# PERIYAR UNIVERSITY
## PERIYAR PALKALAI NAGAR
## SALEM-636 011

## DEGREE OF BACHOLAR OF MATHEMATICS
**WITH**
## COMPUTER APPLICATION
***CHOICE BASED CREDIT SYSTEM***

*Syllabus for*
# B.Sc., MATHEMATICS
**WITH**
## COMPUTER APPLICATION

**(SEMESTER PATTERN)**
**(For Candidates Admitted in the Colleges Affiliated to Periyar University from 2023-2024 onwards)**

## Introduction

1. **Learning and Teaching Activities**
2. **Curriculum Design & Structure of Course**
3. **Value Additions to the revamped curriculum**
4. **Credit Distribution for UG Programmes**
5. **B. Sc Mathematics with Computer Applications Curriculum Design**

## 1. Introduction

### B.Sc. Mathematics with Computer Applications: Programme Outcome, Programme Specific Outcome and Course Outcome

Mathematics is the study of quantity, structure, space and change, focusing on problem solving, with wider scope of application in science, engineering, technology, social sciences etc. The key core areas of study in Mathematics include Algebra, Analysis (Real & Complex), Differential Equations, Geometry, and Mechanics. The Bachelor's Degree B.Sc. Mathematics with Computer Applications is awarded to the students on the basis of knowledge, understanding, skills, attitudes, values and academic achievements expected to be acquired by learners at the end of the Programme. Learning outcomes are aimed at facilitating the learners to acquire these attributes, keeping in view of their preferences and aspirations for gaining knowledge of Mathematics and Computer Science.

As per the guidelines given by the University Gants Commission and the Tamil Nadu State Council for Higher Education , the B.Sc. degree programme is designed in such a way to have a foundation in Mathematics and Computer Applications , a Mathematical attitude towards problem formulation and solving analytical skills and desire for correctness, and appreciation of the approaching of mathematical techniques, the programming skills at higher level Computer Language and research aptitude in both Mathematics and Computer Applications.

Students completing this programme will be able to present Mathematics clearly and precisely, make abstract ideas precise by formulating them in the language of Mathematics, describe Mathematical ideas from multiple perspectives and explain fundamental concepts of Mathematics to non-Mathematicians.

Completion of this programme will also enable the learners to join teaching profession, enhance their employability for government jobs, jobs in banking, insurance and investment sectors, data analyst jobs and jobs in various other public and private enterprises and IT Sectors. .

| 2. LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME | |
|---|---|
| **Programme:** | **B.Sc., MATHEMATICS WITH COMPUTER APPLICATIONS** |
| **Programme Code:** | |
| **Duration:** | **3 years [UG]** |
| **Programme Outcomes:** | **PO1: Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study<br>**PO2: Communication Skills:** Ability to express thoughts 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.<br>**PO3: Critical thinking:** Capability to apply analytic thought to a body of knowledge; analyse 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.<br>**PO4: Problem solving: 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.<br>**PO5: Analytical reasoning**: Ability to evaluate the reliability 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.<br>**PO6: Research-related skills**: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, 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<br>**PO7: Cooperation/Team work:** 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<br>**PO8: Scientific reasoning**: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.<br>**PO9: Reflective thinking**: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.<br>**PO10 Information/digital literacy:** Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.<br>**PO 11 Self-directed learning**: Ability to work independently, identify appropriate resources required for a project, and manage a project through to |

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| | completion.<br>**PO 12 Multicultural competence:** Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.<br>**PO 13: Moral and ethical awareness/reasoning**: Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.<br>**PO 14: Leadership readiness/qualities:** Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.<br>**PO 15: Lifelong learning:** Ability to acquire knowledge and skills, including „learning how to learn", that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/re skilling. |

**Under Graduate Programme**

**Programme Outcomes:**

**PO1: Disciplinary Knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.

**PO2: Critical Thinking:** Capability to apply analytic thought to a body of knowledge; analyse 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.

**PO3: Problem Solving:** 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 earning to real life situations.

**PO4: Analytical Reasoning:** Ability to evaluate the reliability 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.

**PO5: Information/digital literacy:** Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.

**PO6: Self-directed & Lifelong Learning:** Ability to work independently, identify and manage a project. Ability to acquire knowledge and skills, including "learning how to learn", through self-placed and self-directed learning aimed at personal development, meeting economic, social and cultural objectives.

**B. Sc Mathematics with Computer Applications**

**Programme Specific Outcomes:**

**PSO1:** Acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of Mathematics.

**PSO2:** Identify the application of Mathematics in other discipline and society to solve real life problems.

**PSO3:** Explore and apply technical knowledge in diverse areas of Computer Applications and Mathematics is conducive in cultivating skills for successful career, entrepreneurship.

**Mapping of Course Learning Outcomes (CLOs)** with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs) can be carried out accordingly, assigning the appropriate level in the grids:

| | POs | | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | … | 1 | 2 | … |
| CLO1 | | | | | | | | | | |
| CLO2 | | | | | | | | | | |
| CLO3 | | | | | | | | | | |
| CLO4 | | | | | | | | | | |
| CLO5 | | | | | | | | | | |

3. Strong Correlation 2. Medium Correlation 1. Low Correlation

3. **Highlights of the Revamped Curriculum**:

- Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application-oriented content wherever required.
- The Core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising mathematical models and algorithms for providing solutions to industry / real life situations. The curriculum also facilitates peer learning with advanced mathematical topics in the final semester, catering to the needs of stakeholders with research aptitude.
- The General Studies and Mathematics based problem solving skills are included as mandatory components in the 'Training for Competitive Examinations' course at the final semester, a first of its kind.
- The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.
- The Industrial Statistics course is newly introduced in the fourth semester, to expose the students to real life problems and train the students on designing a mathematical model to provide solutions to the industrial problems.
- The Internship during the second year vacation will help the students gain valuable work experience, that connects classroom knowledge to real world experience and to narrow down and focus on the career path.
- Project with viva-voce component in the fifth semester enables the student, application of conceptual knowledge to practical situations. The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over the counterparts in the job market.
- State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective courses, covering conventional topics to the latest - Artificial Intelligence.

**4. Value additions in the Revamped Curriculum:**

| Semester | Newly introduced Components | Outcome / Benefits |
|---|---|---|
| **I** | **Foundation Course**<br>To ease the transition of learning from higher secondary to higher education, providing an overview of the pedagogy of learning abstract Mathematics and simulating mathematical concepts to real world. | • Instil confidence among students<br>• Create interest for the subject |
| **I, II, III, IV** | **Skill Enhancement papers** (Discipline centric / Generic / Entrepreneurial) | • Industry ready graduates<br>• Skilled human resource<br>• Students are equipped with essential skills to make them employable |
| | | • Training on Computing / Computational skills enable the students gain knowledge and exposure on latest computational aspects |
| | | • Data analytical skills will enable students gain internships, apprenticeships, field work involving data collection, compilation, analysis etc. |
| | | • Entrepreneurial skill training will provide an opportunity for independent livelihood<br>• Generates self – employment<br>• Create small scale entrepreneurs<br>• Training to girls leads to women empowerment |
| | | • Discipline centric skill will improve the Technical knowhow of solving real life problems using ICT tools |
| **III, IV, V & VI** | Elective papers-<br>An open choice of topics categorized under Generic and Discipline Centric | • Strengthening the domain knowledge<br>• Introducing the stakeholders to the State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature<br>• Students are exposed to Latest topics on Computer Science / IT, that require strong mathematical background<br>• Emerging topics in higher education / industry / communication network / health sector etc. are introduced with hands-on-training, facilitates designing of mathematical models in the respective sectors |
| **IV** | Industrial Statistics | • Exposure to industry moulds students into solution |

| | | |
|---|---|---|
| | | providers<br>• Generates Industry ready graduates<br>• Employment opportunities enhanced |
| **II year Vacation activity** | Internship / Industrial Training | • Practical training at the Industry/ Banking Sector / Private/ Public sector organizations / Educational institutions, enable the students gain professional experience and also become responsible citizens. |
| **V Semester** | Project with Viva – voce | • Self-learning is enhanced<br>• Application of the concept to real situation is conceived resulting in tangible outcome |
| **VI Semester** | Introduction of Professional Competency component | • Curriculum design accommodates all category of learners; 'Mathematics for Advanced Explain' component will comprise of advanced topics in Mathematics and allied fields, for those in the peer group / aspiring researchers;<br>• 'Training for Competitive Examinations' –caters to the needs of the aspirants towards most sought - after services of the nation viz, UPSC, CDS, NDA, Banking Services, CAT, TNPSC group services, etc. |
| **Extra Credits:**<br>**For Advanced Learners / Honours degree** | | • To cater to the needs of peer learners / research aspirants |

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| **Skills acquired from the Courses** | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |

## 5. Credit Distribution for UG Programmes

| Sem I | Credit | H | Sem II | Credit | H | Sem III | Credit | H | Sem IV | Credit | H | Sem V | Credit | H | Sem VI | Credit | H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part 1. Tamil or other Languages | 3 | 6 | Part..1. Tamil or other Languages | 3 | 6 | Part..1. Tamil or other Languages | 3 | 6 | Part..1. Tamil or other Languages | 3 | 6 | 5.1 Core Course – \CC IX | 4 | 5 | 6.1 Core Course – CC XIII | 4 | 6 |
| Part.2 English | 3 | 6 | Part..2 English | 3 | 6 | Part..2 English | 3 | 6 | Part..2 English | 3 | 6 | 5.2 Core Course – CC X | 4 | 5 | 6.2 Core Course – CC XIV | 4 | 6 |
| 1.3 Core Course – CC I | 5 | 5 | 2..3 Core Course – CC III | 5 | 5 | 3.3 Core Course – CC V | 5 | 5 | 4.3 Core Course – CC VII Core Industry Module | 5 | 5 | 5. 3.Core Course CC -XI | 4 | 5 | 6.3 Core Course – CC XV | 4 | 6 |
| 1.4 Core Course – CC II | 5 | 5 | 2.4 Core Course – CC IV | 5 | 5 | 3.4 Core Course – CC VI | 5 | 5 | 4.4 Core Course – CC VIII | 5 | 5 | 5. 4.Core Course –/ Project with viva-voce CC -XII | 4 | 5 | 6.4 Elective -VII Generic/ Discipline Specific | 3 | 5 |
| 1.5 Elective I Generic/ Discipline Specific | 3 | 4 | 2.5 Elective II Generic/ Discipline Specific | 3 | 4 | 3.5 Elective III Generic/ Discipline Specific | 3 | 4 | 4.5 Elective IV Generic/ Discipline Specific | 3 | 3 | 5.5 Elective V Generic/ Discipline Specific | 3 | 4 | 6.5 Elective VIII Generic/ Discipline Specific | 3 | 5 |
| 1.6 Skill Enhancement Course SEC-1 | 2 | 2 | 2.6 Skill Enhancement Course SEC-2 | 2 | 2 | 3.6 Skill Enhancement Course SEC-4, (Entrepreneurial Skill) | 1 | 1 | 4.6 Skill Enhancement Course SEC-6 | 2 | 2 | 5.6 Elective VI Generic/ Discipline Specific | 3 | 4 | 6.6 Extension Activity | 1 | - |
| 1.7 Skill Enhancement -(Foundation Course) | 2 | 2 | 2.7 Skill Enhancement Course – SEC-3 | 2 | 2 | 3.7 Skill Enhancement Course SEC-5 | 2 | 2 | 4.7 Skill Enhancement Course SEC-7 | 2 | 2 | 5.7 Value Education | 2 | 2 | 6.7 Professional Competency Skill | 2 | 2 |
| | | | | | | 3.8 E.V.S. | - | 1 | 4.8 E.V.S | 2 | 1 | 5.8 Summer Internship /Industrial Training | 2 | | | | |
| | **23** | **30** | | **23** | **30** | | **22** | **30** | | **25** | **30** | | **26** | **30** | | **21** | **30** |
| **Total – 140 Credits** | | | | | | | | | | | | | | | | | |

**Consolidated Semester wise and Component wise Credit distribution**

| Parts | Sem I | Sem II | Sem III | Sem IV | Sem V | Sem VI | Total Credits |
|---|---|---|---|---|---|---|---|
| **Part I** | 3 | 3 | 3 | 3 | - | - | 12 |
| **Part II** | 3 | 3 | 3 | 3 | - | - | 12 |
| **Part III** | 13 | 13 | 13 | 13 | 22 | 18 | 92 |
| **Part IV** | 4 | 4 | 3 | 6 | 4 | 1 | 22 |
| **Part V** | - | - | - | - | - | 2 | 2 |
| **Naan Mudhalvan** | | 2 | | | | | |
| **Total** | 23 | 25 | 22 | 25 | 26 | 21 | **142** |

***Part I. II, and Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programme and the other components. IV, V have to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree.**

## 6. B.Sc., Mathematics with Computer Applications Curriculum Design including Lab Hours

### First Year – Semester-I

| Part | Subject Code | List of Courses | Credit | No. of Hours |
|---|---|---|---|---|
| Part-1 | | Tamil or other Languages | 3 | 6 |
| Part-2 | | English | 3 | 6 |
| Part-3 | 23UMACACT01/ 23UMACT01 | Core Paper – I Algebra & Trigonometry | 4 | 4 |
| | 23UMACACT02 | Core Paper –II Calculus | 4 | 4 |
| | Elective Course-1 | Elective I – Web Designing with HTML(With Lab) | 5 | 6 |
| Part-4 | 23UMACASE01/ 23UMASE01 | Skill Enhancement Course SEC-1(NME I) Mathematics for Competitive Examination – I | 2 | 2 |
| | Foundation Course FC 23UMAFC01 | Bridge Mathematics | 2 | 2 |
| | | | **23** | **30** |

### Semester-II

| Part | Subject Code | List of Courses | Credit | No. of Hours |
|---|---|---|---|---|
| Part-1 | | Tamil or other Languages | 3 | 6 |
| Part-2 | | English | 3 | 4 |
| | NMSDC | Language Proficiency for Employability- Overview of English Communication | 2 | 2 |
| Part-3 | 23UMACACT03 | Core Paper – III Analytical Geometry & Vector Analysis | 4 | 4 |
| | 23UMACACT04/ 23UMACT06 | Core Paper - IV Differential Equations and its Applications | 4 | 4 |
| | | Elective Course II - Programming with Python (with Lab) | 5 | 6 |
| Part-4 | 23UMACASE02/ 23UMASE02 | Skill Enhancement Course -SEC-2 (NME II) Mathematics for Competitive Examination – II | 2 | 2 |
| | 23UMACASE03/ 23UMASE03 | Skill Enhancement Course -SEC-3 (Discipline / Subject Specific) Sage Mathematics | 2 | 2 |
| | | | **25** | **30** |

## Second Year – Semester-III

| Part | Subject Code | List of Courses | Credit | No. of Hours |
|---|---|---|---|---|
| Part-1 | | Tamil or other Languages | 3 | 6 |
| Part-2 | | English | 3 | 6 |
| Part-3 | 23UMACACT05 | Core Paper – V Fourier Series & Integral Transforms | 4 | 4 |

| | | | | |
|---|---|---|---|---|
| | 23UMACACT06 | Core Paper – VI Java and Data Structures (with Lab) | 5 | 6 |
| | 23UMAEC01 | Elective course III Numerical Methods | 4 | 4 |
| Part-4 | 23UMACASE04/ 23UMASE04 | Skill Enhancement Course -SEC-4 (Entrepreneurial Based) Computational Mathematics | 1 | 1 |
| | 23UMACASE05/ 23UMASE05 | Skill Enhancement Course -SEC-5 (Discipline / Subject Specific) Advanced Excel | 2 | 2 |
| | | E.V.S | - | 1 |
| | | | **22** | **30** |

**Semester-IV**

| Part | Subject Code | List of Courses | Credit | No. of Hours |
|---|---|---|---|---|
| Part-1 | | Tamil or other Languages | 3 | 6 |
| Part-2 | | English | 3 | 6 |
| Part-3 | 23UMACACT07 | Core Paper – VII Web Technology (with Lab)(Industrial Module) | 5 | 6 |
| | 23UMACACT08 | Core Paper - VIII Number Theory | 4 | 4 |
| | 23UMAEC02 | Elective Course IV – Mathematical Statistics | 4 | 4 |
| Part-4 | 23UMACASE06/ 23UMASE06 | Skill Enhancement Course -SEC-6 Mathematics for Competitive Examination – III | 2 | 2 |
| | 23UMACASE07/ 23UMASE07 | Skill Enhancement Course -SEC-7 (Discipline / Subject Specific) Statistics with R Programming | 2 | 2 |
| | | E.V.S | 2 | 1 |
| | | | **25** | **30** |

**Third Year -Semester-V**

| Part | Subject Code | List of Courses | Credit | No. of Hours |
|---|---|---|---|---|
| **Part-3** | 23UMACACT09/ 23UMACT09 | Core Paper – IX Modern Algebra | 4 | 5 |
| | 23UMACACT10 | Core Paper – X Real Analysis | 4 | 5 |
| | 23UMACACT11 | Core Paper – XI Mechanics | 4 | 5 |
| | 23UMACAPR1 | Core Paper – XII Project Viva Voce | 4 | 4 |

| | | | | |
|---|---|---|---|---|
| | 23UMACAME01 | Elective Course – V Operations Research – I | 3 | 4 |
| | 23UMACAME02 | Elective Course – VI Artificial Intelligence & Machine Learning(with Lab) | 3 | 5 |
| **Part-4** | | Value Education | 2 | 2 |
| | | Internship / Industrial Visit / Field Visit | 2 | |
| | | | **26** | **30** |

