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THIRUVALLUVAR UNIVERSITY

SERKKADU, VELLORE–632115

B.Sc. MATHEMATICS WITH COMPUTER APPLICATION

SYLLABUS

FROM THE ACADEMIC YEAR

2023 – 2024

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 NaduState 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 ofthe 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. .

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 **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. **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. **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. **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. **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 **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 **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. **PO9: Reflective thinking**: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society. **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. **PO 11 Self-directed learning**: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion. **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. **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. **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. **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/reskilling.

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

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.

Value additions in the Revamped Curriculum:

Semester	Newly introduced Components	Outcome / Benefits
I	**Foundation Course** 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 • Create interest for the subject
I, II, III, IV	**Skill Enhancement papers** (Discipline centric / Generic / Entrepreneurial)	• Industry ready graduates • Skilled human resource • 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 • Generates self – employment • Create small scale entrepreneurs • 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- An open choice of topics categorized under Generic and Discipline Centric	• Strengthening the domain knowledge • Introducing the stakeholders to the State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature • Students are exposed to Latest topics on Computer Science / IT, that require strong mathematical background • 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 • Generates Industry ready graduates • 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 • 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; • '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: **For Advanced Learners / Honours degree**		• To cater to the needs of peer learners / research aspirants

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

Credit and Hours Distribution System for all UG courses including Lab Hours

First Year – Semester-I

Part	List of Courses	Credit	No. of Hours
Part-1	Tamil or other Languages	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses [in Total]	13	16
Part-4	Skill Enhancement Course COURSE-1	2	2
	Foundation Course	2	2
		23	**32**

Semester-II

Part	List of Courses	Credit	No. of Hours
Part-1	Tamil or other Languages	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses including laboratory [in Total]	13	14
Part-4	Skill Enhancement Course -COURSE-2	2	2
	Skill Enhancement Course -COURSE-3 (Discipline / Subject Specific)	2	2
		23	**32**

Second Year – Semester-III

Part	List of Courses	Credit	No. of Hours
Part-1	Tamil or other Languages	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses including laboratory [in Total]	13	14
Part-4	Skill Enhancement Course -COURSE-4 (Entrepreneurial Based)	1	1
	Skill Enhancement Course -COURSE-5 (Discipline / Subject Specific)	2	2
	Environmental Studies	2	2
		24	**32**

Semester-IV

Part	List of Courses	Credit	No. of Hours
Part-1	Tamil or other Languages	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses including laboratory [in Total]	13	16
Part-4	Skill Enhancement Course -COURSE-6 (Discipline / Subject Specific)	2	2
	Skill Enhancement Course -COURSE-7 (Discipline / Subject Specific)	2	2
		23	**32**

Third Year

Semester-V

Part	List of Courses	Credit	No. of Hours
Part-3	Core Courses including Project / Elective Based	22	28
Part-4	Value Education	2	2
	Internship / Industrial Visit / Field Visit	2	
		26	**30**

Semester-VI

Part	List of Courses	Credit	No. of Hours
Part-3	Core Courses including Project / Elective Based & LAB	18	28
Part-4	Extension Activity	1	-
	Professional Competency Skill	2	2
		21	**30**

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
1.1 Part-1 Tamil or other Languages	3	6	2.1 Part-1 Tamil or other Languages	3	6	3.1 Part-1 Tamil or other Languages	3	6	4.1 Part-1 Tamil or other Languages	3	6	5.1 Core Course IX	4	5	6.1 Core Course – XIII	4	6
1.2 Part-2 English	3	6	2.2 Part-2 English	3	6	3.2 Part-2 English	3	6	4.2 Part-2 English	3	6	5.2 Core Course X	4	5	6.2 Core Course XIV	4	6
1.3 Core Course I	5	6	2..3 Core Course III	5	5	3.3 Core Course V	5	5	4.3 Core Course VII Core Industry Module	5	5	5. 3.Core Course XI	4	5	6.3 Core Course XV	4	6
1.4 Core Course II	5	5	2.4 Core Course IV	5	5	3.4 Core Course VI	5	5	4.4 Core Course VIII	5	5	5. 4.Core Course – / Project with viva- voce XII	4	5	6.4 Elective VII Generic/ Discipline Specific	3	5
1.5 Elective I Generic/ Discipline Specific	3	5	2.5 Elective II Generic/ Discipline Specific	3	6	3.5 Elective III Generic/ Discipline Specific	3	5	4.5 Elective IV Generic/ Discipline Specific	3	6	5.5 Elective V Generic/ Discipline Specific	3	4	6.5 Elective VIII Generic/ Discipline Specific	3	5
1.6 Skill Enhancement Course-1	2	2	2.6 Skill Enhancement Course-2	2	2	3.6 Skill Enhancement Course 4, (Entrepreneurial Skill)	1	1	4.6 Skill Enhancement Course 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 3	2	2	3.7 Skill Enhancement Course 5	2	2	4.7 Skill Enhancement Course 7	2	2	5.7 Value Education	2	2	6.7 Professional Competency Skill	2	2
						3.8 Environmental Studies	2	2				5.8 Summer Internship /Industrial Training	2				
	23	**32**		**23**	**32**		**24**	**32**		**23**	**32**		**26**	**30**		**21**	**30**
Total – 140 Credits																	

