.2.1, 4.2.2)                               |

|  |  |
|--|--|
| Extended Professional Component<br>(is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved<br>(To be discussed during the Tutorial hour)   |
| Skills acquired from this course   | Knowledge, Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill  |
| <b>Recommended Texts</b>   | J.P. Tremblay, R. Manohar, Discrete Mathematical structures with Applications to Computer Science, Tata McGraw hill, 2001.   |
| <b>Reference books</b>   | <ol style="list-style-type: none"> <li>1. M.K. Sen and B.C. Charraborthy, Introduction to Discrete Mathematics, Arunabha Sen Books &amp; Allied Pvt. Ltd, Kolkatta.</li> <li>2. Kenneth H.Rosen, Discrete Mathematics and Its Applications, Fourth Edition.</li> </ol> |
| <b>Web Resources</b>   | <a href="https://nptel.ac.in">https://nptel.ac.in</a>  |

| <b>Course outcomes CO</b> | <b>On completion of this course, the students will be able to</b>   |
|---------------------------|---|
| <b>C01</b>                | Find mathematical logic statement and notations   |
| <b>C02</b>                | Determine whether a given statement is a tautology, a contradiction, or satisfiable using a decision procedure that terminates in a finite number of steps. |
| <b>C03</b>                | Find the predicate logic and find the theory of inference for the Predicate calculus  |
| <b>C04</b>                | Define Relations, Ordering and types of functions   |
| <b>C05</b>                | Define Lattice and study the properties of Lattice  |

### Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| C01   | 3   | 3   | 2   | 3   | 3   | 2   | 3   | 3   |
| C02   | 2   | 3   | 3   | 3   | 2   | 3   | 3   | 3   |
| C03   | 3   | 3   | 3   | 2   | 3   | 3   | 3   | 2   |
| C04   | 3   | 3   | 3   | 3   | 3   | 2   | 3   | 3   |
| C05   | 3   | 2   | 3   | 3   | 2   | 3   | 3   | 2   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/ PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------|------|------|------|------|------|
| C01     | 3    | 2    | 3    | 3    | 1    |
| C02     | 3    | 3    | 3    | 3    | 1    |
| C03     | 3    | 3    | 3    | 2    | 1    |
| C04     | 3    | 3    | 3    | 3    | 1    |
| C05     | 3    | 3    | 2    | 3    | 1    |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

## Combinatorial Mathematics

|                                     |   |                                  |                 |                |                     |                    |                 |
|-------------------------------------|---|----------------------------------|-----------------|----------------|---------------------|--------------------|-----------------|
| <b>Title of the Course</b>          |   | <b>Combinatorial Mathematics</b> |                 |                |                     |                    |                 |
| <b>Course Type</b>                  |   | <b>Elective - VI</b>             |                 |                |                     |                    |                 |
| <b>Year</b>                         | <b>III</b>  | <b>Semester</b>                  | <b>V</b>        | <b>Credits</b> | <b>3</b>            | <b>Course Code</b> | <b>25UEMA53</b> |
| <b>Instructional Hours per week</b> |   | <b>Lecture</b>                   | <b>Tutorial</b> |                | <b>Lab Practice</b> | <b>Total</b>       |                 |
|                                     |   | <b>5</b>                         | <b>-</b>        |                | <b>-</b>            | <b>5</b>           |                 |
| <b>Learning Objectives</b>          |   |                                  |                 |                |                     |                    |                 |
| <b>L01</b>                          | To find binomial coefficients and classify ordered selections |                                  |                 |                |                     |                    |                 |
| <b>L02</b>                          | To solve pairing problems                                     |                                  |                 |                |                     |                    |                 |
| <b>L03</b>                          | To explain recurrence and generating functions                |                                  |                 |                |                     |                    |                 |
| <b>L04</b>                          | To illustrate the inclusion and exclusion principles          |                                  |                 |                |                     |                    |                 |
| <b>L05</b>                          | To construct and solve block designs and square block designs |                                  |                 |                |                     |                    |                 |

| <b>UNIT</b> | <b>CONTENTS</b>   |
|-------------|---|
| <b>I</b>    | Selections and Binomial coefficients–Permutations–Ordered selections–unordered selections–Miscellaneous Problems.<br>(Chapter1:Sections - 1.1 to 1.4) |
| <b>II</b>   | Parings Problems: Pairings within a set–Pairing between sets.<br>(Chapter2:Sections -2.1 and 2.2)   |
| <b>III</b>  | Recurrence–Fibonacci-type relations using generating functions–Miscellaneous methods.<br>(Chapter 3:Sections - 3.1 to 3.4)                            |
| <b>IV</b>   | The Inclusion-Exclusion Principles – Rook Polynomial.<br>(Chapter 4:Sections- 4.1to 4.3)  |
| <b>V</b>    | Block designs– Square block designs.<br>(Chapter 5:Sections- 5.1, 5.2)  |

|   |   |
|---|---|
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved<br>(To be discussed during the Tutorial hour) |
| Skills acquired from this course  | Knowledge, Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill   |

|                           |   |
|---------------------------|---|
| <b>Recommended Texts</b>  | Ian C. Andersen, A First Course in Combinatorial Mathematics, Clarendon Press, Oxford, 1989.                  |
| <b>Reference books</b>    | Ralph P. Grimaldi, Discrete and Combinatorial Mathematics-An Applied Introduction, V Edition, Pearson, 2004.  |
| <b>Web Resources</b>      | <a href="https://nptel.ac.in">https://nptel.ac.in</a>   |
| <b>Course outcomes CO</b> | <b>On completion of this course, the students will be able to</b>   |
| <b>C01</b>                | Explain selections and to find binomial coefficients and classify ordered selections and unordered selections |
| <b>C02</b>                | Solve pairing problems  |
| <b>C03</b>                | Explain recurrence and classify the types of relations using generating functions                             |
| <b>C04</b>                | Illustrate the inclusion and exclusion principles   |
| <b>C05</b>                | Construct and solve block designs and square block designs  |

### Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|
| <b>C01</b> | 3   | 3   | 2   | 3   | 3   | 2   | 3   | 3   |
| <b>C02</b> | 2   | 3   | 3   | 3   | 2   | 3   | 3   | 3   |
| <b>C03</b> | 3   | 3   | 3   | 2   | 3   | 3   | 3   | 2   |
| <b>C04</b> | 3   | 3   | 3   | 3   | 3   | 2   | 3   | 3   |
| <b>C05</b> | 3   | 2   | 3   | 3   | 2   | 3   | 3   | 2   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/PSO     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------|------|------|------|------|------|
| <b>C01</b> | 3    | 3    | 3    | 3    | 1    |
| <b>C02</b> | 3    | 3    | 3    | 3    | 1    |
| <b>C03</b> | 3    | 3    | 2    | 3    | 1    |
| <b>C04</b> | 3    | 3    | 3    | 2    | 1    |
| <b>C05</b> | 3    | 2    | 3    | 3    | 1    |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