**Semester-VI**

| Part | Subject Code | List of Courses | Credit | No. of Hours |
|---|---|---|---|---|
| **Part-3** | 23UMACACT12 | Core Paper – XIII Linear Algebra | 4 | 6 |
| | 23UMACACT13 | Core Paper – XIV Complex Analysis | 4 | 6 |
| | 23UMACACT14 | Core Paper – XV Discrete Mathematics and Graph Theory | 4 | 6 |
| | 23UMACAME03 | Elective Course – VII Operations Research – II | 3<br>3 | 5<br>5 |
| | 23UMACAME04 | Elective Course – VIII Data Science (with Lab) | | |
| **Part-4** | | Extension Activity | 1 | - |
| | 23UMACAPCS01 | Professional Competency Skill LaTeX Practical | 2 | 2 |
| | | | **21** | **30** |

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="8">FOUNDATION COURSE- BRIDGE MATHEMATICS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">FOUNDATION – FC01</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Skill Enhancement Course</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">23UMAFC01</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>2</td><td colspan="2">-</td><td colspan="2">--</td><td colspan="2">2</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="8">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="8">To bridge the gap and facilitate transition from higher secondary to tertiary education;<br>To instil confidence among stakeholders and inculcate interest for Mathematics;</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="8">UNIT-I:Algebra: Binomial theorem, General term, middle term, problems based on these concepts</td></tr>
<tr><td colspan="8">Unit II: Sequences and series (Progressions). Fundamental principle of counting. Factorial n.</td></tr>
<tr><td colspan="8">Unit III: Permutations and combinations, Derivation of formulae and their connections, simple applications, combinations with repetitions, arrangements within groups, formation of groups.</td></tr>
<tr><td colspan="8">Unit IV: Trigonometry: Introduction to trigonometric ratios, proof of sin(A+B), cos(A+B), tan(A+B) formulae, multiple and sub multiple angles, sin(2A), cos(2A), tan(2A) etc., transformations sum into product and product into sum formulae, inverse trigonometric functions, sine rule and cosine rule</td></tr>
<tr><td colspan="8">UnitV: 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.</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="8">1. NCERT class XI and XII text books.<br>2. Any State Board Mathematics text books of class XI and XII</td></tr>
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| **Website and e-Learning Source** | https://nptel.ac.in |

**Course Learning Outcome**

After completion of this course successfully, the students will be able to

**CLO1:** Prove the binomial theorem and apply it to find the expansions of any $(x + y)^n$ and also, solve the related problems

**CLO2:** Find the various sequences and series and solve the problems related to them. Explain the principle of counting.

**CLO3:**Find the number of permutations and combinations in different cases. Apply the principle of counting to solve the problems on permutations and combinations

**CLO4:** Explain various trigonometric ratios and find them for different angles, including sum of the angles, multiple and submultiple angles, etc. Also, they can solve the problems using the transformations.

**CLO5:** Find the limit and derivative of a function at a point, the definite and indefinite integral of a function. Find the points of min/max of a function.

Mapping of Course Learning Outcomes (CLOs) with Programme Learning Outcomes (PLOs) and Programme Specific Outcomes (PSOs)

| | Pos | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 |
| CLO1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| CLO2 | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 1 |
| CLO3 | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 1 |
| CLO4 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 |
| CLO5 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 |

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">ALGEBRA & TRIGONOMETRY</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">CORE PAPER I</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23UMACACT01/ 23UMACT01</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td colspan="2"></td><td colspan="2">--</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">• Basic ideas on the Theory of Equations, Matrices and Number Theory.<br>• Knowledge to find expansions of trigonometry functions, solve theoretical and applied problems.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="7">Unit I: Reciprocal Equations-Standard form–Increasing or decreasing the roots of a given equation- Removal of terms, Approximate solutions of roots of polynomials by Horner’s method – Simple problems.(Book1-Chapter6: Sections 16, 17, 19, 30).</td></tr>
<tr><td colspan="7">Unit II: Summation of Series: Binomial– Exponential –Logarithmic series (Theorems without proof) – Approximations - Simple problems.<br>(Book1 – Chapter3: Sections 10,14; Chapter4: Sections-1,2,3,5,7,8,9. 11).</td></tr>
<tr><td colspan="7">Unit III: Characteristic equation –Eigen values and Eigen Vectors-Similar matrices - Cayley –Hamilton Theorem (Statement only) - Finding powers of square matrix-Inverse of a square matrix up to order 3, Diagonalization of square matrices - Simple problems.<br>(Book2 – Chapter2: Sections -8,16).</td></tr>
<tr><td colspan="7">Unit IV: 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 $\tan(\theta_1+\theta_2+,\ldots,+\theta_n)$-Expansions of $\sin\theta$, $\cos\theta$ and $\tan\theta$ in terms of $\theta$ - Simple problems.<br>(Book3 - Chapter3: Sections 1 to 5).</td></tr>
<tr><td colspan="7">Unit V: Hyperbolic functions – Relation between circular and hyperbolic functions Inverse hyperbolic functions, Logarithm of complex quantities, Summation of trigonometric series – Simple problems. (Book3 - Chapter4; Chapter5; Chapter6: Sections 1,3,3.1)</td></tr>
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|---|---|
| **Skills acquired from this course** | Knowledge, problem solving, analytical ability, professional competency, professional communication and transferable skill. |
| **Recommended Text** | 1. Manicavasagam Pillai, T.K., T. Natarajan and Ganapathy KS – Algebra Vol-I, Viswanathan Publishers and Printers Pvt Ltd., - 2008.<br>2. Manicavasagam Pillai, T.K., T. Natarajan and Ganapathy KS – Algebra Vol-II, Viswanathan Publishers and Printers Pvt Ltd., - 2008.<br>3. Manicavasagam Pillai, T.K. and S. Narayanan, Trigonometry– Viswanathan Publishers and Printers Pvt. Ltd. 2013. |
| **Recommended Refference** | 1. W.S. Burnstine and A.W. Panton, Theory of equations<br>2. David C. Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007<br>3. G.B. Thomas and R.L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005<br>4. C.V.Durell and A. Robson, Advanced Trigonometry, Courier Corporation, 2003<br>5. J.Stewart, L.Redlin, and S. Watson, Algebra and Trigonometry, Cengage Learning, 2012.<br>6. Calculus and Analytical Geometry, G.B. Thomas and R. L. Finny, Pearson Publication, 9th Edition, 2010. |
| **Website and e-Learning Source** | https://nptel.ac.in |

**METHOD OF EVALUATION:**

| Continuous Internal Assessment | End Semester Examination | Total |
|---|---|---|
| 25 | **75** | **100** |

**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

**CLO 1:** Classify and Solve reciprocal equations.

**CLO 2:** Calculate the sum of binomial, exponential and logarithmic series.

**CLO 3:** Estimate Eigen values, Eigen vectors, verify Cayley – Hamilton theorem and Diagonalize the given matrix.

**CLO 4:** Expand the powers and multiples of trigonometric functions in terms of sine and cosine.

**CLO 5:** Determine relationship between circular and hyperbolic functions and the summation of trigonometric series.

| | POs | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 2 | 3 | 1 | - | 1 | 3 | 2 | 1 |
| CLO2 | 2 | 2 | 3 | 2 | - | - | 3 | 2 | 1 |
| CLO3 | 3 | 2 | 3 | 1 | - | 1 | 3 | 2 | 1 |
| CLO4 | 3 | 2 | 3 | 1 | 1 | - | 3 | 2 | 1 |
| CLO5 | 3 | 2 | 3 | 2 | 1 | 1 | 3 | 2 | 1 |

3 - Strong Correlation 2 - Medium Correlation 1 - Low Correlation

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">CALCULUS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">CORE PAPER II</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23UMACACT02</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td colspan="2">--</td><td colspan="2">--</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• The basic skills of differentiation, successive differentiation, and their applications.<br>• Basic knowledge on the notions of curvature, evolutes, involutes and polar co-ordinates and in solving related problems.<br>• Knowledge on integration and its geometrical applications, double, triple integrals and improper integrals.<br>• Knowledge about Beta and Gamma functions and their applications.</td></tr>
<tr><td colspan="2" rowspan="3">Course Outline</td><td colspan="6">UNIT – I ::Successive Differentiation - $n^{th}$ derivative, Standard results– Leibnitz Theorem(without Proof) and its applications. Related problems (Book I - Chapter3: Sections 1.1 to 1.6 and 2.1.)</td></tr>
<tr><td colspan="6">UNIT-II: Envelopes- Methods of finding envelopes- Curvature–Circle, radius, Centre of Curvature – Involutes -Evolutes-Cartesian and Polar formula for the radius of curvature. Co-ordinates of Centre of Curvature Maxima and Minima functions of two variables,- Jacobians. Related problems.<br>(Book I – Chapter 10: Sections1.1 to 1.4; 2.1 to 2.6.<br>Book III- Chapter 3: Section 3 and 4.)</td></tr>
<tr><td colspan="6">UNIT-III: Integral Calculus: Reduction formulae: Bernoulli’s formula, $\int e^{ax}\cos bx\,dx$, $\int e^{ax}\sin bx\,dx$- $\int \sin^m x\cos^n x\,dx$ (m, n being positive integers), $\int x^m(\log x)^n\,dx$, $\int \cos^m x\cos nx\,dx$,$\int \cos^m x\sin nx\,dx$<br>(Book III- Chapter 11)</td></tr>
</table>

| | |
|---|---|
| | **UNIT-IV**: Double Integrals (Cartesian co-ordinates only), Multiple Integrals - definition of double integrals - evaluation of double integrals - Change of order of integration. Triple integrals(Cartesian co-ordinates only).<br>(Book II – Chapter 5: Sections1, 2.1,2.2 & 4.) |
| | **UNIT-V:**Beta and Gamma functions(Applications to simple problems)<br>(Book III – Chapter 13. ) |
| Skills acquired from this course | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text** | 1. "Calculus",Vol-I, S.Narayanan and T.K.Manicavachagam Pillai S.Viswanathan publishers–2007.<br>2. "Calculus",Vol-II, S.Narayanan and T.K.Manicavachagam Pillai S.Viswanathan publishers–2007.<br>3. Calculus, Dr. P R Vittal and Dr. V Malini, Margham publications, Reprint 2016. |
| **Reference Books** | 1. R. Courant and F. John, Introduction to Calculus and Analysis (Volumes I & II), Springer- Verlag, New York, Inc., 1989.<br>2. T. Apostol, Calculus, Volumes I and II.<br>3. S. Goldberg, Calculus and mathematical analysis.<br>4. H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002.<br>5. G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2010.<br>6. D. Chatterjee, Integral Calculus and Differential Equations, Tata-McGraw Hill Publishing Company Ltd. |
| **Website and e-Learning Source** | https://nptel.ac.in |

**METHOD OF EVALUATION:**

| Continuous Internal Assessment | End Semester Examination | Total |
|---|---|---|
| 25 | **75** | **100** |

**Course Learning Outcome (for Mapping with PLOs and PSOs)**

Students will be able to

**CLO 1:** Evaluate the nth derivative using Leibnitz Rule

**CLO 2:** Compute Radius and circle of curvature, Evolute and Maxima – Minima of two variables.

**CLO 3** : Evaluate integral values by appropriate reduction formula.

**CLO 4:** Identify the multiple integral techniques and Evaluate.

**CLO 5:** Evaluate the indefinite integrals using the properties of Beta and Gamma functions.

| | Pos | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 1 | 3 | 1 | 1 | 1 | 3 | 2 | 1 |
| CLO2 | 3 | 1 | 3 | 1 | 1 | - | 3 | 2 | 1 |
| CLO3 | 3 | 2 | 3 | 2 | - | 1 | 3 | 2 | 1 |
| CLO4 | 3 | 2 | 3 | 2 | 1 | - | 3 | 2 | 1 |
| CLO5 | 3 | 2 | 3 | 2 | - | - | 3 | 2 | 1 |

3 - Strong Correlation 2 - Medium Correlation 1 - Low Correlation

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">WEB DESIGNING WITH HTML</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">ELECTIVE COURSE I</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">ELECTIVE</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td colspan="2">-</td><td colspan="2">2</td><td>6</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">• Insert a graphic within a web page.<br>• Create a link within a web page.<br>• Create a table within a web page.<br>• Insert heading levels within a web page.<br>• Insert ordered and unordered lists within a web page. Create a web page.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="7">UNIT I-Introduction to HTML – Opening for writing HTML – Unicode Transformation Format – HTML 5 Resources – What is different in HTML 5? - <DOCTYPE> in HTML 5<br>(Chapter 1: Sec 1.1 to 1.5, Chapter 2: Sec 2.1 to 2.3)</td></tr>
<tr><td colspan="7">UNIT II-Designing a Webpage: Design Considerations and Planning – Basic Tags and Document structure – HTML Tags <HTML> … </HTML> - Head Tags <HEAD> … </HEAD> - Title Tags – Body Tags <BODY> … </BODY> - Metadata – Saving an HTML document – Actions. (Chapter 3: Sec 3.1 to 3.8)</td></tr>
<tr><td colspan="7">UNIT III-Formatting: Page Formatting – Adding a New Paragraph – Adding a Line Break – Inserting Blank Space – Preformatted Text – Changing a Page’s Background Color – Div Element - Text items and objects – Headings – Comments – Block Quotes – Horizontal Lines – Special Characters – Creating Lists – Numbered (Ordered) Lists – Bulleted (Unordered) Lists – Nested Lists- Definition Lists.<br>(Chapter 4: Sec 4.1 to 4 6)</td></tr>
<tr><td colspan="7">UNIT IV-Links: Introduction to Links – Text Links – Image Links – Opening a web page in a new window/Tab – Setting All Links on a page to open in a new window/Tab – Linking to an area on the same page (Bookmarks) – Linking to an E-mail Address – Linking to other types of Files. (Chapter 7: Sec 7.1 to 7.8)</td></tr>
<tr><td colspan="7">UNIT V- Images: Introduction to Images: Adding Images – Resizing images – Alternative (ALT) Text – Image Labels. Tables: Introduction to Tables - Inserting a Table – Table Borders - Table Headers<br>(Chapter 8: 8.1 to 8.5, Chapter 9: 9.1 to 9.3)</td></tr>
</table>

| | |
|---|---|
| Practical Course Outline | 1. Write a program to illustrating the basic tags of HTML.<br>2. Write a program on Page formatting.<br>3. Write a program to illustrate paragraph tag.<br>4. Write a program to change background colour.<br>5. Write a program to create a list (Numbered (Ordered) Lists – Bulleted (Unordered) Lists).<br>6. To create a HTML file using special characters.<br>7. To create a HTML file containing hyper link.<br>8. Write a HTML program to display a table with 5 rows and 4 columns with appropriate heading.<br>9. Write a HTML code to design complex nested list.<br>10. Write a HTML code to develop a web page having two frames that divide the page into two equal rows and divide the first row into two columns. |
| **Skills acquired from this course** | 1. Learn the language of the web: HTML.<br>2. Understand the principles of creating an effective webpage.<br>3. Learn to embed other media links into webpages. |
| **Recommended Text** | 1. "Mastering HTML 5 and CSS 3 Made Easy", Teach U Comp Inc., 2014.<br>2. Thomas Michaud, "Foundations of Web Design: Introduction to HTML & CSS" |
| **Website and e-Learning Source** | 1. https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf<br>2. https://www.w3schools.com/html/default.asp |

**METHOD OF EVALUATION:**

| **Continuous Internal Assessment** | **End Semester Examination** | | **Total** |
|---|---|---|---|
| | **Theory** | **Practical** | |
| **25** | **50** | **25** | **100** |

**Course Learning Outcomes(for Mapping with POs and PSOs)**

Students will be able to

**CLO1:**Understand the basic concept in HTML. Concept of resources in HTML

**CLO2:**Create the Meta Data, Design concept & save the files.

**CLO3:**Understand page formatting and the concept of list.

CLO4: Creating Links and understand the concept of creating link to email address

CLO5: Create concepts by adding images.Understand the table creation.

| | POs | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 2 | 1 | - | 3 | 2 | 2 | 2 | 2 |
| CLO2 | 3 | 2 | 1 | - | 3 | 2 | 2 | 2 | 2 |
| CLO3 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |
| CLO4 | 3 | 2 | 1 | - | 3 | 2 | 2 | 2 | 2 |
| CLO5 | 3 | 2 | 1 | - | 3 | 2 | 2 | 2 | 2 |