METHODS OF EVALUATION		
Internal Evaluation	Continuous Internal Assessment Test	**25 Marks**
	Assignments / Snap Test / Quiz	
	Seminars	
	Attendance and Class Participation	
External Evaluation	End Semester Examination	**75 Marks**
Total		**100 Marks**

METHODS OF ASSESSMENT	
Remembering (K1)	• The lowest level of questions require students to recall information from the course content • Knowledge questions usually require students to identify information in the textbook.
Understanding (K2)	• Understanding of facts and ideas by comprehending organizing, comparing, translating, interpolating and interpreting in their own words. • The questions go beyond simple recall and require students to combine data together
Application (K3)	• Students have to solve problems by using / applying a concept learned in the classroom. • Students must use their knowledge to determine a exact response.
Analyze (K4)	• Analyzing the question is one that asks the students to break down something into its component parts. • Analyzing requires students to identify reasons causes or motives and reach conclusions or generalizations.
Evaluate (K5)	• Evaluation requires an individual to make judgment on something. • Questions to be asked to judge the value of an idea, a character, a work of art, or a solution to a problem. • Students are engaged in decision-making and problem – solving. • Evaluation questions do not have single right answers.
Create (K6)	• The questions of this category challenge students to get engaged in creative and original thinking.

	• Developing original ideas and problem solving skills

B.Sc., Mathematics with Computer Applications including Lab Hours

First Year – Semester-I

Part	List of Courses	Credit	No. of Hours
Part 1.1	Tamil or other Languages	3	6
Part.2 English	English	3	6
1.3 Core Course-I	Algebra & Trigonometry	5	6
1.4 Core Course II	Calculus	5	5
1.5 Elective I Generic/ Discipline Specific	Elective I – Web Designing with HTML(With Lab)	3	5
1.6 Skill Enhancement Course	Skill Enhancement Course SEC-1 Choose any one from the list given below	2	2
1.7 Skill Enhancement - (Foundation Course)	Foundation Course	2	2
	Total –	**23**	**32**

Semester-II

Part	List of Courses	Credit	No. of Hours
Part 1.1	Tamil or other Languages	3	6
Part.2 English	English	3	6
1.3 Core Course-I	Analytical Geometry & Vector Analysis	5	5
1.4 Core Course II	Differential Equations and its Applications	5	5
1.5 Elective II Generic/ Discipline Specific	Programming with Python (with Lab)	3	6
1.6 Skill Enhancement Course	Choose any one from the list given below	2	2
1.7 Skill Enhancement - (Foundation Course)	Choose any one from the list given below Sage Mathematics Choose an one from the list given below	2	2
	Total –	**23**	**32**

Second Year – Semester-III

Part	List of Courses	Credit	No. of Hours
Part 3.1	Tamil or other Languages	3	6
Part.3.2 English	English	3	6
3.3 Core Course – V	Fourier Series & Integral Transforms	5	5
3.4 Core Course – VI	Java and Data Structures (with Lab)	5	5
3.5 Elective III Generic/ Discipline Specific	Elective course III Numerical Methods	3	5
3.6 Skill Enhancement Course - 4, (Entrepreneurial Skill)	Skill Enhancement Course -SEC-4 (Entrepreneurial Based) Choose any one from the list given below	1	1
3.7 Skill Enhancement Course -5	Choose any one from the list given below (Discipline / Subject Specific) Advanced Excel	2	2
3.8. EVS	Environmental Studies	2	2
		22	**30**

Semester-IV

Part	List of Courses	Credit	No. of Hours
Part..4.1.	Tamil or other Languages	3	6
Part.4.2 English	English	3	6
4.3 Core Course – VII Core Industry Module	Web Technology (with Lab)(Industrial Module)	5	5
4.4 Core Course – VIII	Number Theory	5	5
4.5 Elective IV Generic/ Discipline Specific	Mathematical Statistics	3	6
4.6 Skill Enhancement Course SEC-6	Choose any one from the list given below (Discipline / Subject Specific : Statistics with R Programming)	2	2
4.7 Skill Enhancement Course -7	Choose any one from the list given below	2	2
		23	**32**