## Fuzzy Sets and Applications

|                                     |   |                                    |                 |                |                     |                    |                 |
|-------------------------------------|---|------------------------------------|-----------------|----------------|---------------------|--------------------|-----------------|
| <b>Title of the Course</b>          |   | <b>Fuzzy Sets and Applications</b> |                 |                |                     |                    |                 |
| <b>Course Type</b>                  |   | <b>Elective - VI</b>               |                 |                |                     |                    |                 |
| <b>Year</b>                         | <b>III</b>  | <b>Semester</b>                    | <b>V</b>        | <b>Credits</b> | <b>3</b>            | <b>Course Code</b> | <b>25EUMA54</b> |
| <b>Instructional Hours per week</b> |   | <b>Lecture</b>                     | <b>Tutorial</b> |                | <b>Lab Practice</b> | <b>Total</b>       |                 |
|                                     |   | <b>5</b>                           | <b>-</b>        |                | <b>-</b>            | <b>5</b>           |                 |
| <b>Learning Objectives</b>          |   |                                    |                 |                |                     |                    |                 |
| <b>L01</b>                          | To explain crisp sets and fuzzy sets                                    |                                    |                 |                |                     |                    |                 |
| <b>L02</b>                          | To explain of $\alpha$ -cuts and the extension principle for fuzzy sets |                                    |                 |                |                     |                    |                 |
| <b>L03</b>                          | To determine fuzzy complements, fuzzy intersections and fuzzy unions    |                                    |                 |                |                     |                    |                 |
| <b>L04</b>                          | To apply arithmetic operations on intervals and on fuzzy numbers        |                                    |                 |                |                     |                    |                 |
| <b>L05</b>                          | To analyze decision making, multi-person decision making problems.      |                                    |                 |                |                     |                    |                 |

| <b>UNIT</b> | <b>CONTENTS</b>  |
|-------------|--|
| <b>I</b>    | From Crisp sets to Fuzzy sets: Crisp Sets – Fuzzy Sets – Basic Types – Basic Concepts – Characteristics and Significance of Paradigm Shift.<br>(Chapter 1: Sections - 1.1 to 1.5)  |
| <b>II</b>   | Fuzzy sets verses Crisp sets: Additional properties of $\alpha$ -cuts – Representations of Fuzzy sets – Extension principle of Fuzzy sets.<br>(Chapter 2: Sections - 2.1 to 2.3)   |
| <b>III</b>  | Operations on Fuzzy sets: Types of Operations – Fuzzy Complements – Fuzzy intersections: t-Norms – Fuzzy Unions: t-Conorms – Combinations of operations.<br>(Chapter 3: Sections - 3.1 to 3.5)                           |
| <b>IV</b>   | Fuzzy Arithmetic: Fuzzy Numbers – Linguistic Variables – Arithmetic Operations on Intervals – Arithmetic Operations on Fuzzy Numbers - Lattice of Fuzzy numbers - Fuzzy Equations.<br>(Chapter 4: Sections - 4.1 to 4.6) |

|          |  |
|----------|--|
| <b>V</b> | Fuzzy Decision Making: – Individual Decision Making – Multi- Person Decision Making – Multicriteria Decision Making – Fuzzy Linear Programming. (Chapter 15: Sections - 15.1 to 15.4 and 15.7) |
|----------|--|

|   |   |
|---|---|
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)  |
| Skills acquired from this Course  | Knowledge, Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill   |
| <b>Recommended Texts</b>  | George J. Klir and Bo Yuan, Fuzzy sets and Fuzzy Logic Theory Applications, Prentice Hall of India, New Delhi, 2002.  |
| <b>Reference books</b>  | <ol style="list-style-type: none"> <li>1. GeorgeJ. Klir and Tina A. Folger, Fuzzy sets, Uncertainty and Information, Prentice Hall ofIndia, New Delhi, 2003.</li> <li>2. S. Nanda and N. R. Das, Fuzzy Mathematical Concepts, Narosa Publishing House, 2012.</li> </ol> |
| <b>Web Resources</b>  | <a href="https://nptel.ac.in">https://nptel.ac.in</a>   |

| <b>Course outcomes: CO</b> | <b>On completion of this course, the students will be able to</b>   |
|----------------------------|---|
| <b>C01</b>                 | Explain Crisp sets and Fuzzy sets and illustrate the characteristics and significance of Paradigm Shift               |
| <b>C02</b>                 | Elaborate the Additional properties of $\alpha$ -cuts and the extension principle for fuzzy sets                      |
| <b>C03</b>                 | Perform Fuzzy set operations and to determine Fuzzy complements, Fuzzy intersections and Fuzzy unions                 |
| <b>C04</b>                 | Determine Fuzzy numbers and Linguistic variables and to apply arithmetic operations on intervals and on Fuzzy numbers |
| <b>C05</b>                 | Analyze and classify Fuzzy decision making, Individual decision making, and Multi-Person decision making problems.    |

### Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| C01   | 3   | 3   | 2   | 3   | 3   | 2   | 3   | 3   |
| C02   | 2   | 3   | 3   | 3   | 2   | 3   | 3   | 3   |
| C03   | 3   | 3   | 3   | 2   | 3   | 3   | 3   | 2   |
| C04   | 3   | 3   | 3   | 3   | 3   | 2   | 3   | 3   |
| C05   | 3   | 2   | 3   | 3   | 2   | 3   | 3   | 2   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/ PSO | PS01 | PS02 | PS03 | PS04 | PS05 |
|---------|------|------|------|------|------|
| C01     | 3    | 3    | 3    | 3    | 1    |
| C02     | 3    | 3    | 2    | 3    | 1    |
| C03     | 3    | 3    | 3    | 3    | 1    |
| C04     | 3    | 2    | 3    | 2    | 1    |
| C05     | 3    | 3    | 3    | 3    | 1    |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

## Personality Development

|                                     |            |                                      |                 |                      |              |
|-------------------------------------|------------|--------------------------------------|-----------------|----------------------|--------------|
| <b>Title of the Course</b>          |            | <b>Personality Development</b>       |                 |                      |              |
| <b>Course Type</b>                  |            | <b>Indian Knowledge System (IKS)</b> |                 |                      |              |
| <b>Course Code</b>                  |            | <b>25UPDT51</b>                      |                 |                      |              |
| <b>Year</b>                         | <b>III</b> | <b>Semester</b>                      | <b>V</b>        | <b>Credits</b>       | <b>2</b>     |
| <b>Instructional Hours Per week</b> |            | <b>Lecture</b>                       | <b>Tutorial</b> | <b>Lab Practices</b> | <b>Total</b> |
|                                     |            | <b>1</b>                             | <b>1</b>        | <b>--</b>            | <b>2</b>     |

### UNIT – I

Personality - Definition – Determinants – Personality Traits –Theories of Personality – Importance of Personality Development. Self-Awareness – Meaning – Benefits of Self – Awareness – Developing Self – Awareness. Swot – Meaning – Importance- Application – Components. Goal Setting Meaning- Importance – Effective goal setting – Principles of goal setting – Goal setting at the Right level.

### UNIT – II

Self-Monitoring – Meaning – High self – monitor versus low self-monitor – Advantages and Disadvantages self-monitor- Self –monitoring and job performance. Perception- Definition- Factor influencing perception- Perception process –Errors in perception – Avoiding perceptual errors. Attitude – Meaning- Formation of attitude – Types of attitude - Measurement of Attitudes – Barriers to attitude change – Methods to attitude change. Assertiveness - Meaning – Assertiveness in Communication – Assertiveness Techniques – Benefits of being Assertive – Improving Assertiveness.

### UNIT – III

Team Building – Meaning – Types of teams – Importance of Team building- Creating Effective Team. Leadership – Definition – Leadership style- Theories of leadership – Qualities of an Effect leader. Negotiation Skills – Meaning – Principles of Negotiation – Types of Negotiation – The Negotiation Process – Common mistakes in Negotiation process. Conflict Management – Definition- Types of Conflict- Levels of Conflict – Conflict Resolution – Conflict management.