3 - Strong Correlation 2 - Medium Correlation 1 - Low Correlation

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">MATHEMATICS FOR COMPETITIVE EXAMINATION – I</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">SKILL ENHANCEMENT COURSE SEC-01<br>(Non Major Elective)</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">SEC</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">23UMACASE01/ 23UMASE01</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2">Instructional Hours Per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2"></td><td>2</td><td colspan="2">-</td><td colspan="2">-</td><td>2</td></tr>
<tr><td colspan="2">Pre- requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objective of the Course</td><td colspan="6">• Remembering the meaning of HCF and LCM of numbers.<br>• Understanding the concept of percentage on simple problems.<br>• Analyzing the concepts of ratio and proportion.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT – I<br>Numbers - H.C.F and L.C.M. of Numbers.<br>(Chapter – 1 & 2 )</td></tr>
<tr><td colspan="6">UNIT – II<br>Decimal Fractions – Simplification.<br>(Chapter – 3 & 4)</td></tr>
<tr><td colspan="6">UNIT – III<br>Square Roots and Cube Roots – Average.<br>(Chapter – 5 & 6)</td></tr>
<tr><td colspan="6">UNIT – IV<br>Problems on Numbers - Problems on Ages.<br>(Chapter – 7 & 8)</td></tr>
<tr><td colspan="6">UNIT – V<br>Surds & Indices – Percentage.<br>(Chapter – 9 & 10)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="6">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill.</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="6">1. R.S. Aggarwal, Quantitative Aptitude for Competitative Examinations, S.Chand co Ltd., 152. Anna Salai, Chennai,2010</td></tr>
<tr><td colspan="2">Reference Books</td><td colspan="6">1. Quantitative Aptitude ‘’by Abhijit Guha, Tata McGraw Hill Publishing Company Limited, New Delhi (2005)</td></tr>
</table>

| | |
|---|---|
| **Website and e – Learning Source** | https://nptel.ac.in |

**METHOD OF EVALUATION:**

| **Continuous Internal Assessment** | **End Semester Examination (**75 Objective type) | **Total** |
|---|---|---|
| 25 | **75** | **100** |

**Question Paper Pattern:** questions each carrying 1 Mark.

**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

**CLO 1 :** Perform basic mathematics in Numbers.

**CLO 2 :** Understand Decimal Fractions and Simplification.

**CLO 3 :** Develop basic concept of Square Roots and Cube Roots and Average.

**CLO 4 :** Explain Problems on Numbers - Problems on Ages.

**CLO 5 :** Critique and evaluate quantitative arguments that utilize mathematics, statistical and quantitative informations.

| | Pos | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 1 | 3 | - | - | - | 3 | 2 | 1 |
| CLO2 | 2 | 1 | 3 | 1 | - | - | 3 | 2 | 1 |
| CLO3 | 3 | 1 | 3 | 1 | - | - | 3 | 2 | 1 |
| CLO4 | 3 | 1 | 3 | - | - | - | 3 | 2 | 1 |
| CLO5 | 3 | 1 | 3 | - | - | - | 3 | 2 | 1 |

<table>
<tr><td>Title of the Course</td><td colspan="7">ANALYTICAL GEOMETRY &VECTOR ANALYSIS</td></tr>
<tr><td>Paper Number</td><td colspan="7">CORE PAPER III</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23UMACACT03</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td colspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2"></td><td colspan="2">4</td><td colspan="2">--</td><td>--</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• Necessary skills to analyze characteristics and properties of two- and three-dimensional geometric shapes.<br>• To present mathematical arguments about geometric relationships.<br>• To solve real world problems on geometry and its applications.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT-I: System of Planes - Length of the perpendicular - Orthogonal projection.<br>(Book1- Chapter2: Sections 2.5,2.7,2.9)</td></tr>
<tr><td colspan="6">UNIT-II: Representation of line - angle between a line and a plane - co – planar lines - shortest distance between two skew lines - length of the perpendicular - intersection of three planes.<br>(Book1- Chapter3: Sections 3.1, 3.2, 3.4, 3.6, 3.7, 3.8)</td></tr>
<tr><td colspan="6">UNIT-III: Equation of a sphere - general equation - section of a sphere by a plane-equation of the circle - tangent plane - angle of intersection of two spheres- condition for the orthogonality - radical plane.<br>(Book1 - Chapter6: Sections 6.1, 6.2, 6.3, 6.4, 6.6, 6.7, 6.8)</td></tr>
<tr><td colspan="6">UNIT-IV: Vector Differentiation: Directional Derivative - Gradient- Unit normal to the surface - Equation of tangent plane to a surface - Equation of normal to a surface – Divergence – Curl – Laplacian Differential operators.<br>(Book2 – Chapter2.)</td></tr>
<tr><td colspan="6">UNIT-V: Vector Integration: Evaluation of line integral - surface integral and volume integrals. Application of Green’s theorem - Gauss-Divergence theorem – Stokes theorem (proofs of theorems not included)-simple problems.<br>(Book2 - Chapter 3: Section 3.1 to 3.6 and 3.8; Chapter 4.)</td></tr>
</table>

| | |
|---|---|
| **Skills acquired from this course** | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text** | 1. Analytical Solid Geometry of 3D by Shanthi Narayan and Dr.P.K. Mittal - S.Chand & Co.Pvt.Ltd.<br>2. Vector Analysis by P. Duraipandian and Kayalal Pachaiyappa , S.Chand. |
| **Reference Books** | 1. S. L. Loney, Co-ordinate Geometry.<br>2. Robert J. T. Bell, Co-ordinate Geometry of Three Dimensions.<br>3. Calculus and Analytical Geometry, G.B. Thomas and R. L. Finny, Pearson Publication, 9th Edition, 2010.<br>4. Robert C. Yates, Analytic Geometry with Calculus, Prentice Hall, Inc., New York, 1961.<br>5. Earl W. Swokowski and Jeffery A. Cole, Algebra and Trigonometry with Analytic Geometry, Twelfth Edition, Brooks/Cole, Cengage Learning, CA, USA, 2010.<br>6. William H. McCrea, Analytical Geometry of Three Dimensions, Dover Publications, Inc, New York, 2006.<br>7. John F. Randelph, Calculus and Analytic Geometry, Wadsworth Publishing Company, CA, USA, 1969.<br>8. Ralph Palmer Agnew, Analytic Geometry and Calculus with Vectors, McGraw-Hill Book Company, Inc. New York, 1962. |
| **Website and e-Learning Source** | https://nptel.ac.in |

**METHOD OF EVALUATION:**

| Continuous Internal Assessment | End Semester Examination | Total |
|---|---|---|
| 25 | **75** | **100** |

**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

**CLO 1:** Solve problems in the system of Planes

**CLO 2:** Estimate the angle between the line and plane, coplanar lines and shortest distance between skew lines.

**CLO 3:** Understand the concept of equation of sphere and its applications.

**CLO 4:** Calculate Directional Derivative, Divergence and Curl.

**CLO 5:** Apply Green's theorem, Gauss-Divergence theorem, Stoke's theorem to evaluate Area and Volume

| | Pos | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 2 | 2 | 2 | 1 | 1 | 1 | 3 | 2 | 1 |
| CLO2 | 2 | 3 | 2 | 1 | 1 | 1 | 3 | 2 | 1 |
| CLO3 | 3 | 3 | 2 | 1 | 1 | 1 | 3 | 2 | 1 |
| CLO4 | 3 | 3 | 3 | 2 | 1 | 1 | 3 | 2 | 1 |
| CLO5 | 3 | 3 | 3 | 2 | 1 | 1 | 3 | 2 | 1 |

3 - Strong Correlation 2 - Medium Correlation 1 - Low Correlation

<table>
<tr><td>Title of the Course</td><td colspan="6">DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS</td></tr>
<tr><td>Paper Number</td><td colspan="6">CORE PAPER IV</td></tr>
<tr><td rowspan="2">Category Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23UMACACT04/ 23UMACT06</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td>--</td><td colspan="2">--</td><td>4</td></tr>
<tr><td>Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td>Objectives of the Course</td><td colspan="6">• Knowledge about the methods of solving Ordinary and Partial Differential Equations.<br>• The understanding of how Differential Equations can be used as a powerful tool in solving problems in science.</td></tr>
<tr><td rowspan="4">Course Outline</td><td colspan="6">UNIT-I: 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>(Chapter2: Sections 1 to 6)</td></tr>
<tr><td colspan="6">UNIT-II: Equation of first order but not of higher degree: Equation solvable for dy/dx- Equation solvable for y-Equation solvable for x- Clairauts’ form - Linear Equations with constant coefficients - Particular integrals of algebraic, exponential, trigonometric functions and their products.<br>(Chapter4: Sections 1,2 ,3 and Chapter5: 1 to 4)</td></tr>
<tr><td colspan="6">UNIT-III: Simultaneous linear differential equations - Linear Equations of the Second Order - Complete solution in terms of a known integrals - Reduction to the Normal form - Change of the Independent Variable-Method of Variation of Parameters.<br>(Chapter6 and Chapter 8: Sections 1 to 4)</td></tr>
<tr><td colspan="6">UNIT-IV: Partial differential equation: Formation of PDE by Eliminating arbitrary constants and arbitrary functions - complete integral - singular integral- General integral-Lagrange’s Linear Equations - Simple Applications.<br>(Chapter12: 1,2,3, and 4)</td></tr>
</table>

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|---|---|
| | **UNIT-V:** Special methods – Standard forms - Charpit's Methods – Simple Applications.<br>(Chapter12: 5, and 6) |
| **Skills acquired from this course** | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text** | 1. Shepley L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984.<br>2. I. Sneddon, Elements of Partial Differential Equations, McGraw-Hill, International Edition, 1967.<br>3. S.Narayanan & T.K.Manicavachagam Pillay, Calculus Vol III, S.Vishwanathan Printers and publishers pvt.ltd, Chennai (2016). |
| **Reference Books** | 1. D.A. Murray, Introductory course in Differential Equations, Orient and Longman<br>2. H.T. H. Piaggio, Elementary Treaties on Differential Equations and their applications, C.B.S Publisher & Distributors, Delhi,1985.<br>3. Horst R. Beyer, Calculus and Analysis, Wiley, 2010.<br>4. Braun, M. Differential Equations and their Applications. (3rd Edn.), Springer- Verlag, New York. 1983.<br>5. TynMyint-U and Lognath Debnath. Linear Partial Differential Equations for Scientists and Engineers. (4th Edn.) Birhauser, Berlin. 2007.<br>6. N.P.Bali, Differential Equations, Firewall Media Publications,(2006).<br>7. S.Narayanan, Differential Equations and its Applications, Dhivya Subramanian for Anand Book Depot(2017). |
| **Website and e-Learning Source** | https://nptel.ac.in |

**METHOD OF EVALUATION:**

| Continuous Internal Assessment | End Semester Examination | Total |
|---|---|---|
| 25 | **75** | **100** |

**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

**CLO 1:** Determine solutions of homogeneous equations, non-homogeneous equations of degree one in two variables, solve Bernoulli's equations and exact differential equations

**CLO 2:** 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

**CLO 3:** Find solutions of simultaneous linear differential equations, linear equations of second order and to find solutions using the method of variations of parameters

**CLO 4:** Form a PDE by eliminating arbitrary constants and arbitrary functions,
find complete, singular and general integrals, to solve Lagrange's equations

**CLO 5:** Explain standard forms and Solve Differential equations using Charpit's method

| | Pos | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 2 |
| CLO2 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 2 |
| CLO3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 |
| CLO4 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 |
| CLO5 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 2 |

3 - Strong Correlation 2 - Medium Correlation 1 - Low Correlation

<table>
<tr><td>Title of the Course</td><td colspan="6">PROGRAMMING WITH PYTHON</td></tr>
<tr><td>Paper Number</td><td colspan="6">ELECTIVEPAPER II</td></tr>
<tr><td rowspan="2">Category Elective</td><td>Year</td><td>I</td><td>Credits</td><td>5</td><td>Course Code</td><td></td></tr>
<tr><td>Semester</td><td>II</td><td colspan="3"></td></tr>
<tr><td>Instructional Hours per week</td><td colspan="2">Lecture<br>4</td><td>Tutorial<br>--</td><td colspan="2">Lab Practice<br>2</td><td>Total<br>6</td></tr>
<tr><td>Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td>Objectives of the Course</td><td colspan="6">• Describe the core syntax and semantics of Python programming language.<br>• Discover the need for working with the strings and functions.<br>• Illustrate the process of structuring the data using lists, dictionaries, tuples and sets.<br>• Understand the usage of packages and Dictionaries<br>• To know the costs and profit maximization</td></tr>
<tr><td>Course Outline</td><td colspan="6">UNITI-Introduction to Python–Origins–Features–Downloading and Installing Python– Running Python – Python Documentation. Getting Started – Program Output statement – Program Input function – Python Basics – Statements and syntax –Variable Assignment – Identifiers – Numbers – Introduction – Integers – Double Precision Floating Point Numbers – Complex Numbers – Operators – Built-in functions for all numeric types.(Chapter 1 : Sec 1.1 to 1.8, Chapter 2: Sec 2.1 to 2.6, Chapter 3 Sec 3.1 to 3.6, Chapter 5 Sec 5.1 to 5.6)</td></tr>
<tr><td></td><td colspan="6">UNIT II-Sequences: Strings, Lists and Tuples – Sequences – Strings – Strings and Operators–String-Only Operators–Built-in Functions–String Built-in Method–Lists–Operators-Built-in Functions–List Type Built-in Methods–Tuples—Tuple Operators and Built-in Functions. ( Chapter 6 Sec 6.1 to 6.19)</td></tr>
<tr><td></td><td colspan="6">UNIT III- Conditionals and Loops–If statement– else statement– elif statement–Conditional expressions–while statement–for statement–break statement–Continue statement–pass statement –Functions and Functional Programming–Calling Functions–Creating Functions–Passing Functions–Formal Arguments-Variable-Length Arguments. ( Chapter 6 Sec 6.1 to 6.19)</td></tr>
<tr><td></td><td colspan="6">UNIT IV-Errors and Exceptions – Exceptions in Python – Detecting and Handling Exceptions Context Management – with statement – Raising Exceptions – Modules – Modules and Files – Name spaces – Importing Modules – Features of Module - Import –Module Built-in Functions–Packages.( Chapter 10 Sec 10.1 to 10.13)</td></tr>
</table>

| | |
|---|---|
| | **UNIT V-** Files and Input / Output: File Objects – File Built-in Functions – File Built-in Methods – File Built-in Attributes – Command-Line Arguments - File System –Object-oriented Programming – Introduction – Classes – Class Attributes –Instances– Instance Attributes.( Chapter 9 Sec 9.1 to 9.10) |
| Practical Course Outline | 1. Program for Systemconfiguration<br>2. WorkingwithStrings<br>3. WorkingwithLists<br>4. WorkingwithTuples<br>5. WorkingwithDictionary<br>6. Workingwithconditionalloops–if, else, elif<br>7. Workingwithconditionalexpressions–for, while,break,continue<br>8. Implementingprogramsonfunctions<br>9. Workingwithfunction–formalargumentsandvariable-lengtharguments<br>10. WorkingwithDetectingandHandlingException<br>11. Workingwithmodules<br>12. Working withBuilt-inFunctions |
| **Skills acquired from this course** | 1. Impart knowledge and skill in getting started with Python basic concepts.<br>2. Expose to the concepts of sequences, string and built-in-function of python.<br>3. Introduce the various control statements and looping for decision making.<br>4. Study the exceptions and error handling in program execution.<br>5. Gain knowledge on file management in Python Programming. |
| **RecommendedTexts** | Wesley J.Chun, "Core Python Programming", 2nd Edition, Pearson Education LPE, NewDelhi,2007. |

| | |
|---|---|
| **ReferenceBooks** | 1. Mark Summerfield, Programming in Python 3, Pearson Education LPE, New Delhi, 1996.<br>2. Python Programming, Brain draper, kindle unlimited pvt.ltd.<br>3. Core Python Programming, Dr.R.Nageswara Rao, dreamtech pvtltd. Kindle.<br>4. The complete reference on Python, Martin.C.Brown MAC GrawHill pvt.ltd.<br>5. Coding for beginners using Python .Louie Stowell, kindle publishing pvt.ltd. |
| **Website and e-Learning Source** | 1. https://www.programiz.com/python-programming<br>2. https://www.guru99.com/python-tutorials.html<br>3. https://www.w3schools.com/python/python_intro.asp<br>4. https://www.geeksforgeeks.org/python-programming-language/<br>5. https://en.wikipedia.org/wiki/Python_(programming_language) |

**METHOD OF EVALUATION:**

| **Continuous Internal Assessment** | **End Semester Examination** | | **Total** |
|---|---|---|---|
| | **Theory** | **Practical** | |
| **25** | **50** | **25** | **100** |

**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

**CLO1:** Develop and execute simple Python programs.

**CLO2:**Write simple Python programs using conditionals and looping for solving problems.

**CLO3:**Decompose a Python program into functions.

**CLO4:**Represent compound data using Python lists, tuples, dictionaries etc.

**CLO5:** Read and write data from/to files in Python programs.

| | POs | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |
| CLO2 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |
| CLO3 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |
| CLO4 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |
| CLO5 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |

3- Strong Correlation 2-Medium Correlation 1- Low Correlation

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">MATHEMATICS FOR COMPETITIVE EXAMINATION – II</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">SKILL ENHANCEMENT COURSE SEC-02<br>(Non Major Elective)</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">SEC</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">23UMACASE02/ 23UMASE02</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours Per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>2</td><td colspan="2">-</td><td colspan="2">-</td><td>2</td></tr>
<tr><td colspan="2">Pre- requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objective of the Course</td><td colspan="7">• Understanding the concepts of chain rule.<br>• Applying the concept of time and distance.<br>• Analyzing the problem on trains with solved examples.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="7">UNIT – I<br>Profit & Loss – Ratio & Proportion.<br>(Chapter – 11 & 12)</td></tr>
<tr><td colspan="7">UNIT – II<br>Partnership – Chain Rule.<br>(Chapter – 13 & 14)</td></tr>
<tr><td colspan="7">UNIT – III<br>Time & Work – Pipes & Cistern.<br>(Chapter – 15 &16)</td></tr>
<tr><td colspan="7">UNIT – IV<br>Time & Distance – Problems on Trains.<br>(Chaper – 17 &18)</td></tr>
<tr><td colspan="7">UNIT – V<br>Boats & Streams – Alligation or Mixture.<br>(Chaper – 19 &20)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="7">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill.</td></tr>
<tr><td colspan="2">Recommended Text<br>Reference Books</td><td colspan="7">1. R.S. Aggarwal, Quantitative Aptitude for Competitative Examinations, S.Chand co Ltd., 152. Anna Salai, Chennai,2010<br>1. Quantitative Aptitude ‘’by Abhijit Guha, Tata McGraw Hill Publishing Company Limited, New Delhi (2005)</td></tr>
<tr><td colspan="2">Website and e – Learning Source</td><td colspan="7">https://nptel.ac.in</td></tr>
</table>

| Continuous Internal Assessment | End Semester Examination (75 Objective type) | Total |
|---|---|---|
| 25 | **75** | **100** |

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**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

**CLO 1 :** Explain in detail about Profit & Loss and Ratio & Proportion.

**CLO 2 :** Explain Partnership and Chain Rule.

**CLO 3 :** Explain Time & Work and Pipes & Cistern.

**CLO 4 :** Explain Time & Distance and Problems on Trains.

**CLO 5 :** Explain Boats & Streams and Alligation or Mixture.

| | Pos | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 1 | 3 | - | - | - | 3 | 2 | 1 |
| CLO2 | 2 | 1 | 3 | 1 | - | - | 3 | 2 | 1 |
| CLO3 | 3 | 1 | 3 | 1 | - | - | 3 | 2 | 1 |
| CLO4 | 3 | 1 | 3 | - | - | - | 3 | 2 | 1 |
| CLO5 | 3 | 1 | 3 | - | - | - | 3 | 2 | 1 |

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">SAGE MATHEMATICS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">SKILL ENHANCEMENT COURSE SEC03</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Skill Enhancement Course</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">23UMACASE03/ 23UMASE03</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>2</td><td colspan="2">-</td><td colspan="2">--</td><td>2</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">To bridge the gap and facilitate transition from higher secondary to tertiary education;<br>To instil confidence among stakeholders and inculcate interest for Mathematics;</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT-I: Using Sage Math as a Calculator: First Sage Math Examples- Computations- Basic Arithmetic Operators- Decimals Versus Exact Values- Constants.<br>(Chapter 2.1, Chapter 2.2 up to Section 2.2.3)</td></tr>
<tr><td colspan="6">Unit II: Breaking Long Lines of Code- Comments- Library Functions- Working with Strings- Solving Equations and Inequalities- Calculus Functions.<br>(Chapter 2.2 from Section 2.2.4 to Section 2.2.9)</td></tr>
<tr><td colspan="6">Unit III: Graphs: 2D Graphs- 3D Graphs.<br>(Chapter 2.3)</td></tr>
<tr><td colspan="6">Unit IV: Introduction to Programming in Sage: Variables- More on Operators- Making Decisions- Boolean Expressions - If Statements- Loops- For Loops- Strings- While Loops- Nested Loops- Lists.<br>(Chapter 3.1 to 3.4)</td></tr>
<tr><td colspan="6">Unit V: Functions: Using Library Functions: Random, SciPy, NumPy- Application to Elementary Statistics: Mean, Median, Histograms, and Bar Charts.<br>(Chapter 3.5 , Chapter 3.9)</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="6">1. Razvan A. Mezei, “An Introduction to Sage Programming” John Wiley & Sons, USA, 2016.</td></tr>
</table>

| | |
|---|---|
| **Recommended Refference** | 1. http://doc.sagemath.org/pdf/en/tutorial/SageTutorial.pdf<br>2. Gregory V. Bard. Sage for Undergraduates, American Mathematical Society, available online at http://www.gregorybard.com/Sage.html<br>3. The SageMathCloud, https://cloud.sagemath.com/<br>4. https://nptel.ac.in/courses/111106149 |
| **Website and e-Learning Source** | https://nptel.ac.in |

**Course Outcomes (COs)**

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

CLO 1: To solve simple mathematical problems involving arithmetic operations using Sage.

CLO 2: To solve equations and inequalities using Sage.

CLO 3: Plot 2D and 3D graphs using Sage.

CLO 4: Apply Boolean expression and control structures to solve mathematical problems.

CLO 5: Apply functions to compute statistical parameters and make charts.

| | **POs** | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **1** | **2** | **3** |
| **CLO1** | 3 | 2 | 1 | 2 | 3 | 2 | 2 | 2 | 1 |
| **CLO2** | 2 | 3 | 3 | 2 | 3 | 2 | 1 | 2 | 2 |
| **CLO3** | 2 | 2 | 3 | 1 | 2 | 2 | 3 | 3 | 1 |
| **CLO4** | 1 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 2 |
| **CLO5** | 2 | 2 | 3 | 1 | 2 | 2 | 3 | 3 | 2 |

3 - Strong Correlation 2 - Medium Correlation 1 - Low Correlation

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">Fourier Series and Integral Transform</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">CORE PAPER V</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23UMACACT05</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td colspan="2">--</td><td>--</td><td colspan="2">4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• To analyse Fourier series and its applicability<br>• To understand Laplace Transform<br>• To apply Laplace transform to solve differential equations<br>• To compute Fourier Transform<br>• To apply Z Transforms to difference equations.</td></tr>
<tr><td colspan="2" rowspan="4">Course Outline</td><td colspan="6">Unit I: Fourier series- Expansion of periodic functions of period 2π- Expansion of even and odd functions, Half range Fourier series – Problems.<br>(Book1 - Chapter 6: Section 1 to 4)</td></tr>
<tr><td colspan="6">Unit II: The Laplace Transforms-Definitions-Sufficient conditions for the existence of the Laplace transform (without proof)-Laplace transform of periodic functions-some general theorems-evaluation of integrals using Laplace transform.<br>(Book1 - Chapter 5: Section 1.1, 1.2, 3, 4, 5)</td></tr>
<tr><td colspan="6">Unit III: The inverse Laplace Transforms- Applications of Laplace Transformsto ordinary differential equations with constant co-efficients and variable co-efficients, simultaneous equations and equations involvingintegrals-simple Problems.<br>(Book1 - Chapter 5: Section 6, 7, 8, 9, 10, 12)</td></tr>
<tr><td colspan="6">Unit IV: Fourier Transform- Infinite Fourier Transform (Complex form) –Properties of Fourier Transform – Fourier cosine and Fourier sine Transform – Properties –simple Problems.<br>(Book1 - Chapter 6: Section 9 to 12)</td></tr>
</table>

| | |
|---|---|
| | **Unit V:** Z Transforms: Definition of Z-Transform and its properties - Z-Transforms of some basic functions- Formation of difference equations – Solution of difference equations using Z – transform- Examples and simple problems (Book2 - Chapter 7: Section 7.1 to 7.5) |
| **Skills acquired from this course** | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text** | 1. Calculus-Volume III" – S.Narayanan and T.K.Manicavachagam Pillai.<br>2. "Engineering Mathematics for Semester III- Third Edition – T.Veerarajan ( Tata McGraw-HillPublishing Company Ltd, New Delhi) (for Unit-V) |
| **Reference Books** | 1. Engineering Mathematics Volume III – P.Kandasamy and others ( S.Chand and Co.)<br>2. Advanced Engineering Mathematics- Stanley Grossman and William R.Devit.<br>3. Engineering Mathematics III -A.Singaravelu, Meenakshi Agency, Chennai, 2008 |
| **Website and e-Learning Source** | https://nptel.ac.in |

**METHOD OF EVALUATION:**

| Continuous Internal Assessment | End Semester Examination | Total |
|---|---|---|
| 25 | **75** | **100** |

**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

**CLO 1:** Study the expansion of periodic functions using Fourier Series

**CLO 2:** Analyse Laplace transform and the conditions of existence of Laplace transform

**CLO 3:** Implement the Laplace transform technique to solve differential equations.

**CLO 4:** Demonstrate the Fourier transform and its properties

**CLO 5:** Apply Z transform for difference equations

| | POs | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 1 | 3 | 2 | 1 | 2 | 3 | 2 | 1 |
| CLO2 | 3 | 3 | 3 | 2 | 1 | 2 | 3 | 2 | 1 |
| CLO3 | 3 | 2 | 3 | 2 | 1 | 2 | 3 | 3 | 1 |
| CLO4 | 3 | 2 | 3 | 2 | 1 | 2 | 3 | 2 | 1 |
| CLO5 | 3 | 2 | 3 | 2 | 1 | 2 | 3 | 2 | 1 |

3- Strong Correlation 2-Medium Correlation 1- Low Correlation

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">JAVA AND DATA STRUCTURES</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">CORE PAPER VI</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td>Credits</td><td>5</td><td>Course Code</td><td>23UMACACT06</td></tr>
<tr><td>Semester</td><td>III</td><td colspan="4"></td></tr>
<tr><td colspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2"></td><td colspan="2">4</td><td colspan="2">-</td><td>2</td><td>6</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• Learn the basic concepts of Java programming<br>• Use class and objects to create applications<br>• Overview the concepts of interfaces, packages, multithreading and exceptions.<br>• Familiarize the concepts of basic data structures and their use in algorithms.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT I: History and Evolution of Java-Features of Java-Overview of Java Language Data Types–Variables-Type Conversion and Casting-Operators–Arithmetic Operators - Bitwise –Relational Operators - Assignment Operator –The conditional Operator–Operator Precedence.<br>(Book 1:Chapter 2: Sec 2.1 to 2.10, Chapter 3: Sec 3.1 to 3.12, Chapter 4: Sec 4.1 to 4.4.12, Chapter 5: Sec 5.1 to 5.16)</td></tr>
<tr><td colspan="6">UNIT II: Control Statements – Arrays.-Classes - Objects - Constructors - Overloading method –String Class-Overriding.<br>(Book 1: Chapter 6: Sec 6.1 to 6.9)</td></tr>
<tr><td colspan="6">UNIT III: Packages-Exception Handling- Throw and Throws-The Java Thread Model-Creating a Thread and Multiple Threads –Thread Priorities Synchronization-Inter thread Communication - Deadlock - Suspending, Resuming and stopping threads –Multithreading-Applets Programming<br>(Book 1: Chapter 11: Sec 11.1 to 11.11, Chapter 12: Sec 12.1 to 12.11)</td></tr>
<tr><td colspan="6">UNIT IV: Data Structures: Definition of a Data structure–Arrays, Operations on Arrays, Order lists. Stacks – Operations on stack - Applications of Stack - Infix to Postfix Conversion –Evaluation of post fix expression ;Recursion. Queues-Circular Queue–Operations on Queues, Queue Applications.<br>(Book 2: Chapter 6: Sec 6.1 to 6.11, Chapter 7: Sec 7.1 to 7.7, Chapter 8: Section 8.1 to 8.12)</td></tr>
<tr><td colspan="6">UNIT V: Linked List–Representation of Linked List in memory–Insertion and Deletion from Linked List.<br>(Book 2: Chapter 5: Section 5.1 to 5.10)</td></tr>
</table>

| | |
|---|---|
| **Practical Course Outline** | **Implement the following programming concepts:**<br>1. Classes and objects<br>2. Arrays<br>3. Multithreading<br>4. Exception handling<br>5. Inheritance<br>6. Applet programming<br>7. Linked List(Stacks and Queues)<br>Two or three programs under each heading |
| **Skills acquired from this course** | • Knowledge of basic on concepts of object oriented programming and enable students to understand about introduction of Java programming.<br>• Analyze and to understand the concepts of interfaces inheritance and packages. Explain and develop programs in applet Programming, Managing errors and Exceptions.<br>• Identify the data and apply the suitable concepts of data structure in programming. |
| **Recommended Text** | 1. E.Balagurusamy, Programming with Java,Sixth edition, Tata-McGraw-hill publishing co.Ltd.<br>2. Seymour Lipschutz Data Structures, Edition 2006, Tata McGraw hill Publications |
| **Reference Books** | 1. Herbert Schildt,The Complete Reference Java 5th edition,Tata-McGraw-hill pubishingco.ltd<br>2. Y.Daniel ziang, An Introduction to Java Programming, Prentice Hall of India Pvt. Ltd.<br>3. Tushar B.Kute, Core Java Programming A Practical Approach<br>4. L.Mathu Krithiga Venkatesh Data Structures and Algorithms Margham Publications.<br>5. R.Kruse C.L.Tondo and B.Leung, 1997, Data Structures and Program designin C,PHI. |
| **Website and e-Learning Source** | • https://howtodoinjava.com<br>• https://www.programiz.com/java-programming<br>• https://www.theserverside.com/javaprogramming<br>• https://www.technopedia.com/java<br>• https://www.hackerearth.com/practice/algorithms/graphs/graph-representation/tutorial/ |

**METHOD OF EVALUATION:**

| Continuous Internal Assessment | End Semester Examination | | Total |
|---|---|---|---|
| | Theory | Practical | |
| 25 | 50 | 25 | 100 |

**Course Learning Outcomes (for Mapping with POs and PSOs)**

students will be able to

**CLO1:** Explain the basic concepts of object oriented programming and enable students to understand about introduction of Java programming.

**CLO2:** Discuss about decision making statements like if, if-else, elseif ladder etc. Use the concept of decision making and looping, classes, objects, methods, and strings to develop programs.

**CLO3:** Analyze and to understand the concepts of interfaces inheritance and packages. Explain and develop programs in applet Programming, Managing errors and Exceptions.

**CLO4:** Identify the data and apply the suitable concepts of data structure in programming.

**CLO5:** Demonstrate linked list and its operations for programming.

| | Pos | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |
| CLO2 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |
| CLO3 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |
| CLO4 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |
| CLO5 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |

3- Strong Correlation 2-Medium Correlation 1- Low Correlation

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">NUMERICAL METHODS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">ELECTIVE COURSE III</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23UMAECD01</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td colspan="2">--</td><td colspan="2">--</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">• Interpolate an unknown value from a given set of data.<br>• Compute numerical solutions of algebraic and transcendental equations.<br>• Compute numerical solutions of integration problems and ODE.</td></tr>
<tr><td colspan="2" rowspan="4">Course Outline</td><td colspan="7">UNIT-I: INTERPOLATION<br><br>Newton’s Forward and Backward formulae for Interpolation- Central difference formulae- Gauss Forward, Gauss Backward, Stirling’s and Bessel’s formulae- Simple Problems only.(Derivations of Formulae and Proof of theorems are excluded)<br><br>(Chapter 6: Section 6, Chapter 7: Section 7 to 7.6)</td></tr>
<tr><td colspan="7">UNIT-II : INTERPOLATION WITH UNEQUAL INTERVALS<br><br>Lagrange’s Formula for Interpolation – Newton’s Divided Differences formula. Lagrange’s inverse interpolation -Simple Problems only. (Derivations of Formulae and Proof of theorems are excluded)<br><br>(Chapter 6: Section 8.5 to 8.8)</td></tr>
<tr><td colspan="7">UNIT-III : SOLUTION OF ALGEBRAIC AND<br><br>TRANSCEDENTAL EQUATIONS<br><br>Numerical solutions of polynomial and Transcendental equations in one variable. Bi-Section Method –Method of false position (Regular Falsi Method) - Method of Iteration - Newton Raphson Method (Derivations of the formulae are excluded)<br><br>(Chapter 3: Section 3.1 to 3.4)</td></tr>
<tr><td colspan="7">UNIT-IV: NUMERICAL INTEGRATION<br><br>Quadrature Formula for equidistant ordinates based on Newton’s Forward formula – Trapezoidal rule – Simpson’s one third rule – Simpson’s Three Eighth rule - Simple Problems only.(Derivations of Formulae are excluded)<br><br>(Chapter 9: Section 9.7 to 9.9, 9.13, 9.14)</td></tr>
</table>

| | |
|---|---|
| | **UNIT-V:** Numerical solution of ordinary differential equation (first order only), Euler's method - Modified Euler's method- Picard's method of successive approximation.-Runge-Kutta method fourth order only<br>(Chapter 11: Section 11, 11.8, 11.9, 11.11, 11.12) |
| **Skills acquired from this course** | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text** | 1.P. Kandasamy & K. Thilagavathy, K.Gunavathi, *Numerical Methods*, S. Chand & Co. |
| **Reference Books** | 1. B.D.Gupta (2001) Numerical Analysis Konark publications Ltd., Delhi<br>2.Dr.M.K.Venkataraman, Numerical Methods in Science & Engineering, Fifth edition (1999),The National Publishing Company, Chennai.<br>3. H.C. Saxena (1991) Finite difference and numerical analysis S.Chand&Co. Delhi.<br>4. S.Arumugham(2003) Numerical Methods, New Gamma Publishing, Palayamkottai.<br>5. M.K.Jain, S.R.K.Iyengar, R.K.Jain, Numerical methods for scientific and engineering computation,Sixth edition(2012), New age International Publishers, New Delhi.<br>6. E.Balagurusamy, Numerical Methods (1999),Tata Mc.Graw Hill, New Delhi.<br>7. T.K.Manicavachagam Pillai & Prof. S. Narayanan, Numerical Analysis, New Edition (2001), S. Viswanathan Printers & publishers Pvt Ltd, Chennai. |
| **Website and e-Learning Source** | https://nptel.ac.in |

**METHOD OF EVALUATION:**

| Continuous Internal Assessment | End Semester Examination | Total |
|---|---|---|
| 25 | **75** | **100** |

**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

**CLO 1:** Applying the Methods of interpolation to compute the missing value in real life problems.

**CLO 2:** Compute the missing values for unequal intervals using Divided differences and Lagrange Method

**CLO 3:** Apply Numerical Methods to evaluate numerical solution of algebraic and transcendental equations..

**CLO 4:** Compute definite integral for different combinations of integrands using various methods and analyze their accuracy.