Third Year -Semester-V

Part	List of Courses	Credit	No. of Hours
5.1 Core Course – IX	Core Paper – IX Modern Algebra	4	5
5.2 Core Course – X	Core Paper – X Real Analysis	4	5
5. 3.Core Course -XI	Core Paper – XI Mechanics	4	5
5. 4.Core Course –/ Project with viva- voce -XII	Core Paper – XII Project Viva Voce	4	5
5.5 Elective V Generic/ Discipline Specific	Elective Course – V Operations Research - I	3	4
5.6 Elective VI Generic/ Discipline Specific	Elective Course – VI Artificial Intelligence & Machine Learning(with Lab)	3	4
5.7 Value Education	Value Education	2	2
5.8 Summer Internship	Internship / Industrial Visit / Field Visit	2	
		26	**30**

Semester-VI

Part	List of Courses	Credit	No. of Hours
6.1 Core Course – XIII	Core Paper – XIII Linear Algebra	4	6
6.2 Core Course – XIV	Core Paper – XIV Complex Analysis	4	6
6.3 Core Course – XV	Core Paper – XV Discrete Mathematics and Graph Theory	4	6
6.4 Elective - VII Generic/ Discipline Specific	Elective Course – VII Operations Research – II	**3**	**5**
6.5 Elective VIII Generic/ Discipline Specific	Elective Course – VIII Data Science (with Lab)	3	**5**
6.6 Extension Activity	Extension Activity	1	-
6.7 Professional Competency Skill	Professional Competency Skill	2	2
		21	**30**

7.1 Suggestive Topics in Core Component

- Classical Algebra
- Trigonometry
- Differential Calculus
- Integral Calculus
- Analytical Geometry (2D / 3D)
- Vector Analysis
- Differential Equations
- Abstract Algebra
- Linear Algebra
- Sequences & Series
- Fourier Series
- Real Analysis
- Transform Techniques (Laplace, Fourier)
- Complex Analysis
- Mechanics (Statics / Dynamics)
- Artificial Intelligence
- Deep Learning
- Software Testing
- Data Mining and more.

7.2 Suggestive Topics in Elective Courses (Generic / Discipline-centric)

Group I:

- Statistical Methods
- Programming Language with practical (C, Python, Java, R, etc.)
- Object Oriented Programming with C++
- Principles of Econometrics
- Introduction to Actuarial Science
- Logistics & Supply chain management
- Forecasting Techniques
- Simulation
- Introduction to Data Science
- Cloud Computing
- Introduction to Machine Learning
- Data Structures
- Neural network models
- Financial Mathematics
- Operating Systems
- Computer Network
- Cryptography
- Big Data Analysis and more

Group II –Suggestive Elective Courses (Discipline-centric)

- Numerical Methods with Applications
- Mathematical Statistics
- Optimization Techniques
- Graph Theory & Applications
- Special functions with Applications
- Discrete Mathematics
- Combinatorial Mathematics
- Number Theory& Cryptography

- Difference equations with application
- Formal Languages & Automata Theory
- Astronomy / Elements of Space Science
- Stochastic Processes
- Fuzzy Sets & its applications
- Introduction to Research Methodology
- Algorithms
- Computational Geometry
- Data Communication and Computer Networks
- Robotics and Applications
- Cyber Forensics and more

7.3 Suggestive Topics in Skill Enhancement Courses (SEC)

Group III - Skill Enhancement Courses (SEC)

- Statistics with R / Excel / SPSS
- LaTeX
- E- Commerce & Tally
- Computing skills (Office Automation)
- Android App development
- Web Designing
- Mathematics for Competitive examinations
- Computational Mathematics
- Data Analysis using latest package
- Fundamentals of Information Technology
- Computer Fundamentals

  (R / Matlab / Maxima/ Torus / GeoGebra /GIMP) and more

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="8">ALGEBRA & TRIGONOMETRY</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">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">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">1</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">• Basic ideas on the Theory of Equations, Matrices and Number Theory.
• 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="8">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.</td></tr>
<tr><td colspan="8">Unit II: Summation of Series: Binomial– Exponential –Logarithmic series (Theorems without proof) – Approximations - Simple problems.</td></tr>
<tr><td colspan="8">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.</td></tr>
<tr><td colspan="8">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 θ - Simple problems.</td></tr>
<tr><td colspan="8">Unit V: Hyperbolic functions – Relation between circular and hyperbolic functions Inverse hyperbolic functions, Logarithm of complex quantities, Summation of trigonometric series – Simple problems.</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 transferable skill.</td></tr>
</table>