## UNIT -IV

Communication – Definition – Importance of communication – Process of communication - Communication Symbols – Communication network – Barriers in communication – Overcoming Communication Barriers. Transactional Analysis – Meaning – Ego States – Types of Transactions – Johari Window- Life Positions. Emotional Intelligence- Meaning – Components of Emotional Intelligence- Significance of managing Emotional intelligence – How to develop Emotional Quotient. Stress Management – Meaning – Sources of Stress – Symptoms of Stress – Consequences of Stress – Managing Stress

## UNIT - V

Social Graces – Meaning – Social Grace at Work – Acquiring Social Graces. Table Manners – Meaning – Table Etiquettes in Multicultural Environment- Do's and Don'ts of Table Etiquettes. Dress Code – Meaning- Dress Code for selected Occasions – Dress Code for an Interview. Group Discussion – Meaning – Personality traits required for Group Discussion- Process of Group Discussion- Group Discussion Topics. Interview – Definition- Types of skills – Employer Expectations –Planning for the Interview – Interview Questions- Critical Interview Questions.

### References:

1. Dr.S. Narayana Rajan, Dr. B. Rajasekaran, G. Venkadasalapathi, V. Vijuresh Nayaham and Herald M.Dhas, **Personality Development**, Publication Division, Manonmaniam Sundaranar University, Tirunelveli
2. Stephan P.Robbins, **Organisational Behaviour**, Tenth Edition, Prentice Hall of India Private Limited, New Delhi,2008
3. Jit S. Chandan, **Oragnisational Behaviour**, Third Edition, Vikas Publishing House Private Limited, 2008
4. Dr.K.K. Ramachandran and Dr.K.K. Karthick, **From Campus to Corporate**, Macmillan Publishers India Limited, New Delhi, 2010.

## Semester - VI Linear Algebra

|                                     |  |                       |           |                 |          |                     |                 |
|-------------------------------------|--|-----------------------|-----------|-----------------|----------|---------------------|-----------------|
| <b>Title of the Course</b>          |  | <b>Linear Algebra</b> |           |                 |          |                     |                 |
| <b>Course Type</b>                  |  | <b>Core - XIII</b>    |           |                 |          |                     |                 |
| <b>Year</b>                         | <b>III</b>   | <b>Semester</b>       | <b>VI</b> | <b>Credits</b>  | <b>6</b> | <b>Course Code</b>  | <b>25UMMA51</b> |
| <b>Instructional Hours per week</b> |  | <b>Lecture</b>        |           | <b>Tutorial</b> |          | <b>Lab Practice</b> |                 |
|                                     |  | <b>6</b>              |           | <b>--</b>       |          | <b>--</b>           |                 |
| <b>Instructional Hours per week</b> |  |                       |           |                 |          | <b>Total</b>        |                 |
|                                     |  |                       |           |                 |          | <b>6</b>            |                 |
| <b>Learning Objectives</b>          |  |                       |           |                 |          |                     |                 |
| <b>L01</b>                          | Acquire a detailed knowledge about vector spaces and subspaces   |                       |           |                 |          |                     |                 |
| <b>L02</b>                          | Explain the concepts of Linear Dependence, Linear Independence, Bases and Dimension of basis   |                       |           |                 |          |                     |                 |
| <b>L03</b>                          | Explain the concept of Linear Transformations and their Matrix representation, Inner product and norms and to apply Gram Schmidt Orthogonalization |                       |           |                 |          |                     |                 |
| <b>L04</b>                          | Know the concept of elementary transformations which is applied to find rank of a matrix and solve simultaneous linear equations                   |                       |           |                 |          |                     |                 |
| <b>L05</b>                          | Find the Eigen values and Eigen vectors and to know the quadratic forms.   |                       |           |                 |          |                     |                 |

| <b>UNIT</b> | <b>CONTENTS</b>   |
|-------------|---|
| <b>I</b>    | Vector Spaces: Definition and examples– Subspaces– Linear Transformations– Fundamental theorem of homomorphism.<br>(Chapter 5: Sections - 5.1 to 5.3)   |
| <b>II</b>   | Span of a set– Linear Dependence and Independence– Basis and Dimension.<br>(Chapter 5: Sections - 5.4 to 5.6)   |
| <b>III</b>  | Rank and Nullity of a transformation – Matrix of a linear transformation – Inner product space: Definition and examples– Orthogonality – Orthogonal complement.<br>( Chapter 5: Sections - 5.7, 5.8 and Chapter 6: Sections - 6.1 to 6.3) |
| <b>IV</b>   | Matrices – Elementary transformation – Rank of a matrix – Simultaneous linear equations – Characteristic equation and Cayley - Hamilton Theorem.<br>(Chapter 7: Sections - 7.4 to 7.7)  |
| <b>V</b>    | Eigen values and Eigen vectors – Properties and problems – Bilinear forms – Quadratic forms – Reduction of quadratic form to diagonal form.<br>(Chapter 7: Sections - 7.8 and Chapter 8: Sections - 8.1, 8.2)                             |

|   |   |
|---|---|
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination Question paper) | Questions related to the above topics from various competitive examinations UPSC / TNPSC / others to be solved<br>(To be discussed during the Tutorial hour)  |
| Skills acquired from this course  | Knowledge, Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill   |
| <b>Recommended Text</b>   | S. Arumugam and A. Thangapandi Isaac, Modern Algebra, Scitech, 2014.  |
| <b>Reference Books</b>  | <ol style="list-style-type: none"> <li>1. I.N. Herstein, Topics in Algebra, Wiley Eastern Ltd. Second Edition, 2006.</li> <li>2. N.S.Gopalakrishnan, University Algebra, New Age International Publications, Wiley Eastern Ltd.</li> <li>3. John B. Fraleigh, First course in Algebra, Addison Wesley.</li> <li>4. Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, Linear Algebra, 5<sup>th</sup> Edition, Prentice Hall of India Pvt. Ltd., 2018.</li> <li>5. David C. Lay, Linear Algebra and its Applications, 3<sup>rd</sup> Ed., Pearson Education Asia, Indian Reprint, 2007.</li> <li>6. S.Lang, Introduction to Linear Algebra, 2<sup>nd</sup> Ed., Springer, 2005.</li> <li>7. Gilbert Strang, Linear Algebra and its Applications, Thomson, 2007.</li> </ol> |
| <b>Web Resources</b>  | <a href="https://nptel.ac.in">https://nptel.ac.in</a>   |

| <b>Course outcomes CO</b> | <b>On completion of this course, the students will be able to</b>  |
|---------------------------|--|
| <b>CO1</b>                | Acquire a detailed knowledge about vector spaces and subspaces   |
| <b>CO2</b>                | Explain the concepts of Linear Dependence, Linear Independence, Bases and Dimension of basis   |
| <b>CO3</b>                | Explain the concept of Linear Transformations and their Matrix representation, Inner product and norms and to apply Gram Schmidt Orthogonalization |
| <b>CO4</b>                | Know the concept of Elementary transformations which is applied to find Rank of a matrix and solve Simultaneous linear equations                   |
| <b>CO5</b>                | Find the Eigen values and Eigen vectors and to know the quadratic forms  |

### Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| C01   | 3   | 3   | 2   | 3   | 3   | 2   | 3   | 3   |
| C02   | 2   | 3   | 3   | 3   | 2   | 3   | 3   | 3   |
| C03   | 3   | 3   | 3   | 2   | 3   | 3   | 3   | 2   |
| C04   | 3   | 3   | 3   | 3   | 3   | 2   | 3   | 3   |
| C05   | 3   | 2   | 3   | 3   | 2   | 3   | 3   | 2   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/ PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------|------|------|------|------|------|
| C01     | 3    | 3    | 2    | 3    | 2    |
| C02     | 3    | 3    | 3    | 3    | 2    |
| C03     | 3    | 3    | 3    | 3    | 2    |
| C04     | 3    | 2    | 3    | 2    | 2    |
| C05     | 3    | 3    | 3    | 3    | 2    |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

## Complex Analysis

|                                     |  |                         |                 |                     |          |                    |                 |
|-------------------------------------|--|-------------------------|-----------------|---------------------|----------|--------------------|-----------------|
| <b>Title of the Course</b>          |  | <b>Complex Analysis</b> |                 |                     |          |                    |                 |
| <b>Course Type</b>                  |  | <b>CORE - XIV</b>       |                 |                     |          |                    |                 |
| <b>Year</b>                         | <b>III</b>   | <b>Semester</b>         | <b>VI</b>       | <b>Credits</b>      | <b>6</b> | <b>Course Code</b> | <b>25UMMA62</b> |
| <b>Instructional Hours per week</b> |  | <b>Lecture</b>          | <b>Tutorial</b> | <b>Lab Practice</b> |          | <b>Total</b>       |                 |
|                                     |  | <b>6</b>                | <b>--</b>       | <b>--</b>           |          | <b>6</b>           |                 |
| <b>Learning Objectives</b>          |  |                         |                 |                     |          |                    |                 |
| <b>L01</b>                          | Analytic functions, their differentiation and continuity   |                         |                 |                     |          |                    |                 |
| <b>L02</b>                          | Explain the concept of linear transformations and to find fixed points of transformations  |                         |                 |                     |          |                    |                 |
| <b>L03</b>                          | Explain the concept matrix representation, inner product and norms and to apply Gram Schmidt Orthogonalization   |                         |                 |                     |          |                    |                 |
| <b>L04</b>                          | Find the convergence of series and derive Taylor's and Laurent's series  |                         |                 |                     |          |                    |                 |
| <b>L05</b>                          | Find the zeros of analytic function, understand zeros and singularities of an analytic function, apply their properties in the evaluation of definite integral |                         |                 |                     |          |                    |                 |

| <b>UNIT</b> | <b>CONTENTS</b>  |
|-------------|--|
| <b>I</b>    | Functions of a complex variable -Limits -Theorem on limits - Continuity - Derivatives - Differentiation formulas - Cauchy Riemann equation - conditions for differentiability - Polar coordinates- Analytic functions- Harmonic functions.<br>(Chapter 2: Sections - 2.1 to 2.8) |
| <b>II</b>   | Conformal Mapping - Elementary Transformation - Bilinear Transformation - Cross Ratio - Fixed Points.<br>(Chapter 2: Section - 2.9 and Chapter 3: Sections - 3.1 to 3.4)   |
| <b>III</b>  | Complex Integration: Definite Integral - Cauchy's Theorem- Cauchy's integral formula - Higher Derivatives.<br>(Chapter 6: Sections - 6.1 to 6.4)   |
| <b>IV</b>   | Sequence and Series - Power Series - Taylor's series - Laurent series- Zeros of an Analytic function - Singularities.<br>(Chapter 4: Sections - 4.1, 4.3 and Chapter 7: Sections - 7.1 to 7.4)   |
| <b>V</b>    | Residues- Cauchy Residue theorem- Evaluation of definite integrals.<br>(Chapter 8: Sections -8.1 to 8.3)   |

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| Extended Professional Component<br>(is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved<br>(To be discussed during the Tutorial hour)  |
| Skills acquired from this Course   | Knowledge, Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill  |
| <b>Recommended Texts</b>   | S. Arumugam, A. Thangapandi Isaac and A.Somasundaram, Complex Analysis, Scitech Publications, 2002.  |
| <b>Reference books</b>   | <ol style="list-style-type: none"> <li>1. James Ward Brownand Ruel V.Churchill, Complex Variables and Application, Seventh Edition, McGraw Hill Book Co., International Edition,2009.</li> <li>2. Theodore W.Gamelan, Complex Analysis,SpringerVerlag,2008</li> <li>3. Joseph Bak and Donald J. Newman, Complex analysis, 2nd Ed., Undergraduate Texts in Mathematics, Springer-Verlag New York, Inc., New York, 1997.</li> <li>4. Richard A. Silverman, Introductory Complex Analysis, Dover Publications, 1972.</li> <li>5. S.Ponnusamy and H.Silverman, Complex Variables with Applications, Birkhauser, 2006.</li> </ol> |
| <b>Web Resources</b>   | <a href="https://nptel.ac.in">https://nptel.ac.in</a>  |

| <b>Course outcomes CO</b> | <b>On completion of this course, the students will be able to</b>  |
|---------------------------|--|
| <b>C01</b>                | Explain about analytic functions, their differentiation and continuity and to verify the harmonic functions using analyticity conditions           |
| <b>C02</b>                | Explain the concept of conformal mappings and mappings by linear transformations and to find fixed points of transformations                       |
| <b>C03</b>                | Explain the concept of linear transformations and their matrix representation, inner product and norms and to apply Gram Schmidt Orthogonalization |
| <b>C04</b>                | Find the convergence of sequences and series and derive Taylor's and Laurent's series  |
| <b>C05</b>                | Find the zeros of analytic function, the residue of a given function at a given singular point and to evaluate definite integrals.                 |

### Mapping with Programme Outcomes and Programme Specific Outcomes

| <b>CO/PO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO7</b> | <b>PO8</b> |
|--------------|------------|------------|------------|------------|------------|------------|------------|------------|
| <b>C01</b>   | 3          | 3          | 2          | 3          | 3          | 2          | 3          | 3          |
| <b>C02</b>   | 2          | 3          | 3          | 3          | 2          | 3          | 3          | 3          |
| <b>C03</b>   | 3          | 3          | 3          | 2          | 3          | 3          | 3          | 2          |
| <b>C04</b>   | 3          | 3          | 3          | 3          | 3          | 2          | 3          | 3          |
| <b>C05</b>   | 3          | 2          | 3          | 3          | 2          | 3          | 3          | 2          |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| <b>CO/PSO</b> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|---------------|-------------|-------------|-------------|-------------|-------------|
| <b>C01</b>    | 3           | 3           | 2           | 3           | 1           |
| <b>C02</b>    | 3           | 3           | 3           | 3           | 1           |
| <b>C03</b>    | 3           | 2           | 3           | 3           | 1           |
| <b>C04</b>    | 3           | 3           | 3           | 3           | 1           |
| <b>C05</b>    | 3           | 3           | 3           | 2           | 1           |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