**CLO 5:** Evaluate the solution of first order differential equation using Euler, Picard's and Runge - Kutta Methods.

| | Pos | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 2 | 2 | 1 | 2 | 1 | 3 | 2 | 1 |
| CLO2 | 3 | 3 | 2 | 1 | 2 | - | 3 | 2 | 1 |
| CLO3 | 3 | 3 | 2 | 1 | 2 | 1 | 3 | 2 | 1 |
| CLO4 | 3 | 3 | 3 | 2 | 2 | - | 3 | 2 | 1 |
| CLO5 | 3 | 3 | 3 | 2 | 2 | 1 | 3 | 2 | 1 |

3 - Strong Correlation 2 - Medium Correlation 1 - Low Correlation

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">ENTREPRENEURIAL BASED COMPUTATIONAL MATHEMATICS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">SKILL ENHANCEMENT COURSE SEC-04</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">SEC</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">1</td><td rowspan="2">Course Code</td><td rowspan="2">23UMACASE04/ 23UMASE04</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>1</td><td colspan="2">--</td><td>--</td><td colspan="2">1</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• Understand and use the structure of C++ programme, to solve different Numerical Methods.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT-I: Algebraic and Transcendental Equations: Bisection method-Method of false position- Method of successive approximation-Newton-Raphson's method-Secant Method-Graeff's root squaring method.</td></tr>
<tr><td colspan="6">UNIT-II: System of Linear Algebraic Equations: Direct method-Iterative method-Eigen value problems.</td></tr>
<tr><td colspan="6">UNIT-III: C++ Program for Bisection method-C++ Program for Method of false position- C++ Program for Method of successive approximation-C++ Program for Newton-Raphson's method.</td></tr>
<tr><td colspan="6">UNIT-IV: C++ Program for Secant Method-C++ Program for Graeff's root squaring method-C++ Program for Gauss elimination method-C++ Program for Gauss Jordan method.</td></tr>
<tr><td colspan="6">UNIT-V: C++ Program for Jacobian method-C++ Program for Gauss Seidal method-C++ Program for Largest eigen value by power method.</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="6">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved<br>(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="6">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
</table>

| | |
|---|---|
| **Recommended Text** | 1. R.M. Somasundaram and R.M. Chandrasekaran, "Numerical Methods with C++ Programming", Prentice Hall India Pvt. Ltd., New Delhi, 2005. |
| **Reference Books** | 1. Pallab Ghosh, "Numerical Methods with Computer Programs in C++", Prentice Hall India Pvt. Ltd., New Delhi, 2009.<br>2. T. Veerarajan and T. Ramachandran, "Numerical Methods with Programs in C", Second Edition, McGraw Hill Education Pvt. Ltd, New Delhi, 2006. |
| **Website and e-Learning Source** | https://nptel.ac.in |

**METHOD OF EVALUATION:**

| Continuous Internal Assessment | End Semester Examination | Total |
|---|---|---|
| 25 | **75** | **100** |

## Course Outcomes (COs)

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

**CLO 1 :** Describe the roots of algebraic equations using different methods like, Newton-Raphson method, Secant Method etc.

**CLO 2 :** Solve system of algebraic equations using direct and iterative methods.

**CLO 3 :** To write C++ Program to compute roots of algebraic equations using Bisection method, Newton-Raphson method etc.

**CLO 4 :** To write C++ Program to compute roots of algebraic equations using Secant method, Gauss Jordan method etc.

**CLO 5 :** To write C++ Program to solve the system of algebraic equations using the Jacobian method, Gauss Seidal method.

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 3 | 3 |
| **CO2** | 2 | 3 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 3 | 3 |
| **CO4** | 2 | 3 | 3 | 2 | 3 |
| **CO5** | 2 | 3 | 3 | 3 | 2 |

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">ADVANCED EXCEL</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">SKILL ENHANCEMENT COURSE SEC05</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Skill Enhancement Course</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">23UMACASE05/ 23UMASE05</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>2</td><td colspan="2">-</td><td colspan="2">--</td><td>2</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">To bridge the gap and facilitate transition from higher secondary to tertiary education;<br>To instil confidence among stakeholders and inculcate interest for Mathematics;</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="7">UNIT-I: Descriptive statistics-Measures of Center-Mean-Using Excel to Calculate the Mean-Median-Using Excel to Find the Median. (Chapter-3: Pages 110 to 114)</td></tr>
<tr><td colspan="7">Unit II: Mode-Using Excel to Find the Mode-Midrange-Using Excel to Calculate the Midrange-Weighted Mean-Using Excel for Descriptive Statistics. (Chapter-3: Pages 114 to 125)</td></tr>
<tr><td colspan="7">Unit III: Basic Concepts of Probability: Basics of Probability- Law of Large Numbers- Excel Demonstration of the Law of Large Numbers- Relative Frequency Probability- Complementary Events- Unlikely Events and Unusual Events- Rare Event Rule. (Chapter 4: Pages 175 to 184)</td></tr>
<tr><td colspan="7">Unit IV: Addition Rule- Disjoint Events- Complementary Events and the Addition Rule-Multiplication Rule: Basics- Applications of the Multiplication Rule- Hypothesis Testing: Effectiveness of Gender Selection- Rationale for the Multiplication Rule. (Chapter 4 : Pages 190 to 204)</td></tr>
<tr><td colspan="7">UnitV: Multiplication Rule: Complements and Conditional Probability- Counting- Permutations and Combinations- Using Excel to Calculate Factorials, Permutations, and Combinations- Fundamental Counting Rule- Permutations Rule- Combinations Rule. (Chapter 4: Pages 209 to 222)</td></tr>
</table>

| | |
|---|---|
| **Recommended Text** | 1. Mario F. Triola, "Elementary Statistics Using Excel," Fifth Edition, Pearson New International Edition, 2014 |
| **Recommended Refference** | 1. E. Balagurusamy, "Computer Oriented Statistical and Numerical Methods," Macmillan Publishers India Limited, 2000.<br>2. V. K. Rohatgi, A. M. E. Saleh, "An introduction to probability and statistics," John Wiley & Sons, 2015.<br>3. B. Held, B. Moriarty & T. Richardson, "Microsoft Excel Functions and Formulas", Stylus Publishing, LLC, 2019.<br>4. N. J. Salkind, "Excel statistics: A quick guide", Sage Publications, 2015.<br>5. J. Schmuller, "Statistical analysis with Excel for dummies," John wiley & sons, 2013. |
| **Website and e-Learning Source** | https://nptel.ac.in |

**Course Outcomes (COs)**

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

CLO 1: Compute Mean and Median using Excel.

CLO 2: Compute Mode, Midrange, Weighted Mean using Excel.

CLO 3: Demonstrate law of large numbers using Excel.

CLO 4: Testing hypothesis by applying fundamentals concepts of probability.

CLO 5: Compute permutation and combinations using Excel.

| | **POs** | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **1** | **2** | **3** |
| **CLO1** | 3 | 1 | 2 | 2 | 3 | 2 | 2 | 2 | 3 |
| **CLO2** | 3 | 2 | 2 | 1 | 3 | 2 | 1 | 3 | 2 |
| **CLO3** | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 |
| **CLO4** | 2 | 3 | 3 | 1 | 1 | 2 | 2 | 2 | 2 |
| **CLO5** | 2 | 2 | 3 | 1 | 2 | 2 | 2 | 1 | 3 |

3 - Strong Correlation 2 - Medium Correlation 1 - Low Correlation

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="8">WEB TECHNOLOGY</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">CORE VII</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2">23UMACACT07</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="3">Lecture</td><td>Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td colspan="3">4</td><td>-</td><td>2</td><td>6</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="8">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="8">• Use PHP and MYSQL to develop dynamic website for user on the internet.<br>• Get exposed to the concepts of operators and control statements for decision making.<br>• Introduce the looping for working with string and numeric functions.<br>• Study the Array functions and creating classes to develop the website.<br>• Gain the knowledge on file management in PHP.</td></tr>
<tr><td colspan="2" rowspan="4">Course Outline</td><td colspan="8">UNIT I-Introducing PHP – Basic development Concepts – Creating first PHP Scripts – Using Variable and Operators – Storing Data in variable –Understanding Data types– Setting and Checking variables.<br><br>(Chapter 1: Page No. 3,7,10 & Chapter 2: Page No. 21-27)</td></tr>
<tr><td colspan="8">UNIT II-Data types – Using Constants – Manipulating Variables with Operators. Controlling Program Flow: Writing Simple Conditional Statements –Writing More Complex Conditional Statements.<br><br>(Chapter 2: Page No. 27,29,30 & Chapter 3: Page No. 49-58)</td></tr>
<tr><td colspan="8">UNIT III-Repeating Action with Loops – Working with String and Numeric Functions. Working with Arrays: Storing Data in Arrays – Processing Arrays with Loops and Iterations.<br><br>(Chapter 3: Page No. 59-64, 66-82, & Chapter 4: Page No.85-95)</td></tr>
<tr><td colspan="8">UNIT IV-Using Arrays with Forms- Working with Array Functions –Working with Dates and Times Using Functions and Classes: Creating User-Defined Functions-Creating Classes – Using Advanced OOP Concepts.<br><br>(Chapter 4: Page No. 97-107, 110-118, & Chapter 5: Page No.121-132,135-139,143-154)</td></tr>
</table>

| | |
|---|---|
| | **UNIT V-** Working with Files and Directories: Reading Files-Writing Files-Processing Directories.<br>(Chapter 6: Page No. 159-165,169-183) |
| **Practical Course Outline** | 1. Write a PHP program to find the Even and Odd numbers.<br>2. Write a PHP program to find the Leap year.<br>3. Write a PHP program to swapping of two numbers.<br>4. Write a PHP program which adds up columns and rows of given table.<br>5. Write a PHP program to compute the sum of first n given prime numbers.<br>6. Write a PHP program to find valid an email address.<br>7. Write a PHP program to convert a number written in words to digit.<br>8. Write a PHP script to delay the program execution for the given number of seconds.<br>9. Write a PHP script, which changes the colour of the first character of a word.<br>10. Write a PHP program to find multiplication table of a number.<br>11. Write a PHP program to calculate Factorial of a number.<br>12. Write a PHP program on file handling. |
| **Skills acquired from this course** | • Use PHP and MYSQL to develop dynamic website for user on the internet.<br>• Gain the knowledge on file management in PHP. |
| **Recommended Text** | Vikram Vaswani, "*PHP A Beginner's Guide*", Tata McGraw Hill 2008. |
| **Reference Texts** | 1. Steven Holzner "*The PHP Complete Reference*",Tata McGraw Hill,2007.<br>2. Steven Holzer, "*Spring into PHP*", Tata McGraw Hill 2011, 5thEdition. |
| **Website and e-Learning Source** | • https://www.w3schools.com/php/<br>• https://t4tutorials.com/e-learning-management-system-project-in-php-mysql-projects-for-mcs-mit/<br>• https://www.php.com/e-learning-video-library/<br>• https://www.w3schools.com/php |

**METHOD OF EVALUATION:**

| Continuous Internal Assessment | End Semester Examination | | Total |
|---|---|---|---|
| | Theory | Practical | |
| 25 | 50 | 25 | 100 |

**Course Learning Outcomes (for Mapping with POs and PSOs)**
students will be able to

**CLO1:** Apply the concept simple control statements of PHP for Web development.

**CLO2:** Analyze the strings and numeric functions to work with Arrays.

**CLO3:** Apply the knowledge of creating classes as done in OOP.

**CLO4:** Formulate the file management in PHP.

**CLO5:** Analyze data and understand the basic developing concepts in PHP.

| | POs | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |
| CLO2 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |
| CLO3 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |
| CLO4 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |
| CLO5 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |

3- Strong Correlation 2-Medium Correlation 1- Low Correlation

| **Title of the Course** | | **NUMBER THEORY** | | | | | |
|---|---|---|---|---|---|---|---|
| **Paper Number** | | **CORE PAPER –VIII** | | | | | |
| **Category** | Core | **Year** | II | **Credits** | 4 | **Course Code** | **23UMACACT08** |
| | | **Semester** | IV | | | | |
| **Instructional Hours per week** | | **Lecture** | | **Tutorial** | | **Lab Practice** | **Total** |
| | | 4 | | -- | | -- | 4 |
| **Pre-requisite** | | $12^{th}$ Standard Mathematics | | | | | |

| | |
|---|---|
| **Objectives of the Course** | • Apply the various techniques of solving puzzles in applications.<br>• Know the connections of number theory with other branches.<br>• Gain competence in solving problems. |
| **Course Outline** | **UNIT-I Introduction** – Basic binary Operations on the set of Integers – Ordering of Integers - Well Ordering Principle – Mathematical Induction. (Simple problems only)<br>(Chapter 1: Section 1.1, 1.3 to 1.6) |
| | **UNIT-II: Divisibility Theory:** Greatest common Divisor- Relatively Prime integers – Algorithm to find G.C.D: Investigation of the set of integers{bx+cy}- Least Common Multiple. (Simple problems only)<br>(Chapter 2: Section 2.3 to 2.5 and 2.7) |
| | **UNIT-III: Linear Diophantine Equations:** Linear Diophantine Equations – The Equation ax+by=c – Diophantine Equations in Three or More Unknowns (Statements and simple problems only)<br>(Chapter 3: Section 3.2 to 3.4) |
| | **UNIT-IV: Quadratic Residues**: Introduction, quadratic residues, Elementary Properties. (Simple problems only)<br>(Chapter 9: Section 9.1 to 9.3) |
| | **UNIT-V: Perfect Numbers**: Introduction, Perfect Numbers, Necessary and Sufficient Conditions for a positive Integer to be an even Perfect number, Mersenne Numbers, Fermat Numbers. (Simple problems only)<br>(Chapter 10: Section 10.1 to 10.5) |
| **Skills acquired from this course** | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text** | Theory of Numbers, Dr. Sudhir, K.Pundir, Pragati Prakashan Publications**,** third revisededition 2012. |
| **Reference Books** | 1. An introduction to the Theory of Numbers (Vth edition) by Ivan Niven, Herbert S. Zuckarmanand Hugh L. Montgometry John Wiley & Sons, Inc.2001.<br>2. Elementary theory of numbers, cy. Hsiung, Allied publishers, 1995.<br>3. Elementary Number Theory, Allyn and Bacon Inc., Boston, 1980. |
| **Website and e-Learning Source** | https://nptel.ac.in |

**METHOD OF EVALUATION:**

| Continuous Internal Assessment | End Semester Examination | Total |
|---|---|---|
| 25 | **75** | **100** |

**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

**CLO 1:** Understand the fundamental concepts of Mathematical Induction.

**CLO 2:** Evaluate the Greatest common Divisor and Least common multiple using the algorithms.

**CLO 3:** Determine and understand the Diophantine equations for three or more unknowns.

**CLO 4:** Demonstrate the quadratic residues, elementary Properties

**CLO 5:** Evaluate and analyze the perfect numbers using the Mersenne and Fermat Numbers.

| | Pos | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 |
| CLO2 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 1 |
| CLO3 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 2 |
| CLO4 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 2 |
| CLO5 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