Recommended Text	1. W.S. Burnstine and A.W. Panton, Theory of equations 2. David C. Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007 3. G.B. Thomas and R.L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005 4. C.V.Durell and A. Robson, Advanced Trigonometry, Courier Corporation, 2003 5. J.Stewart, L.Redlin, and S. Watson, Algebra and Trigonometry, Cengage Learning, 2012. 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="8">CALCULUS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">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">5</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
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<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">1</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">• The basic skills of differentiation, successive differentiation, and their applications.
• Basic knowledge on the notions of curvature, evolutes, involutes and polar co-ordinates and in solving related problems.
• Knowledge on integration and its geometrical applications, double, triple integrals and improper integrals.
• Knowledge about Beta and Gamma functions and their applications.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="8">UNIT – I ::Successive Differentiation - n^{th} derivative, Standard results– Leibnitz Theorem(without Proof) and its applications</td></tr>
<tr><td colspan="8">UNITII: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,</td></tr>
<tr><td colspan="8">UNITIII: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), $\int x^m(\log x)^n\,dx$, $\int \cos^m x\cos nx\,dx$,$\int \cos^m x\sin nx\,dx$</td></tr>
<tr><td colspan="8">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)</td></tr>
<tr><td colspan="8">UNIT-V:BetaandGamma functions(Applicationstosimpleproblems)</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	1. H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002. 2. G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2010. 3. "Calculus",Vol-II b S.Narayanan and T.K.Manicavachagam pillai S.Viswanathan publishers–2007 4. D. Chatterjee, Integral Calculus and Differential Equations, Tata-McGraw Hill Publishing Company Ltd.
Reference Books	1. R. Courant and F. John, Introduction to Calculus and Analysis (Volumes I & II), Springer- Verlag, New York, Inc., 1989. 2. T. Apostol, Calculus, Volumes I and II. 3. S. Goldberg, Calculus and mathematical analysis.
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>Title of the Course</td><td colspan="7">WEB DESIGNING WITH HTML</td></tr>
<tr><td>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">3</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>Lecture</td><td>Tutorial</td><td>Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td>3</td><td>-</td><td>1</td><td colspan="3">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">• Insert a graphic within a web page.
• Create a link within a web page.
• Create a table within a web page.
• Insert heading levels within a web page.
• 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="6">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</td></tr>
<tr><td colspan="6">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.</td></tr>
<tr><td colspan="6">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.</td></tr>
<tr><td colspan="6">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.</td></tr>
<tr><td colspan="6">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</td></tr>
</table>