## Mechanics

|                                     |  |                  |                 |                |                     |                    |                 |
|-------------------------------------|--|------------------|-----------------|----------------|---------------------|--------------------|-----------------|
| <b>Title of the Course</b>          |  | <b>Mechanics</b> |                 |                |                     |                    |                 |
| <b>Course Type</b>                  |  | <b>Core – XV</b> |                 |                |                     |                    |                 |
| <b>Year</b>                         | <b>III</b>   | <b>Semester</b>  | <b>VI</b>       | <b>Credits</b> | <b>6</b>            | <b>Course Code</b> | <b>25UMMA63</b> |
| <b>Instructional Hours per week</b> |  | <b>Lecture</b>   | <b>Tutorial</b> |                | <b>Lab Practice</b> |                    | <b>Total</b>    |
|                                     |  | <b>6</b>         | <b>--</b>       |                | <b>--</b>           |                    | <b>6</b>        |
| <b>Learning Objectives</b>          |  |                  |                 |                |                     |                    |                 |
| <b>L01</b>                          | Equilibrium of a particle under the action of given forces   |                  |                 |                |                     |                    |                 |
| <b>L02</b>                          | Define moment of a force and couple with examples, acting along a triangle, solve problems on frictional forces. |                  |                 |                |                     |                    |                 |
| <b>L03</b>                          | Define work, energy, power, rectilinear motions harmonic motion and find its geometrical representation.         |                  |                 |                |                     |                    |                 |
| <b>L04</b>                          | Define projectile, impulse find the direct and oblique impact of smooth elastic spheres                          |                  |                 |                |                     |                    |                 |
| <b>L05</b>                          | Explain conic as centered orbits and solve problems related to central orbits.                                   |                  |                 |                |                     |                    |                 |

| UNIT       | CONTENTS   |
|------------|--|
| <b>I</b>   | Force: Newton’s laws of motion –Resultant of two forces on a particle - Equilibrium of a Particle: Equilibrium of a particle – Limiting equilibrium of a particle on an inclined plane.<br>(Chapter 2: Section-2.1, 2.2 and Chapter 3: Section 3.1, 3.2)   |
| <b>II</b>  | Forces on a Rigid Body: Moment of a Force – General motion of a rigid body – Equivalent systems of forces- Parallel Forces – Forces acting along a Triangle - A specific reduction of Forces: Reduction of coplanar forces into a force and a couple – Problems involving frictional forces.<br>(Chapter 4: Section-4.1 to 4.5 and Chapter 5: Sections - 5.1, 5.2) |
| <b>III</b> | Work, Energy and Power: Work – Conservative field of force – Power – Rectilinear Motion under varying force: Simple Harmonic Motion - along a horizontal line – along a vertical line.<br>(Chapter 11 : Sections - 11.1 to 11.3 and Chapter 12: Sections – 12.1 to 12.3)   |

|           |  |
|-----------|--|
| <b>IV</b> | Projectiles: Forces on a projectile–Projectile projected on an inclined plane.<br>(Chapter 13: Sections -13.1, 13.2) |
| <b>V</b>  | Central Orbits: General orbits–Central orbit–Conic as centered orbit.<br>(Chapter 16: Sections -16.1 to 16.3)        |

|  |  |
|--|--|
| Extended Professional Component<br>(is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved<br>(To be discussed during the Tutorial hour)  |
| Skills acquired from this Course   | Knowledge, Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill  |
| <b>Recommended Texts</b>   | P. Duraipandian, Laxmi Duraipandian and Muthamizh Jayapragasm, Mechanics, S.Chand & Company Ltd, 2007  |
| <b>Reference books</b>   | <ol style="list-style-type: none"> <li>1. A.Ruinaand R.Pratap, Introduction to Statics and Dynamics, Oxford University Press, 2014.</li> <li>2. S.L. Loney, the Elements of Statics and Dynamics, Cambridge University Press, 1904.</li> <li>3. J.L. Meriam, L. G. Kraige and J.N. Bolton, Engineering Mechanics, Dynamics,8th edn, Wiley and sons Pvt ltd., New York, 2015.</li> <li>4. A.K.Dhiman, P.Dhinam and D.Kulshreshtha, Engineering Mechanics (Statics and Dynamics) , McGraw Hill Education (India) Private Limited, New Delhi, 2015</li> </ol> |
| <b>Web Resources</b>   | <a href="https://nptel.ac.in">https://nptel.ac.in</a>  |

| <b>Course outcomes<br/>CO</b> | <b>On completion of this course, the students will be able to</b>   |
|-------------------------------|---|
| <b>CO1</b>                    | Define resultant, component of a force, coplanar forces, like and unlike parallel forces, equilibrium of a particle, limiting equilibrium of a particle on an inclined plane. |
| <b>CO2</b>                    | Define moment of a force and couple with examples. Define parallel forces and forces acting along a triangle, solve problems on frictional forces.                            |
| <b>CO3</b>                    | Define work, energy, power, rectilinear motions under varying forces, define simple harmonic motion and find its geometrical representation.                                  |
| <b>CO4</b>                    | Define projectile, impulse, impact and laws of impact, prove that the path of a projectile is a parabola, find the direct and oblique impact of smooth elastic spheres        |
| <b>CO5</b>                    | Define central orbits, explain conic as centered orbits and solve problems related to central orbits.   |

### Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| C01   | 3   | 3   | 2   | 3   | 3   | 2   | 3   | 3   |
| C02   | 2   | 3   | 3   | 3   | 2   | 3   | 3   | 3   |
| C03   | 3   | 3   | 3   | 2   | 3   | 3   | 3   | 2   |
| C04   | 3   | 3   | 3   | 3   | 3   | 2   | 3   | 3   |
| C05   | 3   | 2   | 3   | 3   | 2   | 3   | 3   | 2   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/ PSO | PS01 | PS02 | PS03 | PS04 | PS05 |
|---------|------|------|------|------|------|
| C01     | 3    | 3    | 3    | 2    | 2    |
| C02     | 3    | 2    | 3    | 3    | 2    |
| C03     | 3    | 3    | 3    | 3    | 2    |
| C04     | 3    | 3    | 3    | 3    | 2    |
| C05     | 3    | 3    | 2    | 3    | 2    |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

## Operations Research - II

|                                     |   |                                 |                 |                     |          |                    |                 |
|-------------------------------------|---|---------------------------------|-----------------|---------------------|----------|--------------------|-----------------|
| <b>Title of the Course</b>          |   | <b>Operations Research - II</b> |                 |                     |          |                    |                 |
| <b>Course Type</b>                  |   | <b>Elective - VII</b>           |                 |                     |          |                    |                 |
| <b>Year</b>                         | <b>III</b>  | <b>Semester</b>                 | <b>VI</b>       | <b>Credits</b>      | <b>3</b> | <b>Course Code</b> | <b>25UEMA61</b> |
| <b>Instructional Hours per week</b> |   | <b>Lecture</b>                  | <b>Tutorial</b> | <b>Lab Practice</b> |          | <b>Total</b>       |                 |
|                                     |   | <b>6</b>                        | <b>--</b>       | <b>--</b>           |          | <b>6</b>           |                 |
| <b>Learning Objectives</b>          |   |                                 |                 |                     |          |                    |                 |
| <b>L01</b>                          | Develop analytical skills to solve operational and managerial decision problems.  |                                 |                 |                     |          |                    |                 |
| <b>L02</b>                          | Provide knowledge of quantitative techniques such as sequencing, network analysis, game theory, queuing theory, and inventory management. |                                 |                 |                     |          |                    |                 |
| <b>L03</b>                          | Enable students to apply mathematical models to real-life business situations.  |                                 |                 |                     |          |                    |                 |
| <b>L04</b>                          | Enhance problem-solving and decision-making abilities using scientific and logical approaches.  |                                 |                 |                     |          |                    |                 |
| <b>L05</b>                          | Build research orientation and analytical reasoning in business operations.   |                                 |                 |                     |          |                    |                 |