3 - Strong Correlation 2 - Medium Correlation 1 - Low Correlation

| **Title of the Course** | | **MATHEMATICAL STATISTICS** | | | | | |
|---|---|---|---|---|---|---|---|
| **Paper Number** | | **ELECTIVE COURSE IV** | | | | | |
| **Category** | Elective | **Year** | II | **Credits** | 4 | **Course Code** | **23UMAECD02** |
| | | **Semester** | IV | | | | |
| **Instructional Hours per week** | | **Lecture** | | **Tutorial** | **Lab Practice** | **Total** | |
| | | 4 | | -- | -- | 4 | |
| **Pre-requisite** | | $12^{th}$ Standard Mathematics | | | | | |
| **Objectives of the Course** | | 1. Acquire the knowledge about Theoretical Distributions and understand the concepts of correlation and regression.<br>2. Be familiarized with the applications of various test of significance | | | | | |

| | |
|---|---|
| **Course Outline** | **Unit I:** Theoretical Distributions : Binomial – Poisson – Normal distributions - Fitting of distributions - Simple Problems (Derivations excluded) (Chapter 8: Sec 8.4,8.5, Chapter 9: Sec 9.2) |
| | **Unit II:.** Correlation and Regression : Karl Pearson's Coefficient of Correlation-Rank Correlation – Lines of Regressions - Simple Problems (Derivations excluded) (Chapter 10: Sec 10.4 to 10.7, Chapter 11: Sec 11.2 to 11.4) |
| | **Unit III**: Test of Significance For Large Samples: Z-test- Test for Single Proportion- Test of Significance for Difference of Proportions -Test of Significance for Single Mean- Test of Significance for Difference of Means- Simple Problems (Derivations excluded)(Chapter 14: Sec 14.6 to 14.8 , Chapter 16 : Sec 16.11) |
| | **Unit IV:** Test of Significance For Small Samples: t- Test –Test for Single Mean-Test for Difference Of Means- Paired t-Test For Difference of Means - F- Test for Equality of Population Variance- Simple Problems (Derivations excluded) (Chapter 16: Sec 16.2 to 16.10) |
| | **Unit V:** Chi-Square Test- Test of Goodness of Fit, Test for Independence of Attributes. Analysis Of Variance: ANOVA – One Way Classification, Two Way Classification. Simple Problems (Derivations excluded) (Chapter 15: Sec 15.1 to 15.7) |
| **Skills acquired from this course** | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text** | 1.S.C. Gupta and V.K. Kapoor, Elements of Mathematical Statistics, Third edition(2015) Sultan Chand & Sons publications, NewDelhi. |

| | |
|---|---|
| **Reference Books** | 1. P.R. Vittal, Mathematical Statistics(2002), Margham Publications,Chennai.<br>2. S.C. Gupta and V.K. Kapoor,Fundamentalsof Mathematical Statistics, Eleventh edition(2002)Sultan Chand & Sons publications<br>3. RobertV.Hogg,Joseph Mckean &Craig A.T,Introduction to Mathematical Statistics,(2013)PearsonsEducation India<br>4. George W.Snedecor, William G.Cochran ,Statistical Methods(1967),Oxford &IBH Publishers<br>5. Dr.S.P.Gupta, Statistical Methods,41st edition (2011),Sultan Chand &Sons,NewDelhi. |
| **Website and e-Learning Source** | **https://nptel.ac.in** |

**METHOD OF EVALUATION**

| Continuous Internal Assessment | End Semester Examination | Total |
|---|---|---|
| 25 | **75** | **100** |

**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

**CLO 1:** Apply Binomial, Poisson and Normal distribution properties to solve real life problems.
**CLO 2:** Study the relationship between two or more variables.
**CLO 3:** Understand the uses of Large Samples.
**CLO 4:** Apply the concept of small sample test to solve real life problems.
**CLO 5:** Apply and examine chi-square test and analyse the principles of designs of experiments to yield valid conclusions.

| | POs | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 3 | 3 | 3 | 1 | 2 | 3 | 3 | 1 |
| CLO2 | 3 | 3 | 3 | 3 | 1 | 2 | 3 | 3 | 1 |
| CLO3 | 3 | 3 | 3 | 3 | 1 | 2 | 3 | 3 | 1 |
| CLO4 | 3 | 3 | 3 | 3 | 1 | 2 | 3 | 3 | 1 |
| CLO5 | 3 | 3 | 3 | 3 | 1 | 2 | 3 | 3 | 1 |

3- Strong Correlation 2-Medium Correlation 1- Low Correlation

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Title of the Course** | | **MATHEMATICS FOR COMPETITIVE EXAMINATION – III** | | | | | |
| **Paper Number** | | **SKILL ENHANCEMENT COURSE SEC- 06** | | | | | |
| **Category** | **SEC** | **Year** | **II** | **Credits** | 2 | **Course** | **23UMACASE06/** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | **Semester** | III | | | **Code** | **23UMASE06** |
| **Instructional Hours Per week** | | **Lecture** | **Tutorial** | | **Lab Practice** | | **Total** |
| | | 2 | - | | - | | 2 |
| **Pre- requisite** | | $12^{th}$ Standard Mathematics | | | | | |
| **Objective of the Course** | | • Remembering the concept of Logarithms.<br>• Understanding the concept of Simple Interest – Compound Interest.<br>• Analyzing the concepts of Stocks and Shares. | | | | | |
| **Course Outline** | | **UNIT – I**<br>Simple Interest – Compound Interest.(Chap – 21 & 22 ) | | | | | |
| | | **UNIT – II**<br>Logarithms - Area.(Chap – 23 & 24) | | | | | |
| | | **UNIT – III**<br>Volume & Surface Areas – Races & Games of Skill. (Chap – 25 & 26) | | | | | |
| | | **UNIT – IV**<br>Calendar - Clocks.(Chap – 27 & 28) | | | | | |
| | | **UNIT – V**<br>Stocks & Shares.(Chap – 29) | | | | | |
| **Skills acquired from this course** | | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill. | | | | | |
| **Recommended Text** | | 1. R.S. Aggarwal, Quantitative Aptitude for Competitative Examinations, S.Chand co Ltd., 152. Anna Salai, Chennai,2010 | | | | | |
| **Reference Books** | | 1. Quantitative Aptitude ‘’by Abhijit Guha, Tata McGraw Hill Publishing Company Limited, New Delhi (2005) | | | | | |
| **Website and e – Learning Source** | | https://nptel.ac.in | | | | | |

**Question Paper Pattern:** 75 Objective type questions each carrying 1 Mark.

**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

**CLO 1 :** Explain in detail about Simple Interest and Compound Interest.

**CLO 2 :** Explain Logarithms and Area.

**CLO 3 :** Explain Volume & Surface Areas and Races & Games of Skill.

**CLO 4 :** Explain Calendar and Clocks.

**CLO 5 :** Explain Stocks & Shares.

| | Pos | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 1 | 3 | - | - | - | 3 | 2 | 1 |
| CLO2 | 2 | 1 | 3 | 1 | - | - | 3 | 2 | 1 |
| CLO3 | 3 | 1 | 3 | 1 | - | - | 3 | 2 | 1 |
| CLO4 | 3 | 1 | 3 | - | - | - | 3 | 2 | 1 |
| CLO5 | 3 | 1 | 3 | - | - | - | 3 | 2 | 1 |

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">STATISTICS WITH R PROGRAMMING</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">SKILL ENHANCEMENT COURSE SEC- 07</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">PCS</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">23UMACASE07/ 23UMASE07</td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td colspan="2">Instructional Hours per week</td><td colspan="2">Lecture<br>2</td><td colspan="2">Tutorial<br>--</td><td>Lab Practice<br>--</td><td>Total<br>2</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• To acquire the practical knowledge of R programming for solving problems in mathematical statistics.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT-I: Introduction to R Software: How to Download and Install R-Using R for Descriptive Statistical Analysis and Plots-Basics of R-R Data Types-Scalars-Vectors-Matrices-Data Frames.<br>(Chapter-2 : Section 2.1 to 2.3.2.4 )</td></tr>
<tr><td colspan="6">UNIT-II: Lists-Factors-Date and Time-Missing Values-Data Creation-Data Type Conversion-Variable Information.<br>(Chapter-2: Section 2.3.2.5 to 2.3.6 )</td></tr>
<tr><td colspan="6">UNIT-III: Basic Operations in R-Control Structures-Conditional -For Loop-Repeat Loop- While Loop-Built-In Functions in R-Numerical Functions-Character Functions-Statistical Probability Functions-Other Statistical Functions-Other Useful Functions-User-Written Functions. (Chapter-2: Section 2.4 to 2.4.4)</td></tr>
<tr><td colspan="6">UNIT-IV: Importing, Reporting, and Writing Data-Packages-Working Directory and R Script-Reading and Writing Local Flat Files-Reading and Writing Excel Files-Connection Interfaces-Connect to a Database- Data Exploration -Data Exploration through Visualization-Bar Chart-Pie Chart-Box-Plot Distributions. (Chapter-2: Section 2.4.4 to 2.5.1.3)</td></tr>
<tr><td colspan="6">UNIT-V: Descriptive Statistics: Central Tendency-The Mean-The Median-The Mode-Measure of Dispersion-Shapes of the Distribution-Symmetric and Asymmetric- Skewness Illustrated. (Chapter- 3: Section 3.1 to 3.3)</td></tr>
</table>

| | |
|---|---|
| **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 |
| **Recommended Text** | 1. Mustapha Abiodun Akinkunmi, "Business Statistics with Solutions in R"deGruyter-Berlin, 2019. |
| **Reference Books** | 1. Peter Dalgaard, "Introductory Statistics with R" Second Edition, Springer, 2008.<br>2. Yosef Cohen, Jeremiah Y. Cohen, "Statistics and data with R"John Wiley & Sons Ltd. 2008. |
| **Website and e-Learning Source** | https://nptel.ac.in |

**Course Outcomes (COs)**

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

**CLO 1 :** Understand the usage of R Software and able to handle basic data types of R.

**CLO 2 :** Create data, find the missing values, converting data types.

**CLO 3 :** Apply the control structures, numerical and statistical functions.

**CLO 4 :** To import files, able to connect with a data base and handle Pie and Bar Charts.

**CLO 5 :** Compute mean, median, mode and skewness using R.

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="8">MODERN ALGEBRA</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">CORE PAPER –IX</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td colspan="2" rowspan="2">23UMACACT09/ 23UMACT10</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">5</td><td colspan="2">--</td><td colspan="2">--</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="8">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="8">• Establishtherelationshipsbetweenabstractalgebraicstructuregroups&subgroupwithfamiliarnumbersystemssuchasintegersandrealnumbers.<br>• Learn the extended concept of group & field such as rings and its properties.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="8">UNIT-I: Introduction to groups- Subgroups- cyclic groups and properties of cyclic groups- Lagrange’s Theorem-A counting principle – Examples.<br>(Chapter 2: Section 2.1 to2.5)</td></tr>
<tr><td colspan="8">UNIT-II: Normal subgroups and Quotient group- Homomorphism-Automorphism -Examples.<br>(Chapter 2: Section 2.6 to 2.8)</td></tr>
<tr><td colspan="8">UNIT-III: Cayley’s Theorem-Permutation groups - Examples.<br>(Chapter 2: Section 2.9 to 2.10)</td></tr>
<tr><td colspan="8">UNIT-IV: Definition and examples of ring- Some special classes of rings-homomorphism of rings- Ideals and quotient rings- More ideals and quotient rings.<br>(Chapter 3: Section 3.1 to 3.10)</td></tr>
<tr><td colspan="8">UNIT-V: The field of quotients of an integral domain-Euclidean Rings - The particular Euclidean Ring – Examples.<br>(Chapter 3: Section 3.6 to 3.8)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="8">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
</table>

| | |
|---|---|
| **Recommended Text** | Topics in Algebra–I.N.Herstein, Wiley Eastern Ltd. Second Edition (1st January 2006) |
| **Reference Books** | 1. John B. Fraleigh, A First Course in Abstract Algebra, 7th Ed., Pearson, 2002.<br>2. M. Artin, Abstract Algebra, 2nd Ed., Pearson, 2011.<br>3. Joseph A Gallian, Contemporary Abstract Algebra, 4th Ed., Narosa, 1999. |
| **Website and e-Learning Source** | https://nptel.ac.in |

**METHOD OF EVALUATION:**

| Continuous Internal Assessment | End Semester Examination | Total |
|---|---|---|
| 25 | **75** | **100** |

**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

**CLO 1:** Demonstrate the importance of algebraic properties and definitions.

**CLO 2:** Explaintheequivalencerelationbetweensetsandequivalenceclassestoformanormal Sub group and quotient group.

**CLO 3:** Demonstrate the embedding of any group into a group of permutations.

**CLO 4:** Identify the rings and analyze the basic theoretical proofs.

**CLO 5:**Formulateanygivenintegeras either prime or product of primes in a unique way.

| | Pos | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 2 |
| CLO2 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 |
| CLO3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 2 |
| CLO4 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 2 |
| CLO5 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 2 |

3 - Strong Correlation 2 - Medium Correlation 1 - Low Correlation

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">REAL ANALYSIS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">CORE PAPER X</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23UMACACT10</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td colspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td colspan="2"></td><td>5</td><td colspan="2">--</td><td>--</td><td colspan="2">5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• Real Numbers and properties of Real–valued functions.<br>• Connectedness, Compactness, Completeness of Metric spaces.<br>• Convergence of sequences of functions, Examples and counter examples<br>• Learn the concepts of Sets of measure zero & Riemann Integral.</td></tr>
<tr><td colspan="2" rowspan="4">Course Outline</td><td colspan="6">UNIT-I: Countability of Real Numbers- Least Upper Bounds-Sequences and Subsequence-Limit of a Sequence-Convergent and DivergenceSequence-BoundedSequences-MonotoneSequences-CauchySequences.<br><br>(Chapter 1: Section 1.5, 1.6, 1.7 and Chapter 2: Section 2.1 to 2.6, 2.10)</td></tr>
<tr><td colspan="6">UNIT-II:ConvergenceandDivergenceofSeries-SerieswithNon-NegativeTerms-AlternatingSeries-ConditionalandAbsoluteConvergence-TestforAbsolute Convergence.<br><br>(Chapter 3: Section 3.1 to 3.4, 3.6)</td></tr>
<tr><td colspan="6">UNIT-III: Limit of a Function – Metric Spaces-Function Continuous at a Point on the Real Line-Open Sets-Closed Sets.<br><br>(Chapter 4: Section 4.1, 4.2 and Chapter 5: Section 5.1, 5.4, 5.5)</td></tr>
<tr><td colspan="6">UNIT-IV: Connectedness, Completeness and Compactness: More about Open Sets- Connected Sets-Complete Metric Spaces-Compact Metric Spaces.<br><br>(Chapter 6: Section 6.1, 6.2, 6.4)</td></tr>
</table>

| | |
|---|---|
| | **UNIT-V:**Sets of measure Zero- Definition of the Riemann Integral Existence of the Riemann Integral (statement only) Properties of Riemann Integral.<br>(Chapter 7: Section 7.1 to 7.4) |
| **Skills acquired from this course** | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text** | Methods of Real Analysis-Richard R.Goldberg (John Wiley & sons, 2nd edition) (Indian edition –Oxford and IBH Publishing Co, New Delhi, 1st January 2020) |
| **Reference Books** | 1. Principles of Mathematical Analysis by Walter Rudin, Tata McGraw Hill Education, Third edition (1 July 2017).<br>2. Mathematical Analysis Tom M A postal, Narosa Publishing House, 2nd edition (1974), Addison-Wesley publishing company, New Delhi. |
| **Website and e-Learning Source** | https://nptel.ac.in |

**METHOD OF EVALUATION:**

| Continuous Internal Assessment | End Semester Examination | Total |
|---|---|---|
| 25 | **75** | **100** |

**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

**CLO 1:** Understand the fundamental properties of real analysis and the limits in sequences, Series & derivatives.

**CLO 2:** Identify the given series as whether convergent or divergent.

**CLO 3:** Apply the abstract ideas and rigorous methods of mathematical analysis to Practical problems.

**CLO 4:** Construct mathematical proofs for basic results of real analysis.

**CLO 5:** Identifying the sets of measure zero and Riemann Integral.

| | Pos | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 2 |
| CLO2 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 1 |
| CLO3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| CLO4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| CLO5 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

3 - Strong Correlation 2 - Medium Correlation 1 - Low Correlation

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">MECHANICS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">CORE PAPER-XI</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23UMACACT11</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td colspan="2">Instructional Hours per week</td><td colspan="2">Lecture<br>5</td><td colspan="2">Tutorial<br>--</td><td>Lab Practice<br>--</td><td>Total<br>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• To demonstrate the application of Mechanics in various fields.<br>• To develop the proficiency in problem solving.<br>• To have an insight into Types of forces, Moments, Kinematics, Simple Harmonic Motion, Projectiles, Impact and Central orbits.</td></tr>
<tr><td colspan="2" rowspan="3">Course Outline</td><td colspan="6">UNIT-I: Force: Newton’s laws of motion – Resultant of two forces on a particle.<br>Equilibrium of a Particle: Equilibrium of a particle – Limiting equilibrium of a particle on an inclined plan.<br>(Chapter 2: Section 2.1, 2.2 and Chapter 3: Section 3.1, 3.2)</td></tr>
<tr><td colspan="6">UNIT-II: Forces on a Rigid Body: Moment of a Force – General motion of a rigid body – Equivalent systems of forces- Parallel Forces – Forces along the sides of a triangle.<br>(Chapter 4: Section 4.1 to 4.5)</td></tr>
<tr><td colspan="6">UNIT-III: Kinematics: Velocity-Velocity of particle describing a circle - Resultant velocity -Relative velocity -Acceleration-Rectilinear motion - Rectilinear motion with a constant acceleration.<br>Rectilinear Motion under Varying Force: Simple Harmonic Motion – Projection of a particle having a uniform circular motion-Composition of two simple harmonic motions of same period.<br>(Chapter 1: Section 1.2,1.3; Chapter 12: Section 12.1)</td></tr>
</table>

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|---|---|
| | **UNIT – IV: Projectiles**: Forces on a projectile– Displacement as a combination of vertical and horizontal displacements-Nature of trajectory-Results pertaining to the motion of a projectile- Maximum horizontal range for a given velocity-Two trajectories with a given speed and range-Projectile projected horizontally.<br>**Impact:** Impulsive force-Impact of sphere – Impact of two smooth spheres –Direct impact of two smooth spheres- Oblique impact of two smooth spheres- Change in Kinetic energy.<br>(Chapter 13: Section 13.1; Chapter 14: Section 14.1 to 14.3 and 14.5) |
| | **UNIT-V: Central Orbits:** General orbits – Central orbit – Conic as a centred orbit.<br>(Chapter 16: Section 16.1 to 16.3) |
| **Skills acquired from this course** | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text** | 1. A. Ruina and R. Pratap, Introduction to Statics and Dynamics, Oxford University Press, 2014.<br>2.Duraipandian.P, Laxmi Duraipandian, Muthamizh Jayapragasam. (2015) Mechanics ($6^{th}$ Revised Edition), New Delhi, S.Chand and Co.<br>3.S.L. Loney, The Elements of Statics and Dynamics, Cambridge University Press, 1904. |
| **Reference Books** | 1. J.L. Meriam and L. G. Kraige, Engineering Mechanics: Statics, Seventh Edition,Wiley and sons Pvt ltd., New York, 2012.<br>2. J.L. Meriam, L. G. Kraige, and J.N. Bolton, Engineering Mechanics: Dynamics, $8^{th}$edn, Wiley and sons Pvt ltd., New York, 2015.<br>3. A. K. Dhiman, P.Dhinam and D. Kulshreshtha, Engineering Mechanics (Statics and Dynamics) ,McGraw Hill Education(India) Private Limited, New Delhi, 2015. |
| **Website and e-Learning Source** | https://nptel.ac.in |

**METHOD OF EVALUATION:**

| Continuous Internal Assessment | End Semester Examination | Total |
|---|---|---|
| 25 | **75** | **100** |

**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will able to

**CLO 1:**Discuss the fundamental concept of forces and apply the concept of Lami's theorem to determine the equilibrium of a particle under three or more forces.