Practical Course Outline	1. Write a program to illustrating the basic tags of HTML. 2. Write a program on Page formatting. 3. Write a program to illustrate paragraph tag. 4. Write a program to change background colour. 5. Write a program to create a list (Numbered (Ordered) Lists – Bulleted (Unordered) Lists). 6. To create a HTML file using special characters. 7. To create a HTML file containing hyper link. 8. Write a HTML program to display a table with 5 rows and 4 columns with appropriate heading. 9. Write a HTML code to design complex nested list. 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. 2. Understand the principles of creating an effective webpage. 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. 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 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>Title of the Course</td><td colspan="6">ANALYTICAL GEOMETRY &VECTOR ANALYSIS</td></tr>
<tr><td>Paper Number</td><td colspan="6">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">5</td><td rowspan="2">Course Code</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td>Instructional Hours per week</td><td>Lecture</td><td>Tutorial</td><td>Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td></td><td>4</td><td>1</td><td>--</td><td colspan="3">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">• Necessary skills to analyze characteristics and properties of two- and three-dimensional geometric shapes.
• To present mathematical arguments about geometric relationships.
• To solve real world problems on geometry and its applications.</td></tr>
<tr><td rowspan="5">Course Outline</td><td colspan="6">UNIT-I: System of Planes - Length of the perpendicular - Orthogonal projection.</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.</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.</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.</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.</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. S. L. Loney, Co-ordinate Geometry. 2. Robert J. T. Bell, Co-ordinate Geometry of Three Dimensions. 3. Vector Analysis by P.Duraipandian and Kayalal Pachaiyappa ,S.Chand 4. Analytical Solid Geometry of 3D by Shanthi Narayan and Dr.P.K. Mittal - S.Chand & Co.Pvt.Ltd
Reference Books	1. Calculus and Analytical Geometry, G.B. Thomas and R. L. Finny, Pearson Publication, 9th Edition, 2010. 2. Robert C. Yates, Analytic Geometry with Calculus, Prentice Hall, Inc., New York, 1961. 3. Earl W. Swokowski and Jeffery A. Cole, Algebra and Trigonometry with Analytic Geometry, Twelfth Edition, Brooks/Cole, Cengage Learning, CA, USA, 2010. 4. William H. McCrea, Analytical Geometry of Three Dimensions, Dover Publications, Inc, New York, 2006. 5. John F. Randelph, Calculus and Analytic Geometry, Wadsworth Publishing Company, CA, USA, 1969. 6. 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 colspan="2">Title of the Course</td><td colspan="6">DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">CORE PAPER IV</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">5</td><td rowspan="2">Course Code</td><td rowspan="2"></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>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td>1</td><td colspan="2">--</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">• Knowledge about the methods of solving Ordinary and Partial Differential Equations.
• The understanding of how Differential Equations can be used as a powerful tool in solving problems in science.</td></tr>
<tr><td colspan="2" rowspan="5">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.</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.</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.</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.</td></tr>
<tr><td colspan="6">UNIT-V: Special methods – Standard forms - Charpit’s Methods – Simple Applications.</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. Shepley L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984. 2. I. Sneddon, Elements of Partial Differential Equations, McGraw-Hill, International Edition, 1967. 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 2. H.T. H. Piaggio, Elementary Treaties on Differential Equations and their applications, C.B.S Publisher & Distributors, Delhi,1985. 3. Horst R. Beyer, Calculus and Analysis, Wiley, 2010. 4. Braun, M. Differential Equations and their Applications. (3rd Edn.), Springer-Verlag, New York. 1983. 5. TynMyint-U and Lognath Debnath. Linear Partial Differential Equations for Scientists and Engineers. (4th Edn.) Birhauser, Berlin. 2007. 6. N.P.Bali, Differential Equations, Firewall Media Publications,(2006). 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 colspan="2">Title of the Course</td><td colspan="6">PROGRAMMING WITH PYTHON</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">ELECTIVEPAPER II</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>I</td><td>Credits</td><td>3</td><td>Course Code</td><td></td></tr>
<tr><td>Semester</td><td>II</td><td colspan="3"></td></tr>
<tr><td colspan="2" 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">3</td><td>--</td><td colspan="2">1</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">• Describe the core syntax and semantics of Python programming language.
• Discover the need for working with the strings and functions.
• Illustrate the process of structuring the data using lists, dictionaries, tuples and sets.
• Understand the usage of packages and Dictionaries
• To know the costs and profit maximization</td></tr>
<tr><td colspan="2" rowspan="4">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.</td></tr>
<tr><td colspan="6">UNIT II-Sequences: Strings, Lists and Tuples – Sequences – Strings – Strings and Operators–String-Only Operators–Built-in Functions–String Built-inMethod–Lists–Operators-Built-inFunctions–List Type Built-in Methods–Tuples—Tuple Operators and Built-in Functions-</td></tr>
<tr><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.</td></tr>
<tr><td colspan="6">UNIT IV-Errors and Exceptions – Exceptions in Python – Detecting and Handling Exceptions Context Management – with statement – Raising Exceptions – Modules – Modulesand Files – Name spaces – Importing Modules – Features of Module - Import –Module Built-in Functions–Packages.</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.
Practical Course Outline	1. Program for Systemconfiguration 2. WorkingwithStrings 3. WorkingwithLists 4. WorkingwithTuples 5. WorkingwithDictionary 6. Workingwithconditionalloops–if, else, elif 7. Workingwithconditionalexpressions–for, while,break,continue 8. Implementingprogramsonfunctions 9. Workingwithfunction–formalargumentsandvariable-lengtharguments 10. WorkingwithDetectingandHandlingException 11. Workingwithmodules 12. Working withBuilt-inFunctions
Skills acquired from this course	1. Impart knowledge and skill in getting started with Python basic concepts. 2. Expose to the concepts of sequences, string and built-in-function of python. 3. Introduce the various control statements and looping for decision making. 4. Study the exceptions and error handling in program execution. 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. 2. Python Programming, Brain draper, kindle unlimited pvt.ltd. 3. Core Python Programming, Dr.R.Nageswara Rao, dreamtech pvtltd. Kindle. 4. The complete reference on Python, Martin.C.Brown MAC GrawHill pvt.ltd. 5. Coding for beginners using Python .Louie Stowell, kindle publishing pvt.ltd.
Website and e-Learning Source	1. https://www.programiz.com/python-programming 2. https://www.guru99.com/python-tutorials.html 3. https://www.w3schools.com/python/python_intro.asp 4. https://www.geeksforgeeks.org/python-programming-language/ 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="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">5</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td colspan="2">Instructional Hours per week</td><td colspan="2">Lecture
4</td><td colspan="2">Tutorial
1</td><td>Lab Practice
--</td><td>Total
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 analyse Fourier series and its applicability
• To understand Laplace Transform
• To apply Laplace transform to solve differential equations
• To compute Fourier Transform
• To apply Z Transforms to difference equations.</td></tr>
<tr><td colspan="2" rowspan="5">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.</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.</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 involving integrals-simple Problems.</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.</td></tr>
<tr><td colspan="6">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</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. Calculus-Volume III" – S.Narayanan and T.K.Manicavachagam Pillai. 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.) 2. Advanced Engineering Mathematics- Stanley Grossman and William R.Devit. 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></td></tr>
<tr><td>Semester</td><td>III</td><td colspan="3"></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">3</td><td colspan="2">-</td><td>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">• Learn the basic concepts of Java programming
• Use class and objects to create applications
• Overview the concepts of interfaces, packages, multithreading and exceptions.
• 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.</td></tr>
<tr><td colspan="6">UNIT II: Control Statements – Arrays.-Classes - Objects - Constructors - Overloading method –String Class-Overriding.</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</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.</td></tr>
<tr><td colspan="6">UNIT V: Linked List–Representation of Linked List in memory–Insertion and Deletion from Linked List.</td></tr>
<tr><td colspan="2">Practical Course Outline</td><td colspan="6">Implement the following programming concepts:
1. Classes and objects
2. Arrays
3. Multithreading
4. Exception handling
5. Inheritance
6. Applet programming
7. Linked List(Stacks and Queues)
Two or three programs under each heading</td></tr>
</table>