| <b>UNIT</b> | <b>CONTENTS</b>   |
|-------------|---|
| <b>I</b>    | Operations Scheduling: Problem of Sequencing – Basic terms used in sequencing – Processing $n$ jobs through two machines – Processing $n$ jobs through $k$ machines- Processing two jobs through $k$ machines<br>(Chapter 12: Sections – 12.1 to 12.6)  |
| <b>II</b>   | Network Scheduling: Network basic components – Logical Sequencing – Rules of Network construction – Critical path analysis – Probability consideration in PERT and CPM – Application of network techniques.<br>(Chapter 25: Sections – 25.1 to 25.4, 25.6 to 25.9)  |
| <b>III</b>  | Game Theory: Two-Person Zero-sum Game – Solution of Two-person Zero-sum Game – The Maximin- Minimax Principle – Saddle point – A Games with Pure strategy, mixed strategy – $2 \times 2$ Games – Graphical Solution for $2 \times n$ and $m \times 2$ Games– Dominance Property.<br>(Chapter 17: Sections – 17.1 to 17.7) |

|           |   |
|-----------|---|
| <b>IV</b> | Queuing Theory: Queuing system – Deterministic, Characteristic and Probability Distributions in Queuing system – Classification of Queuing models – Probabilistic Queuing models – Poisson-Exponential Models( $(M/M/1) : \infty/FIFO$ ) and $(M/M/1) : (N/FIFO)$ only)<br>(Chapter 21: Sections -21.1 to 21.9)                 |
| <b>V</b>  | Inventory Management: Types of Inventory–Inventory Decisions– Costs associated with Inventories – Factors affecting inventory control – The concept of EOQ– Deterministic inventory problems with no shortages– Problems of EOQ and price breaks.<br>(Chapter 19: Sections – 19.1, 19.2, 19.4, 19.6, 19.7, 19.9, 19.10, 19.12 ) |

|   |   |
|---|---|
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved<br>(To be discussed during the Tutorial hour)   |
| Skills acquired from this Course  | Knowledge, Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill   |
| <b>Recommended Texts</b>  | Kanti Swarup, P. K. Gupta and Man Mohan, Operations Research, [19th Revised Edition], Sultan Chand & Sons, New Delhi, 2018.   |
| <b>Reference books</b>  | <ol style="list-style-type: none"> <li>1. P. K. Gupta, and D. S. Hira, Operations Research, Sultan Chand &amp; Sons, New Delhi, 2020.</li> <li>2. P. K. Gupta and Man Mohan, Problems in Operations Research [Ninth Edition], Sultan Chand and Sons, New Delhi, 2014.</li> <li>3. S. Kalavathy, Operations Research [Fourth Edition], Vikas Publishing House, Chennai, 2012.</li> </ol> |
| <b>Web Resources</b>  | <a href="https://nptel.ac.in">https://nptel.ac.in</a>   |

| <b>Course outcomes<br/>CO</b> | <b>On completion of this course, the students will be able to</b>  |
|-------------------------------|--|
| <b>C01</b>                    | Apply sequencing models to optimize job scheduling and minimize processing time in operations.   |
| <b>C02</b>                    | Construct and analyze project networks using CPM and PERT techniques for effective project management.                                   |
| <b>C03</b>                    | Analyze competitive situations using game theory and determine optimal strategies.making use of mixed strategies and dominance property. |
| <b>C04</b>                    | Evaluate queuing systems and compute performance measures using appropriate probabilistic models.  |
| <b>C05</b>                    | Develop and analyze inventory models including EOQ and price-break models for cost optimization.   |

### Mapping with Programme Outcomes and Programme Specific Outcomes

| <b>CO/PO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO7</b> | <b>PO8</b> |
|--------------|------------|------------|------------|------------|------------|------------|------------|------------|
| <b>C01</b>   | 3          | 3          | 2          | 3          | 3          | 2          | 3          | 3          |
| <b>C02</b>   | 2          | 3          | 3          | 3          | 2          | 3          | 3          | 3          |
| <b>C03</b>   | 3          | 3          | 3          | 2          | 3          | 3          | 3          | 2          |
| <b>C04</b>   | 3          | 3          | 3          | 3          | 3          | 2          | 3          | 3          |
| <b>C05</b>   | 3          | 2          | 3          | 3          | 2          | 3          | 3          | 2          |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| <b>CO/ PSO</b> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|----------------|-------------|-------------|-------------|-------------|-------------|
| <b>C01</b>     | 3           | 3           | 3           | 3           | 2           |
| <b>C02</b>     | 3           | 3           | 3           | 2           | 2           |
| <b>C03</b>     | 3           | 3           | 2           | 3           | 2           |
| <b>C04</b>     | 3           | 3           | 3           | 3           | 2           |
| <b>C05</b>     | 3           | 2           | 3           | 3           | 2           |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

# Financial Mathematics

|                                     |                                |                              |                 |                     |          |                    |                 |
|-------------------------------------|--------------------------------|------------------------------|-----------------|---------------------|----------|--------------------|-----------------|
| <b>Title of the Course</b>          |                                | <b>Financial Mathematics</b> |                 |                     |          |                    |                 |
| <b>Course Type</b>                  |                                | <b>Elective - VII</b>        |                 |                     |          |                    |                 |
| <b>Year</b>                         | <b>III</b>                     | <b>Semester</b>              | <b>VI</b>       | <b>Credits</b>      | <b>3</b> | <b>Course Code</b> | <b>25UEMA62</b> |
| <b>Instructional Hours per week</b> |                                | <b>Lecture</b>               | <b>Tutorial</b> | <b>Lab Practice</b> |          | <b>Total</b>       |                 |
|                                     |                                | <b>6</b>                     | <b>--</b>       | <b>--</b>           |          | <b>6</b>           |                 |
| <b>Learning Objectives</b>          |                                |                              |                 |                     |          |                    |                 |
| <b>L01</b>                          | Know stocks, bonds             |                              |                 |                     |          |                    |                 |
| <b>L02</b>                          | Know, capital and ratio        |                              |                 |                     |          |                    |                 |
| <b>L03</b>                          | Measure risk of the investment |                              |                 |                     |          |                    |                 |
| <b>L04</b>                          | Know the life annuities        |                              |                 |                     |          |                    |                 |
| <b>L05</b>                          | Explain the property           |                              |                 |                     |          |                    |                 |

| <b>UNIT</b> | <b>CONTENTS</b>  |
|-------------|--|
| <b>I</b>    | Mathematics of Investment: Stocks – Bonds – Mutual funds.<br>(Chapter 5: Sections - 1 to 3)                                    |
| <b>II</b>   | Mathematics of Investment: Options –Cost of Capital and Ratio.<br>(Chapter 5: Sections - 4 and 5)                              |
| <b>III</b>  | Mathematics of Return and Risk: Measuring Return and Risk – The Capital Asset Pricing Model.<br>(Chapter 6: Sections -1 and 2) |
| <b>IV</b>   | Mathematics of Insurance: Life Annuities – Life Insurance.<br>(Chapter 7: Sections - 1, 2.1 to 2.8)                            |
| <b>V</b>    | Mathematics of Insurance: Life Insurance – Property and Casualty Insurance.<br>(Chapter 7: Sections - 2.9 to 2.14, 3)          |