**CLO 2:** Explain different forces acting on a rigid body

**CLO 3:** Understand the concepts of velocity, acceleration and composition of S.H.M in two directions

**CLO 4:** Solve problems relating to the motion of a projectile. Understand impulsive forces and analyze loss of K.E due to direct and oblique impact.

**CLO 5:** AbletoderivebasicorbitequationsanditsrelationshiptotheconicSections.

| | Pos | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 |
| CLO2 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 |
| CLO3 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 |
| CLO4 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 |
| CLO5 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 |

3 - Strong Correlation 2 - Medium Correlation 1 - Low Correlation

| Title of the Course | | PROJECT WITH VIVA VOCE | | | | | |
|---|---|---|---|---|---|---|---|
| Paper Number | | CORE PAPER XII | | | | | |
| Category | Core | Year | III | Credits | 4 | Course Code | 23UMACAPR1 |
| | | Semester | V | | | | |
| Instructional Hours per week | | Lecture | | Tutorial | | Lab Practice | Total |
| | | 4 | | - | | -- | 4 |

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="8">OPERATIONS RESEARCH – I</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">ELECTIVE COURSE –I</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23UMACAME01</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td colspan="2">--</td><td colspan="2">--</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="8">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="8">• To develop computational skills<br>• To develop logical thinking in formulating industry oriented problems<br>• To apply these techniques in real life situations</td></tr>
<tr><td colspan="2" rowspan="3">Course Outline</td><td colspan="8">UNIT-I Linear programming: General LPP- Mathematical formulation-Solution for LPP By Graphical Method and Simplex Method (finite optimal solution, unbounded solution, alternative optimal solution)- Slack and surplus variables – Solution for LPP with unrestricted variables<br>(Book 1: Chapter 2: Section 2.1 to 2.4; Chapter 3: Section 3.1,3.2; Chapter 4: Section 4.1 to 4.3,4.5,4.7,4.9; Chapter 5: Section 5.1,5.2,5.4-5.8,5.11)</td></tr>
<tr><td colspan="8">UNIT-II: Artificial Variable Technique- Big-M Method (Charner's Penalty Method) – Concept of Duality- Dual theorem (only statement)- Reading solution of the dual from the final simplex table of the primal and vice-versa.<br>(Book 1: Chapter 4: Section 4.4; Chapter 5: Section 5.3,5.9,5.12; Chapter 6: Section 6.1, 6.5-6.7)</td></tr>
<tr><td colspan="8">UNIT-III: Transportation problems: Mathematical formulation- North- West corner Rule - Least cost Method- Vogel's approximation method- Optimality test<br>(Book 2: Chapter 10: Section 10.1 to 10.3, 10.5,10.6,10.8-10.10)</td></tr>
</table>

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|---|---|
| | **UNIT-IV: Assignment problems**: Hungarian method of solving an assignment problem – Unbalanced assignment problems – Traveling Salesman (routing) problem<br>(Book 2: Chapter 11: Section 11.1 to 11.5 and 11.7) |
| | **UNIT-V:Game theory:** Two persons zero sum games, the Maxmin-Minmax principle, Saddle point and Value of games, Games without saddle points, Pure and mixed strategies, Properties of optimal mixed strategies, Dominance property.<br>(Book 2: Chapter 17: Section 17.1 to 17.7) |
| **Skills acquired from this course** | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text** | 1. R.K. Gupta, Operations Research, Krishna Prakash.<br>2. KantiSwarup, P.K.Gupta and ManMohan, Operations Research, S.Chand & Co,Delhi. |
| **Reference Books** | 1. Taha, Operation Research, Printice Hall, New Delhi.<br>2. V. Sundaresan, K.S. Ganapathy Subramanian, &K. Ganesan, Resource<br>Management Techniques (Operations Research), A.R. Publications, Nagapattinum District .<br>3. Kalavathy , Operations Research Vikas Publishing House Pvt .Ltd.<br>4. Gupta P.K&Hira D.S ,Problems in Operations Research, S.Chand&Co, Delhi<br>5. S.D. Sharma, Operations Research, KedharNath Ram Nathco,Meerut |
| **Website and e-Learning Source** | https://nptel.ac.in |

**METHOD OF EVALUATION:**

| Continuous Internal Assessment | End Semester Examination | Total |
|---|---|---|
| 25 | **75** | **100** |

**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

**CLO 1:** Analyse and study the concepts in linear programming problems to optimize the solution.

**CLO 2:** Examine,Analyse,formulateandevaluatetheoptimalsolutionsusingvarious methods in linear programming.

**CLO 3:** Evaluatetheoptimalsolutionforvariousindustryorientedproblemsusing Quantitative and qualitative tools like Modi's method

**CLO 4:** Compute the optimal solution by using Hungarian method to minimize the cost.

**CLO 5:** Analyse the application of game theory in various fields and obtain the best Solution to optimize the function.

| | Pos | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 2 |
| CLO2 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 1 |
| CLO3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 |
| CLO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 |
| CLO5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 |

3 - Strong Correlation 2 - Medium Correlation 1 - Low Correlation

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">ARTIFICIAL INTELLIGENCE & MACHINE LEARNING</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">ELECTIVE COURSE–II</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23UMACAME02</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>3</td><td colspan="2">-</td><td colspan="2">2</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• Knowledge on AI Techniques.<br>• Introduce the AI representations and mappings.<br>• Study the simple logical facts using reasoning.<br>• Introducing the Machine Learning and its types.<br>• Gain knowledge on modelling and Evaluating.</td></tr>
<tr><td colspan="2" rowspan="4">Course Outline</td><td colspan="6">UNIT I-Introduction: AI Problems AI techniques, Problem Spaces and Search: Defining the problem ofspacesearch-Statespacesearch–ProductionSystems–ProblemCharacteristics.<br>(Book 1: Chapter 1: Sec 1.1 to 1.7, Chapter 2: Sec 2.1 to 2.4)</td></tr>
<tr><td colspan="6">UNIT II- Heuristic Search techniques: Generate and Test– Hill Climbing–Best First search, Problem Reduction, Constraint Satisfaction, Means-end analysis-Knowledge representation issues: Representations and mappings–Approaches.<br>(Book 1: Chapter 3: Sec 3.1 to 3.6, Chapter 4: Sec 4.1 to 4.4)</td></tr>
<tr><td colspan="6">UNIT III-Using Predicate Logic: Representation in simple facts in logic – Representation instance and is a Relationship– Computable functions and predicates–Resolution. Representation Knowledge using Rules: Procedural Vs Declarative Knowledge – Logic Programming – Forward Vs Backward Reasoning.<br>(Book 1: Chapter 5: Sec 5.1 to 5.5, Chapter 6: Sec 6.1 to 6.3)</td></tr>
<tr><td colspan="6">UNIT IV-Introduction to Machine Learning: What is Machine Learning? – Types of Machine Learning–Applications of Machine Learning Issues in Machine Learning. Preparing to Model: Machine Learning Activities – Types of Data –Data quality and remediation.<br>( Book 2: Chapter 1: Sec 1.4 to 1.7, Chapter 2 : Sec 2.1 to 2.6)</td></tr>
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|---|---|
| | **UNIT V-** Modelling and Evaluation: Selecting a model Training a model– Model representation and Interpretation–ModelPerformanceandevaluation– Improvingperformanceofamodel.<br>(Book 2: Chapter 1: Sec 1.4 to 1.7, Chapter 2 : Sec 2.1 to 2.6) |
| Practical Course Outline | 1. Write a program to implement the Hill Climbing problem<br>2. Write a program to implement the Towers of Hanoi problem<br>3. Write a program to implement the Missionaries and Cannibals problem<br>4. Write a program to implement the 8 queens problem<br>5. Write a program to implement the A* Algorithm<br>6. Write a program to Implement the Breadth first algorithm<br>7. Solving Regression & Classification using Decision Trees<br>8. Root Node Attribute Selection for Decision Trees using Information Gain<br>9. Bayesian Inference in Gene Expression Analysis .<br>10. Pattern Recognition Application using Bayesian Inference |
| **Skills acquired from this course** | • Knowledge on AI Techniques<br>• Introducing the Machine Learning and its types.<br>• Gain knowledge on modelling and Evaluating |
| **Recommended Texts** | 1. ElaineRich"ArtificialIntelligence", McGraw-HillCompanies.<br>2. SaikatDutt,SubramanianChandramouli,AmitKumarDass,"Machi neLearning",PearsonEducationIndia,2019. |
| **Reference Texts** | 1. StuartRussell&PeterNorvig,"ArtificialIntelligenceAModernApproach",Peras on, 2ndEdition.<br>2. VS JanakiRaman, K Sarukesi, P. Gopalakrishnan,"Foundations of Artificial Intelligent and Expert Systems", MacMillan India limited. |
| **Website and e-Learning Source** | 1. https://www.opentrends.net/en/article/basic-concepts-artificial-intelligence<br>2. https://data-flair.training/blogs/heuristic-search-ai/<br>3. https://www.educba.com/machine-learning-techniques/<br>4. https://www.analyticsvidhya.com/blog/2021/05/machine-learning-model-evaluation/ |

**METHOD OF EVALUATION:**

| Continuous Internal Assessment | End Semester Examination | | Total |
|---|---|---|---|
| | Theory | Practical | |
| 25 | 50 | 25 | 100 |

**Course Learning Outcomes (for Mapping with POs and PSOs)**
Students will be able to

**CLO1:**Knows the basic concept in AI Techniques.

**CLO2:**Knows Heuristic search and Hill Climbing.

**CLO3:**Understand the Procedural and Declarative knowledge.

**CLO4:**Know the basic concept on Machine Learning and its types.

**CLO5:**Concept of Modelling and evaluating the models.

| | Pos | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |
| CLO2 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |
| CLO3 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |
| CLO4 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |
| CLO5 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |

3- Strong Correlation 2-Medium Correlation 1- Low Correlation

<table>
<tr><td>Title of the Course</td><td colspan="6">LINEAR ALGEBRA</td></tr>
<tr><td>Paper Number</td><td colspan="6">CORE PAPER XIII</td></tr>
<tr><td rowspan="2">Category Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23UMACACT13</td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td rowspan="2">Instructional Hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>6</td><td>--</td><td colspan="2">--</td><td colspan="2">6</td></tr>
<tr><td>Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td>Objectives of the Course</td><td colspan="6">• Learn the concept of vector spaces and subspaces.<br>• Explore the dimension of vector space using bases and linear dependence concepts.<br>• Understand the concept of Inner product space and its properties.</td></tr>
<tr><td rowspan="5">Course Outline</td><td colspan="6">UNIT-I: VECTOR SPACES– Subspaces – Linear Combinations and linear span - Linear Dependence and Linear independence - Related Problems<br>(Book 1: Chapter 1: Section 1.2 to 1.5)</td></tr>
<tr><td colspan="6">UNIT-II: VECTOR SPACES (CONTD): Linear Span, Bases, Dimension of Vector Spaces- Maximal linearly independent subsets - Dual spaces - Related Problems (Book 1: Chapter 1: Section 1.6,1.7; Chapter 2: Section 2.6)</td></tr>
<tr><td colspan="6">UNIT-III:INNERPRODUCTSPACES: Inner Product Space, Definition, Examples, Schwarz inequality, Orthogonal Set, Orthonormal Set, Gram Schmidt Orthogonalization Process - Related Problems<br>(Book 2: Chapter 4: Section 4.4)</td></tr>
<tr><td colspan="6">UNITIV: LINEARTRANFORMATIONS:<br>Algebra of Linear transformations, Regular and Singular Linear Transformations, Rank of Linear Transformation – Related Problems.<br>(Book 2: Chapter 6: Section 6.1)</td></tr>
<tr><td colspan="6">UNIT-V:LINEAR TRANSFORMATIONS(CONTD): Characteristic Roots,CharacteristicVectors&Matrices–Canonicalforms–triangularforms.<br>(Book 2: Chapter 6: Section 6.2 to 6.4)</td></tr>
<tr><td>Skills acquired from this course</td><td colspan="6">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
</table>

| | |
|---|---|
| **Recommended Text** | 1. Linear Algebra - Stephen H Friedberg, Arnold J Insel and Lawrence E Spence, 5th edition (2018) Pearson.<br>2. I.N.Herstein, Topics in Algebra, Wiley EasternLtd. Second Edition, 2006. |
| **Reference Books** | 1. N.S.Gopalakrishnan, University Algebra, New Age International Publications, Wiley Eastern Ltd.<br>2. David C. Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007.<br>3. S. Lang, Introduction to Linear Algebra, 2nd Ed., Springer, 2005.<br>4. Gilbert Strang, Linear Algebra and its Applications, Thomson, 2007. |
| **Website and e-Learning Source** | https://nptel.ac.in |

**METHOD OF EVALUATION:**

| Continuous Internal Assessment | End Semester Examination | Total |
|---|---|---|
| 25 | **75** | **100** |

**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

**CLO 1:** Identify the vector spaces and its subspaces.

**CLO 2:** Find the dimension of vector space and distinguish the linear dependent and Independent vectors which expands knowledge in Matrices.

**CLO 3:** Evaluate the length &distance of vectors and to construct orthonormal sets of Vectors that help in understanding the few concepts of mechanics.

**CLO 4:** Able to characterize the linear transformation as one-one, onto transformations and their role in carrying a basis of vector space to another vector space.

**CLO5:** Express linear transformation in matrix form to make the calculation or Representation easier, for analyzing the given data.

| | Pos | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 2 |
| CLO2 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 2 |
| CLO3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 |
| CLO4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 |
| CLO5 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 2 |

3 - Strong Correlation 2 - Medium Correlation 1 - Low Correlation

<table>
<tr><td>Title of the Course</td><td colspan="6">COMPLEX ANALYSIS</td></tr>
<tr><td>Paper Number</td><td colspan="6">CORE PAPER-XIV</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23UMACACT14</td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">6</td><td>--</td><td colspan="2">--</td><td>6</td></tr>
<tr><td>Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td>Objectives of the Course</td><td colspan="6">• To equip the students with the understanding of the fundamental concept of Complex function.<br>• Understand the concept of mappings and transformations.<br>• Calculate series expansions for analytical complex-valued functions and evaluate contour integrals & definite integrals.</td></tr>
<tr><td rowspan="3">Course Outline</td><td colspan="6">UNIT-I:Analytic Functions: 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: Section 12, 15 to 26)</td></tr>
<tr><td colspan="6">UNIT-II: Mapping by Elementary Functions & Conformal Mapping: Linear transformations– The transformation $w=\frac{1}{z}$– Mappings by $\frac{1}{z}$ – Linear fractional transformations (bilinear)- An implicit form - Preservation of angles.<br>(Chapter 8: Section 90, 91 and Chapter 9: Section 101)</td></tr>
<tr><td colspan="6">UNIT-III: Complex Integration: Contours-Contour integrals–Cauchy- Goursat Theorem (statement only)- Cauchy theorem for simply and multiply connected domains– Cauchy integral formula – Formula for derivatives– Liouville's theorem –Fundamental theorem of Algebra.<br>(Chapter 4: Section 37, 39, 40, 46, 48, 49, 50 to 53)</td></tr>
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|---|---|
| | **UNIT – IV: Series and Singularities**: Convergence of sequences- Convergence of series –Taylor and Laurent Series(statement only)-Isolated singular points – Residues-Cauchy's Residue theorem – Residue at infinity- The three types of Isolated singular points - Residues at poles - Zeros of analytic functions - Zeros and Poles - Meromorphic function -Argument principle -Rouche'stheorem.<br>(Chapter 5: Section 55, 56, 57, 60 and Chapter 6: Section 68 to 73 to 76, 86, 87) |
| | **UNIT-V: Applications of Residues**: Evaluation of Improper Integrals<br>$(i)\int_0^{2\pi} f(\cos\theta, \sin\theta)d\theta$<br>$(ii)\int_{-\infty}^{\infty} f(x)dx where f(x) = \frac{g(x)}{h(x)}.$<br>(iii) $\int_{-\infty}^{\infty} f(x)\sin mx\, dx$ & $\int_{-\infty}^{\infty} f(x)cosmxdx\ where f(x) = \frac{g(x)}{h(x)}$<br>(Chapter 7: Section 78 to 81,85) |
| **Skills acquired from this course** | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text** | 1.R.V.Churchill and J.W. Brown(2014), Complex Variables and Applications($8^{th}$edition)McGraw Hill International Book Co.,New York |

| | |
|---|---|
| **Reference Books** | 1. S. Ponnusamy and H. Silverman, Complex variables with applications, Birkhauser, 2006.<br>2. Theodore W. Gamelan, Complex Analysis, Springer Verlag, 2008<br>3. Joseph Bak and Donald J. Newman, Complex analysis, 2nd Ed., Undergraduate Texts in Mathematics, Springer-Verlag New York, Inc., New York, 1997.<br>4. Richard A. Silverman, Introductory Complex Analysis. Dover Publications, 1972.<br>5. S.Arumugam,A.ThangapandianIssac,A.Somasundaram,ComplexAnalysis,Sci techpublications,Chennai.<br>6. T.K.ManicavachagamPillay,Dr.S.P.Rajagopalan,Dr.R.Sattanathan,ComplexA nalysis, S.Viswanathan printers and Publishers, pvt.Ltd,(2011). |
| **Website and e-Learning Source** | https://nptel.ac.in |

**METHOD OF EVALUATION:**

| Continuous Internal Assessment | End Semester Examination | Total |
|---|---|---|
| 25 | **75** | **100** |

**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

**CLO 1:** Derive Cauchy Riemann equation and identify analytic functions.

**CLO 2:** Discuss Bilinear transformation and various standard transformations.

**CLO 3**: Evaluate the value of the function using Cauchy's integral theorem..

**CLO 4:** Represent the given function in a series form, valid in a domain and classify zeros and singularities of an analytic functions.