Skills acquired from this course	• Knowledge of basic on concepts of object oriented programming and enable students to understand about introduction of Java programming. • Analyze and to understand the concepts of interfaces inheritance and packages. Explain and develop programs in applet Programming, Managing errors and Exceptions. • 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. 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 2. Y.Daniel ziang, An Introduction to Java Programming, Prentice Hall of India Pvt. Ltd. 3. Tushar B.Kute, Core Java Programming A Practical Approach 4. L.Mathu Krithiga Venkatesh Data Structures and Algorithms Margham Publications. **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 • https://www.programiz.com/java-programming • https://www.theserverside.com/javaprogramming • https://www.technopedia.com/java • 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>Category</td><td>Elective</td><td>Year</td><td>II</td><td>Credits</td><td>3</td><td>Course Code</td><td></td></tr>
<tr><td></td><td></td><td>Semester</td><td>III</td><td></td><td></td><td></td><td></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">3</td><td colspan="2">1</td><td>--</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.
• Compute numerical solutions of algebraic and transcendental equations.
• Compute numerical solutions of integration problems and ODE.</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="7">UNIT-I: INTERPOLATION

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)</td></tr>
<tr><td colspan="2"></td><td colspan="7">UNIT-II : INTERPOLATION WITH UNEQUAL INTERVALS

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)</td></tr>
<tr><td colspan="2"></td><td colspan="7">UNIT-III : SOLUTION OF ALGEBRAIC AND TRANSCEDENTAL EQUATIONS

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)</td></tr>
<tr><td colspan="2"></td><td colspan="7">UNIT-IV: NUMERICAL INTEGRATION

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)</td></tr>
<tr><td colspan="2"></td><td colspan="7">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</td></tr>
</table>

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. 2. B.D.Gupta (2001) Numerical Analysis Konark publications Ltd., Delhi 3. Dr.M.K.Venkataraman, Numerical Methods in Science & Engineering, Fifth edition (1999),The National Publishing Company, Chennai. 4. H.C. Saxena (1991) Finite difference and numerical analysis S.Chand&Co. Delhi.
Reference Books	1. S.Arumugham(2003) Numerical Methods, New Gamma Publishing, Palayamkottai. 2. 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. 3. E.Balagurusamy, Numerical Methods (1999),Tata Mc.Graw Hill, New Delhi. 4. 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="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>Credits</td><td>5</td><td>Course Code</td><td></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">3</td><td colspan="2">-</td><td colspan="2">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">• Use PHP and MYSQL to develop dynamic website for user on the internet.
• Get exposed to the concepts of operators and control statements for decision making.
• Introduce the looping for working with string and numeric functions.
• Study the Array functions and creating classes to develop the website.
• Gain the knowledge on file management in PHP.</td></tr>
<tr><td colspan="2" rowspan="5">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.</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.</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.</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.</td></tr>
<tr><td colspan="8">UNIT V- Working with Files and Directories: Reading Files-Writing Files-Processing Directories.</td></tr>
</table>

Practical Course Outline	1. Write a PHP program to find the Even and Odd numbers. 2. Write a PHP program to find the Leap year. 3. Write a PHP program to swapping of two numbers. 4. Write a PHP program which adds up columns and rows of given table. 5. Write a PHP program to compute the sum of first n given prime numbers. 6. Write a PHP program to find valid an email address. 7. Write a PHP program to convert a number written in words to digit. 8. Write a PHP script to delay the program execution for the given number of seconds. 9. Write a PHP script, which changes the colour of the first character of a word. 10. Write a PHP program to find multiplication table of a number. 11. Write a PHP program to calculate Factorial of a number. 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. • 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. 2. Steven Holzer, "*Spring into PHP*", Tata McGraw Hill 2011, 5thEdition.
Website and e-Learning Source	• https://www.w3schools.com/php/ • https://t4tutorials.com/e-learning-management-system-project-in-php-mysql-projects-for-mcs-mit/ • https://www.php.com/e-learning-video-library/ • 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