|   |  |
|---|--|
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved<br>(To be discussed during the Tutorial hour)  |
| Skills acquired from this Course  | Knowledge, Problem Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill   |
| <b>Recommended Texts</b>  | M. J. Alhabeeb, Mathematical Finance, A John Wiley & Sons, Inc., Publication, 2012.  |
| <b>Reference books</b>  | <ol style="list-style-type: none"> <li>1. S. P. Gupta and S. K. Jain, Financial Mathematics, Sahitya Bhawan Publications, 2022</li> <li>2. Bimal Jaiswal and Leena S. Shimpi, Financial Mathematics, New Royal Book Company, 2020.</li> <li>3. Marek Capinski and Tomasz Zastawniak, Mathematics for Finance: An Introduction to Financial Engineering, Springer, 2010.</li> </ol> |
| <b>Web Resources</b>  | <a href="https://nptel.ac.in">https://nptel.ac.in</a>  |

| <b>Course outcomes<br/>CO</b> | <b>On completion of this course, the students will be able to</b> |
|-------------------------------|---|
| <b>CO1</b>                    | Know stocks, bonds and mutual funds                               |
| <b>CO2</b>                    | Know the options, capital and ratio                               |
| <b>CO3</b>                    | Measure return and risk of the investment                         |
| <b>CO4</b>                    | Know the life annuities and life insurance                        |
| <b>CO5</b>                    | Explain the property and casualty insurance                       |

## Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| C01   | 3   | 3   | 2   | 3   | 3   | 2   | 3   | 3   |
| C02   | 2   | 3   | 3   | 3   | 2   | 3   | 3   | 3   |
| C03   | 3   | 3   | 3   | 2   | 3   | 3   | 3   | 2   |
| C04   | 3   | 3   | 3   | 3   | 3   | 2   | 3   | 3   |
| C05   | 3   | 2   | 3   | 3   | 2   | 3   | 3   | 2   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/ PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------|------|------|------|------|------|
| C01     | 3    | 3    | 3    | 3    | 2    |
| C02     | 3    | 3    | 3    | 3    | 2    |
| C03     | 3    | 2    | 3    | 3    | 2    |
| C04     | 3    | 3    | 2    | 3    | 2    |
| C05     | 3    | 3    | 3    | 2    | 2    |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

## Number Theory

|                                     |  |                        |                 |                |                     |                    |                 |
|-------------------------------------|--|------------------------|-----------------|----------------|---------------------|--------------------|-----------------|
| <b>Title of the Course</b>          |  | <b>Number Theory</b>   |                 |                |                     |                    |                 |
| <b>Course Type</b>                  |  | <b>Elective - VIII</b> |                 |                |                     |                    |                 |
| <b>Year</b>                         | <b>III</b>   | <b>Semester</b>        | <b>V</b>        | <b>Credits</b> | <b>3</b>            | <b>Course Code</b> | <b>25UEMA63</b> |
| <b>Instructional Hours per week</b> |  | <b>Lecture</b>         | <b>Tutorial</b> |                | <b>Lab Practice</b> | <b>Total</b>       |                 |
|                                     |  | <b>5</b>               | <b>1</b>        |                | <b>-</b>            | <b>6</b>           |                 |
| <b>Learning Objectives</b>          |  |                        |                 |                |                     |                    |                 |
| <b>L01</b>                          | To explain the concept of binomial theorem                                     |                        |                 |                |                     |                    |                 |
| <b>L02</b>                          | To study division algorithm and Diophantine equation $ax+by=c$                 |                        |                 |                |                     |                    |                 |
| <b>L03</b>                          | To explain the fundamental theorem of arithmetic and The Sieve of Eratosthenes |                        |                 |                |                     |                    |                 |
| <b>L04</b>                          | To learn congruence's and to apply Chinese Remainder Theorem                   |                        |                 |                |                     |                    |                 |
| <b>L05</b>                          | To discuss Fermat's Theorem and Wilson's Theorem                               |                        |                 |                |                     |                    |                 |

| <b>UNIT</b> | <b>CONTENTS</b>   |
|-------------|---|
| <b>I</b>    | Preliminaries: Mathematical induction–The Binomial Theorem– Early Number Theory.<br>(Chapter 1: Sections - 1.1, 1.2 and Chapter 2: Section – 2.1)                             |
| <b>II</b>   | Division Algorithm–GCD–Euclidean Algorithm– The Diophantine equation $ax+by=c$ .<br>(Chapter 2: Sections - 2.3 to 2.5)  |
| <b>III</b>  | The Fundamental Theorem of Arithmetic – The Sieve of Eratosthenes– The Gold batch conjecture.<br>(Chapter 3: Sections - 3.1 to 3.3)   |
| <b>IV</b>   | Basic properties of congruence's – Binary and decimal representation of integers – Linear congruence and The Chinese Remainder Theorem.<br>(Chapter 4: Sections – 4.2 to 4.4) |
| <b>V</b>    | Fermat's Theorem–Wilson's Theorem– The Fermat Kraitchik Factorization Method.<br>(Chapter 5: Sections - 5.1 to 5.4)   |

|   |  |
|---|--|
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics from various competitive examinations UPSC / TRB / NET / UGC - CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)   |
| Skills acquired from this course  | Knowledge, Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill  |
| <b>Recommended Texts</b>  | David M. Burton, Elementary Number Theory, McGraw Hill Education (India) Pvt. Ltd., New Delhi, 2014.   |
| <b>Reference books</b>  | <ol style="list-style-type: none"> <li>1. Neville Robinns, Beginning Number Theory, 2<sup>nd</sup> Ed., Narosa Publishing House Pvt. Limited, Delhi, 2006.</li> <li>2. Richard E.K lima, Neil Sigmon, Ernest Stitzinger, Applications of Abstract Algebra with Maple, CRC Press ,Boca Raton, 2000.</li> <li>3. S. Kumaravelu and Susheela Kumaravelu, Elements of Number Theory, Raja Sankar Offset Printers, 2002.</li> </ol> |
| <b>Web Resources</b>  | <a href="https://nptel.ac.in">https://nptel.ac.in</a>  |

| <b>Course outcomes CO</b> | <b>On completion of this course, the students will be able to</b>  |
|---------------------------|--|
| <b>CO1</b>                | Explain mathematical induction and to make use of binomial theorem   |
| <b>CO2</b>                | Illustrate division algorithm and to determine the GCD of given two numbers and solution of Diophantine equation $ax+by=c$ |
| <b>CO3</b>                | Interpret the fundamental theorem of arithmetic and to explain The Sieve of Eratosthenes and to use Gold batch conjecture  |
| <b>CO4</b>                | Summarize the basic properties of congruence's and to apply Chinese Remainder Theorem                                      |
| <b>CO5</b>                | Elaborate Fermat's Theorem, Wilson's Theorem and to apply Kraitchik Factorization Method.                                  |

### Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| C01   | 3   | 3   | 2   | 3   | 3   | 2   | 3   | 3   |
| C02   | 2   | 3   | 3   | 3   | 2   | 3   | 3   | 3   |
| C03   | 3   | 3   | 3   | 2   | 3   | 3   | 3   | 2   |
| C04   | 3   | 3   | 3   | 3   | 3   | 2   | 3   | 3   |
| C05   | 3   | 2   | 3   | 3   | 2   | 3   | 3   | 2   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/ PSO | PS01 | PS02 | PS03 | PS04 | PS05 |
|---------|------|------|------|------|------|
| C01     | 3    | 3    | 2    | 3    | 2    |
| C02     | 3    | 2    | 3    | 3    | 2    |
| C03     | 3    | 3    | 3    | 3    | 2    |
| C04     | 3    | 3    | 3    | 2    | 2    |
| C05     | 3    | 3    | 3    | 3    | 2    |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