**CLO 5:** Evaluate different types of contour integrals using residue theorem.

| | Pos | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 1 |
| CLO2 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 2 |
| CLO3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 2 |
| CLO4 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 2 |
| CLO5 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 2 |

3 - Strong Correlation 2 - Medium Correlation 1 - Low Correlation

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">DISCRETE MATHEMATICS AND GRAPH THEORY</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">CORE PAPER- XV</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23UMACACT15</td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">6</td><td colspan="2">-</td><td colspan="2">--</td><td>6</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• Evaluate basic logic statements including compound statements, implications, inverses, converses, and contrapositives using truth tables and the properties of logic.<br>• Appreciate the basic principles of lattices, and its properties.<br>• Simplify expression using the properties of Boolean algebra; basic principles of Boolean algebra<br>• Learn coreide as of graph definition and graph operations in graph theory.<br>• Study the theorem of Eulerian and Hamiltonian graphs.</td></tr>
<tr><td colspan="2" rowspan="3">Course Outline</td><td colspan="6">UnitI: Propositional Calculus Tautology and contradiction – Equivalence of formulae – Duality law –Tautological implications - Normal forms – Disjunctive normal forms – Conjunctive normal forms.<br>(Book 1: Chapter 1: Section 1.2.1 to 1.2.11; Chapter 3: Section 1.3.1, 1.3.2)</td></tr>
<tr><td colspan="6">Unit II: Lattices-Introduction–Principle of duality-Properties of Lattices – sub Lattice–DistributiveLatticemodularlattices–Boundedlattice-Complementedlattice<br>(Book 1: Chapter 4: Section 4.1.1 to 4.1.5)</td></tr>
<tr><td colspan="6">Unit III: Boolean Algebra Definition – Other basic laws of Boolean Algebra – Principle of duality for Boolean Algebras–ATOM definition ATOMIC Boolean algebra –Finite Boolean Algebra. Boolean expression – Definition – Boolean function – Literal – Minterm and Maxterm, Normal forms and Canonicalforms.<br>(Book 1: Chapter 4: Section 4.2 to 4.5)</td></tr>
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|---|---|
| | **Unit IV:**. Graphs, Subgraphs and Connectedness Introduction – Definition and examples – Degrees –Subgraphs – Isomorphisms – Walks, Trails and Paths – Connectedness and Components –blocks –Connectivity.<br>(Book 1: Chapter 5: Section 5.1, 5.2) |
| | **Unit V:** Eulerian and Hamiltonian Graphs Introduction-Eulerian graphs– Hamiltonian graphs<br>(Book 2: Chapter 8: Section 8.5 |
| **Skills acquired from this course** | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text** | 1. J.P.Tremblay&R.Manohar,"DiscreteMathematicalStructureswithApplication stoComputerScience",Tata Mcgraw–Hill Publication Co.limited, New Delhi,2003.<br>2. Seymour Lipschutz, Marc Laras Lipson, Varsha H.Patil, Discrete Mathematics(Schaum's Outlines)(2017). |
| **Reference Books** | 1. Dr.M.K.Venkataraman,Dr.S.SridharanandDr.M.Chandrasekeran,DiscreteMathematics,theNationalPublishingCompany.<br>2. Ralph.P.Grimaldi,"DiscreteandCombinatorialMathematics:AnAppliedIntroduction"4th edition,PearsonEduncationAsia,Delhi2002.<br>3. Dr.S.P.Rajagopalan,Dr.R.Sattanathan,DiscreteMathematics,MarghamPublications,Chennai-17 |
| **Website and e-Learning Source** | https://nptel.ac.in |

**METHOD OF EVALUATION:**

| Continuous Internal Assessment | End Semester Examination | Total |
|---|---|---|
| 25 | **75** | **100** |

**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

**CLO 1:** PrepareMathematicalconcepts intermsofpredicates, quantifiers,andlogical connectives.

**CLO 2:** AnalyseandIdentifytheknowledgeoflatticesanditsproperties.

**CLO 3:** EvaluateBooleanfunctionsandsimplifyexpressionsusingthepropertiesof Boolean algebra.

**CLO 4:** Learn to understand, analyse and develop a strong back ground in graph Theory

**CLO 5:** Identify the knowledge of Eulerian and Hamiltonian theorem using Terminology of graphs.

| | Pos | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 |
| CLO2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 |
| CLO3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 |
| CLO4 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 |
| CLO5 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 |

3 - Strong Correlation 2 - Medium Correlation 1 - Low Correlation

<table>
<tr><td>Title of the Course</td><td colspan="6">OPERATIONS RESEARCH – II</td></tr>
<tr><td>Paper Number</td><td colspan="6">ELECTIVECOURSE–III</td></tr>
<tr><td>Category</td><td>Elective</td><td>Year<br>Semester</td><td>III<br>VI</td><td>Credits</td><td>3</td><td>Course Code</td><td>23UMACAME03</td></tr>
<tr><td>Instructional Hours per week</td><td colspan="2">Lecture<br>5</td><td colspan="2">Tutorial<br>--</td><td colspan="2">Lab Practice<br>--</td><td>Total<br>5</td></tr>
<tr><td>Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td>Objectives of the Course</td><td colspan="6">• To develop computational skills<br>• To develop logical thinking in formulating industry oriented problems<br>• To apply these techniques in real life situations.</td></tr>
<tr><td rowspan="3">Course Outline</td><td colspan="6">UNIT-I Inventory theory: Introduction- Variables in an inventory problem - Need of inventory- Inventory problems - Advantages and disadvantages of inventory- Classification of inventory Models - Economic lot size model.<br>Model I: Economic lot size model with uniform rate size demand, Infinite rate of production and no shortages.(Derivation excluded - simple problems)<br>Model II: Order level model with Uniform rate of demand (Q to be fulfilled in constant time) infinite rate of production and having shortages to be fulfilled.(Derivation excluded - simple problems)<br>(Book 2: Chapter 19: Section 19.1 to 19.11)</td></tr>
<tr><td colspan="6">UNIT-II: Model III: The general single period model of profit maximization with time independent cost - Discrete case only..(Derivation excluded - simple problems)<br>Model IV: Purchase Inventory model with – One price break – Two price breaks. (derivation excluded),Newspaper boy problem (Derivation excluded - simple problems)<br>(Book 2: Chapter 19: Section 19.12; Chapter 20: Section 20.4, 20.5)</td></tr>
<tr><td colspan="6">UNIT-III: Queuing theory- General concepts and definitions- Classification of queues-Poisson process, Models (No derivations, only problems)<br>(Book 1: Chapter 12: Section 12.1 to 12.6, 12.11 to 12.20)</td></tr>
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|---|---|
| | **UNIT-IV: Network Analysis**: Introduction- Network diagram representation - Rules for drawing Network diagram- labeling: Fulkerson's 'I-J' rule- time estimates and critical path - In Network analysis- Forward pass, Backward pass computation- Determination of floats and slack times- Determination of critical path. **Project Evaluation and Review Techniques (PERT)**: Optimistic time-<br>most likely Time - Pessimistic time- Expected time-variance- Rules for finding variance of events problems in PERT.<br>(Book 2: Chapter 25: Section 25.1 to 25.7) |
| | **UNIT-V: Sequencing Problem** – n jobs through 2 machines – n jobs through 3machines –n jobs through m machines.<br>(Book 2: Chapter 12: Section 12.1, 12.4, 12.5) |
| **Skills acquired from this course** | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skills |
| **Recommended Text** | 1. R.K. Gupta, Operations Research, Krishna Prakash<br>2. KantiSwarup,P.K.GuptaandManMohanOperationsResearch,S.Chand&Co, Delhi. |
| **Reference Books** | 1. Taha, Operation Research, Printice Hall, New Delhi.<br>2. V.Sundaresan, K.S. Ganapathy Subramanian, &K.Ganesan, Resource Management Techniques (Operations Research), A.R. Publications, NagapattinumDistrict .<br>3. Kalavathy , Operations Research Vikas Publishing House Pvt .Ltd.<br>4. Gupta P.K&Hira D.S ,Problems in Operations Research, S.Chand& b Co, Delhi<br>5. S.D. Sharma, Operations Research, KedharNath Ram Nath&co,Meerut |
| **Website and e-Learning Source** | https://nptel.ac.in |

**METHOD OF EVALUATION:**

| Continuous Internal Assessment | End Semester Examination | Total |
|---|---|---|
| 25 | **75** | **100** |

**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

**CLO 1:** Study and analyse the concepts of various inventory models to minimize the cost.

**CLO 2:**Analyse and evaluate the profit using inventory models.

**CLO 3:** Analyse the various queueing models and evaluate the various system performance Measures of Queueing to maximize the profit.

**CLO 4:** Analyse and ensure optimum utilization of human and other resources.

**CLO 5:** Estimate optimum solution for sequencing problems.

| | Pos | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 2 |
| CLO2 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 2 |
| CLO3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 |
| CLO4 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 |
| CLO5 | 3 | 3 | 3 | 3 | 1 | 2 | 3 | 3 | 2 |

3 - Strong Correlation 2 - Medium Correlation 1 - Low Correlation

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">DATA SCIENCE</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">ELECTIVE COURSE IV</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23UMACAME04</td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>5</td><td colspan="2">--</td><td>--</td><td colspan="2">5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">• Knowledge on Data Science and its benefits.<br>• Introduce the Data Science process.<br>• Study the simple Algorithms and modeling.<br>• Introducing the Hadoop frame work.<br>• Gain knowledge by using case study.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="7">UNIT I-Introduction to Data Science– Benefits and uses – Facetsofdata– Data science process–Big data eco system and data science.<br>(Chapter 1: Sec 1.1 to 1.6)</td></tr>
<tr><td colspan="7">UNIT II-The Data science process – Overview – research goals - retrieving data - transformation –Exploratory Data Analysis– Modelbuilding. (Chapter 2: Sec 2.1 to 2.8)</td></tr>
<tr><td colspan="7">UNIT III-Algorithms - Machine learning algorithms – Modeling process – Types – Supervised –Unsupervised-Semi-supervised.<br>(Chapter 3: Sec 3.1 to 3.5)</td></tr>
<tr><td colspan="7">UNIT IV-Introduction to Hadoop – framework – Spark – replacing MapReduce– NoSQL – ACID –CAP–BASE–types.<br>(Chapter 5 Sec 5.1 to 5.3, Chapter 6 Sec 6.1)</td></tr>
<tr><td colspan="7">UNIT V- Case Study– Prediction of Disease-Setting research goals-Dataretrieval–preparation-exploration-Diseaseprofiling-presentationandautomation.<br>(Chapter 6: Sec 6.2)</td></tr>
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|---|---|
| Practical Course Outline | 1. Demonstrate the working of “id” and “type” functions.<br>2. Find all prime numbers within a given range.<br>3. Print n terms of Fibonacci series using iteration.<br>4. Demonstrate use of slicing in string.<br>5. Compute the frequency of the words from the input. The output should output after sorting the key alphanumerically.<br>6. Write a program that accepts a comma separated sequence of words as input and prints the words in a comma-separated sequence after sorting them alphabetically.<br>7. Demonstrate use of list & related functions.<br>8. Demonstrate use of Dictionary & related functions.<br>9. Demonstrate use of tuple & related functions.<br>10. Implement stack using list.<br>11. Implement queue using list.<br>12. Read and write from a file.<br>13. Copy a file. |
| **Skills acquired from this course** | • Introduce the Data Science process.<br>• Study the simple Algorithms and modeling.<br>• Gain knowledge by using case study. |
| **Recommended Text** | DavyCielen,ArnoD.B.Meysman,MohamedAli,“IntroducingDataScience”,manningpublications2016. |
| **Reference Texts** | 1. Roger Peng, “TheArtofDataScience”,lulu.com2016.<br>2. Murtaza Haider, “Getting Started with Data Science–Making Sense<br>Of Data with Analytics”,IB Mpress,E-book.<br>3. DavyCielen,ArnoD.B.Meysman,MohamedAli,“Introducing DataScience:BigData,MachineLearning,andMore,UsingPython Tools”,DreamtechPress2016.<br>4. AnnalynNg,KennethSoo,“Numsense!DataScienceforLaym an:NoMathAdded”,2017,1stEdition.<br>5. CathyO'Neil,RachelSchutt,“DoingDataScienceStraightTalkfromth eFrontline”,O'ReillyMedia 2013.<br>6. Lillian Pierson,“Data Science forDummies”,2017,2ndEdition. |

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|---|---|
| **Website and e-Learning Source** | • https://intellipaat.com/blog/tutorial/data-science-tutorial/<br>• https://www.guru99.com/data-science-tutorial.html<br>• https://www.w3schools.com/ |

**METHOD OF EVALUATION:**

| **Continuous Internal Assessment** | **End Semester Examination** | | **Total** |
|---|---|---|---|
| | **Theory** | **Practical** | |
| **25** | **50** | **25** | **100** |

**Course Learning Outcomes(for Mapping with POs and PSOs)**
students will be able to

**CLO1**:Knows the basic concept of Data Science

**CLO2**:Knowledge on Data Science process

**CLO3**:Understand the Modeling procedure.

**CLO4**:Know the basic concept of Hadoop.

**CLO5**:Understand the Data Science using Case study.

| | Pos | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |
| CLO2 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |
| CLO3 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |
| CLO4 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |
| CLO5 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 |

3- Strong Correlation 2-Medium Correlation 1- Low Correlation

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">LaTeX-PRACTICAL</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">PROFESSIONAL COMPETENCY SKILL PCS01</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">SEC</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">23UMACAPC01/ 23UMAPC01</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">2</td><td colspan="2">--</td><td colspan="2">--</td><td>2</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">• To enable the Students to Prepare Research Articles in LaTeX format.</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="7">1. Creation of a Document with different Alignments(Left, Right, Center, Justify).<br>2. Typing a Letter for Appling a job.<br>3. Creation of Own Bio-Data.<br>4. Creating a Table Structure.<br>5. Typing a Mathematical Expression involving Differentiation, Integration and Trigonometry.<br>6. Typing a Mathematical Expression using all Expressions and Inequalities.<br>7. Creation of an Article using LaTeX.<br>8. Inserting Picture in a LaTeX.<br>9. Preparing a question paper in LaTeX Format.<br>10. Creation of Power Point Presentation in LaTeX.</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="7">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved<br>(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="7">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
</table>

| | |
|---|---|
| **Recommended Text** | 1. David F Griffiths and Desmond J. Higham, ***Learning LaTex,*** SIAM(Society for Industrial and Applied Mathematics) Publishers, Phidelphia, 1996. |
| **Reference Books** | 1. Nambudiripad, K.B.M., 2014. ***LaTeX for beginners.*** Narosa Publishing House private limited, New Delhi.<br>2. Martin J. Erickson and Donald Bindner, ***A student's Guide to the Study, Practice and Tools of Modern Mathematics,*** CRC Press, Boca Raton, FL, 2011.<br>3. L. Lamport, ***LATEX: A Document Preparation System, User's Guide and Reference Manual,*** Addison-Wesley, Newyork, Second edition, 1994. |
| **Website and e-Learning Source** | https://nptel.ac.in |

**Course Learning Outcome**

After completion of the course, the students will be able to

**CLO 1 :** Make different Alignments in a document and an Application for a job

**CLO 2 :** Generate Bio-Data and Table Structures.

**CLO 3 :** Create Mathematical Statements using LaTeX.

**CLO 4 :** Prepare Articles and Inserting Pictures.

**CLO 5 :** Prepare Question paper and PowerPoint presentation in LaTeX format.