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="8">NUMBER THEORY</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">CORE PAPER –VIII</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"></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">4</td><td colspan="2">1</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">• Apply the various techniques of solving puzzles in applications.
• Know the connections of number theory with other branches.
• Gain competence in solving problems.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="8">UNIT-I Introduction – Basic binary Operations on the set of Integers – Ordering of Integers - Well Ordering Principle – Mathematical Induction. (Simple problems only)</td></tr>
<tr><td colspan="8">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)</td></tr>
<tr><td colspan="8">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)</td></tr>
<tr><td colspan="8">UNIT-IV: Quadratic Residues: Introduction, quadratic residues, Elementary Properties. (Simple problems only)</td></tr>
<tr><td colspan="8">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)</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>
<tr><td colspan="2">Recommended Text</td><td colspan="8">Theory of Numbers, Dr. Sudhir, K.Pundir, Pragati Prakashan Publications, third revisededition 2012.</td></tr>
<tr><td colspan="2">Reference Books</td><td colspan="8">1. An introduction to the Theory of Numbers (Vth edition) by Ivan Niven, Herbert S. Zuckarmanand Hugh L. Montgometry John Wiley & Sons, Inc.2001.
2. Elementary theory of numbers, cy. Hsiung, Allied publishers, 1995.
3. Elementary Number Theory, Allyn and Bacon Inc., Boston, 1980.</td></tr>
<tr><td colspan="2">Website and e-Learning Source</td><td colspan="8">https://nptel.ac.in</td></tr>
</table>

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

<table>
<tr><td>Title of the Course</td><td colspan="8">Mathematical Statistics</td></tr>
<tr><td>Paper Number</td><td colspan="8">ELECTIVE COURSE IV</td></tr>
<tr><td>Category</td><td>Elective</td><td>Year</td><td>II</td><td>Credits</td><td>3</td><td>Course Code</td><td colspan="2"></td></tr>
<tr><td></td><td></td><td>Semester</td><td>IV</td><td></td><td></td><td></td><td colspan="2"></td></tr>
<tr><td>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></td><td colspan="2">2</td><td colspan="2">1</td><td colspan="2">--</td><td>3</td></tr>
<tr><td>Pre-requisite</td><td colspan="8">12th Standard Mathematics</td></tr>
<tr><td>Objectives of the Course</td><td colspan="8">1. Acquire the knowledge about Theoretical Distributions and understand the concepts of correlation and regression.
2. Be familiarized with the applications of various test of significance</td></tr>
<tr><td rowspan="5">Course Outline</td><td colspan="8">Unit I: Theoretical Distributions : Binomial – Poisson – Normal distributions - Fitting of distributions - Simple Problems (Derivations excluded)</td></tr>
<tr><td colspan="8">Unit II:. Correlation and Regression : Karl Pearson’s Coefficient of Correlation-Rank Correlation – Lines of Regressions - Simple Problems (Derivations excluded)</td></tr>
<tr><td colspan="8">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)</td></tr>
<tr><td colspan="8">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)</td></tr>
<tr><td colspan="8">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)</td></tr>
<tr><td>Skills acquired from this course</td><td colspan="8">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td>Recommended Text</td><td colspan="8">1.S.C. Gupta and V.K. Kapoor, Elements of Mathematical Statistics, Third edition(2015) Sultan Chand & Sons publications, NewDelhi.</td></tr>
</table>

Reference Books	1. P.R. Vittal, Mathematical Statistics(2002), Margham Publications,Chennai. 2. S.C. Gupta and V.K. Kapoor,Fundamentalsof Mathematical Statistics, Eleventh edition(2002)Sultan Chand & Sons publications 3. RobertV.Hogg,Joseph Mckean &Craig A.T,Introduction to Mathematical Statistics,(2013)PearsonsEducation India 4. George W.Snedecor, William G.Cochran ,Statistical Methods(1967),Oxford &IBH Publishers 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