## Astronomy

|                                     |  |                        |                 |                     |          |                    |                 |
|-------------------------------------|--|------------------------|-----------------|---------------------|----------|--------------------|-----------------|
| <b>Title of the Course</b>          |  | <b>Astronomy</b>       |                 |                     |          |                    |                 |
| <b>Course Type</b>                  |  | <b>Elective - VIII</b> |                 |                     |          |                    |                 |
| <b>Year</b>                         | <b>III</b>   | <b>Semester</b>        | <b>VI</b>       | <b>Credits</b>      | <b>3</b> | <b>Course Code</b> | <b>25UEMA64</b> |
| <b>Instructional Hours per week</b> |  | <b>Lecture</b>         | <b>Tutorial</b> | <b>Lab Practice</b> |          | <b>Total</b>       |                 |
|                                     |  | <b>6</b>               | <b>--</b>       | <b>--</b>           |          | <b>6</b>           |                 |
| <b>Learning Objectives</b>          |  |                        |                 |                     |          |                    |                 |
| <b>L01</b>                          | Explain spherical trigonometry and to elaborate the fundamental of spherical trigonometry, the sine, the cosine, four parts and Napier's formula           |                        |                 |                     |          |                    |                 |
| <b>L02</b>                          | Imagine the celestial sphere, illustrate about the rising and setting of a star and to identify and classify circumpolar stars and morning, evening stars. |                        |                 |                     |          |                    |                 |
| <b>L03</b>                          | Imagine earth and to explain refraction and to deduce tangent formula and Cassini's formula  |                        |                 |                     |          |                    |                 |
| <b>L04</b>                          | Illustrate geocentric parallax and heliocentric parallax   |                        |                 |                     |          |                    |                 |
| <b>L05</b>                          | Elaborate Kepler's laws and to classify true anomaly, mean anomaly and eccentric anomaly and to obtain the relationship between them                       |                        |                 |                     |          |                    |                 |

| <b>UNIT</b> | <b>CONTENTS</b>   |
|-------------|---|
| <b>I</b>    | Spherical Trigonometry: Spherical triangle -The fundamental formula of spherical trigonometry, the sine, cosine, four parts and Napier formula (without proof) and simple problems.<br>(Chapter 1: Pages - 1 to 40) |
| <b>II</b>   | The Celestial Sphere: Celestial co-ordinates - Diurnal motion -Rising and setting of a star sidereal time - circumpolar stars - Morning and Evening stars.<br>(Chapter 2: Pages - 41 to 97)                         |
| <b>III</b>  | Earth - Length of a day - Refraction - Tangent formula - Cassini's formula - Effects of refraction.<br>(Chapter 3: Pages - 98 to 143 and 154 to 174)  |

|           |   |
|-----------|---|
| <b>IV</b> | Geocentric parallax – Effects – Heliocentric parallax – Effects.<br>(Chapter 5: Pages - 175 to 190 and Chapter 8: Pages – 263 to 293)   |
| <b>V</b>  | Kepler’s laws – Verification of Kepler’s laws – True anomaly, Mean anomaly, Eccentric anomaly – Relation between them.<br>(Chapter 6: Pages - 191 to 219 and Chapter 7: Pages – 220 to 237) |

|   |   |
|---|---|
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved<br>(To be discussed during the Tutorial hour) |
| Skills acquired from this course  | Knowledge, Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill   |
| <b>Recommended Texts</b>  | S. Kumaravelu and Susheela Kumaravelu, Astronomy for degree classes, Rainbow Printers, Nagercoil, 2005.   |
| <b>Reference books</b>  | 1. G. V. Ramachandran, Astronomy, Mission Press, Palayamkottai, 1965. 2. Andrew Fraknoi, David Morrison and Sidney C. Wolff,<br>2. Introduction to Astronomy, OpenStax, 2012.               |
| <b>Web Resources</b>  | <a href="https://nptel.ac.in">https://nptel.ac.in</a>   |

| Course outcomes<br>CO | On completion of this course, the students will be able to   |
|-----------------------|--|
| <b>CO1</b>            | Explain spherical trigonometry and to elaborate the fundamental of spherical trigonometry, the sine, the cosine, four parts and Napier’s formula           |
| <b>CO2</b>            | Imagine the celestial sphere, illustrate about the rising and setting of a star and to identify and classify circumpolar stars and morning, evening stars. |
| <b>CO3</b>            | Imagine earth and to explain refraction and to deduce tangent formula and Cassini’s formula  |
| <b>CO4</b>            | Illustrate geocentric parallax and heliocentric parallax   |
| <b>CO5</b>            | Elaborate Kepler’s laws and to classify true anomaly, mean anomaly and eccentric anomaly and to obtain the relationship between them                       |

### Mapping with Programme Outcomes and Programme Specific Outcomes

| CO/PO | P01 | P02 | P03 | P04 | P05 | P06 |   | P08 |
|-------|-----|-----|-----|-----|-----|-----|---|-----|
| C01   | 3   | 3   | 2   | 3   | 3   | 2   |   | 3   |
| C02   | 2   | 3   | 3   | 3   | 2   | 3   |   | 3   |
| C03   | 3   | 3   | 3   | 2   | 3   | 3   |   | 2   |
| C04   | 3   | 3   | 3   | 3   | 3   | 2   | 3 | 3   |
| C05   | 3   | 2   | 3   | 3   | 2   | 3   | 3 | 2   |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

| CO/ PSO | PS01 | PS02 | PS03 | PS04 | PS05 |
|---------|------|------|------|------|------|
| C01     | 3    | 3    | 3    | 2    | 2    |
| C02     | 3    | 3    | 3    | 3    | 2    |
| C03     | 3    | 3    | 2    | 3    | 2    |
| C04     | 3    | 2    | 3    | 3    | 2    |
| C05     | 3    | 3    | 3    | 3    | 2    |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

## Blue Print – End Semester Examinations Semester – I to VI

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**Class: U.G.**

**Time: 3 Hours**

**Max. Marks: 75**

### Section A

**(10 x 1 = 10)**

**Answer all questions.**

**Choose the correct answer. (With four options)**

|               | Unit I | Unit II | Unit III | Unit IV | Unit V |
|---------------|--------|---------|----------|---------|--------|
| Question Nos. | 1 & 2  | 3 & 4   | 5 & 6    | 7 & 8   | 9 & 10 |

### Section B

**(5 x 5 = 25)**

**Answer all questions choosing either (a) or (b).**

**Answer should not exceed 250 words**

|               | Unit I                | Unit II               | Unit III              | Unit IV               | Unit V                |
|---------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Question Nos. | 11 (a)<br>&<br>11 (b) | 12 (a)<br>&<br>12 (b) | 13 (a)<br>&<br>13 (b) | 14 (a)<br>&<br>14 (b) | 15 (a)<br>&<br>15 (b) |

### Section C

**(5 x 8 = 40)**

**Answer all questions choosing either (a) or (b).**

**Answer should not exceed 500 words**

|               | Unit I                | Unit II               | Unit III              | Unit IV               | Unit V                |
|---------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Question Nos. | 16 (a)<br>&<br>16 (b) | 17 (a)<br>&<br>17 (b) | 18 (a)<br>&<br>18 (b) | 19 (a)<br>&<br>19 (b) | 20 (a)<br>&<br>20 (b) |