<table>
<tr><td>Title of the Course</td><td colspan="6">MODERN ALGEBRA</td></tr>
<tr><td>Paper Number</td><td colspan="6">CORE PAPER –IX</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td>Credits</td><td>4</td><td>Course Code</td></tr>
<tr><td>Semester</td><td>V</td><td></td><td></td><td></td></tr>
<tr><td>Instructional Hours per week</td><td colspan="2">Lecture
4</td><td colspan="2">Tutorial
1</td><td>Lab Practice
--</td><td>Total
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">• Establishtherelationshipsbetweenabstractalgebraicstructuregroups&subgroupwithfamiliarnumbersystemssuchasintegersandrealnumbers.
• Learn the extended concept of group & field such as rings and its properties.</td></tr>
<tr><td rowspan="5">Course Outline</td><td colspan="6">UNIT-I: Introduction to groups- Subgroups- cyclic groups and properties of cyclic groups- Lagrange’s Theorem-A counting principle – Examples.</td></tr>
<tr><td colspan="6">UNIT-II: Normal subgroups and Quotient group- Homomorphism-Automorphism -Examples.</td></tr>
<tr><td colspan="6">UNIT-III: Cayley’s Theorem-Permutation groups - Examples.</td></tr>
<tr><td colspan="6">UNIT-IV: Definition and examples of ring- Some special classes of rings-homomorphism of rings- Ideals and quotient rings- More ideals and quotient rings.</td></tr>
<tr><td colspan="6">UNIT-V: The field of quotients of an integral domain-Euclidean Rings - The particular Euclidean Ring – Examples.</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>
<tr><td>Recommended Text</td><td colspan="6">Topics in Algebra–I.N.Herstein, Wiley Eastern Ltd. Second Edition (1st January 2006)</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. John B. Fraleigh, A First Course in Abstract Algebra, 7th Ed., Pearson, 2002.
2. M. Artin, Abstract Algebra, 2nd Ed., Pearson, 2011.
3. Joseph A Gallian, Contemporary Abstract Algebra, 4th Ed., Narosa, 1999.</td></tr>
</table>

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: Demonstratetheimportanceofalgebraicpropertiesanddefinitions.

CLO 2: Explaintheequivalencerelationbetweensetsandequivalenceclassestoformanormal subgroupandquotientgroup.

CLO 3: Demonstratethe embeddingofanygroupintoagroupofpermutations.

CLO 4: Identifytheringsandanalyzethebasictheoreticalproofs.

CLO 5: Formulateanygivenintegeras either prime or productofprimesinauniqueway.

	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="8">REAL ANALYSIS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">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"></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">1</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">• Real Numbers and properties of Real–valued functions.
• Connectedness, Compactness, Completeness of Metric spaces.
• Convergence of sequences of functions, Examples and counter examples
• Learn the concepts of Sets of measure zero&RiemannIntegral.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="8">UNIT-I: Countability of Real Numbers- Least Upper Bounds-Sequences andSubsequence-LimitofaSequence-Convergentand DivergenceSequence-BoundedSequences-MonotoneSequences-CauchySequences.</td></tr>
<tr><td colspan="8">UNIT-II:ConvergenceandDivergenceofSeries-SerieswithNon-NegativeTerms-AlternatingSeries-ConditionalandAbsoluteConvergence-TestforAbsolute Convergence.</td></tr>
<tr><td colspan="8">NIT-III:LimitofaFunction-MetricSpaces-FunctionContinuousataPointontheRealLine-OpenSets-ClosedSets.</td></tr>
<tr><td colspan="8">UNIT-IV:Connectedness, Completeness and Compactness: More aboutOpenSets-ConnectedSets-CompleteMetricSpaces-CompactMetric Spaces.</td></tr>
<tr><td colspan="8">UNIT-V:Sets of measure Zero- Definition of the Riemann Integral Existence oftheRiemannIntegral(statementonly)-PropertiesofRiemannIntegral.</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	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). 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 thefundamentalpropertiesofrealanalysis andtheirusesinsequences, Series&derivatives.

CLO 2: Identifythegivenseriesaswhetherconvergentordivergent.

CLO 3: Applytheabstractideasand rigorousmethodsofmathematicalanalysisto practicalproblems.

CLO 4: Constructmathematicalproofs forbasicresultsofrealanalysis.

CLO 5: IdentifyingthesetsofmeasurezeroandRiemannIntegral.

	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"></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>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td>1</td><td colspan="2">--</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">• To demonstrate the application of Mechanics in various fields.
• To develop the proficiency in problem solving.
• 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.
Equilibrium of a Particle: Equilibrium of a particle – Limiting equilibrium of a particle on an inclined plane.</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.</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.
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.</td></tr>
</table>

	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. **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.
	UNIT-V: Central Orbits: General orbits – Central orbit – Conic as a centred orbit.
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. 2.Duraipandian.P, Laxmi Duraipandian,MuthamizhJayapragasam. (2015) Mechanics (6^{th} Revised Edition), New Delhi, S.Chand and Co. 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. 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. 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 obliqueimpact.

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	
		Semester	V				

Instructional Hours per week	Lecture	Tutorial	Lab Practice	Total
	5	-	--	5

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">OPERATIONS RESEARCH – I</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">ELECTIVE COURSE –V</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"></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">3</td><td colspan="2">1</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">• To develop computational skills
• To develop logical thinking in formulating industry oriented problems
• To apply these techniques in real life situations</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="7">UNIT-ILinear 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</td></tr>
<tr><td colspan="7">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.</td></tr>
<tr><td colspan="7">UNIT-III: Transportation problems: Mathematical formulation- North-West corner Rule - Least cost Method- Vogel's approximation method- Optimality test</td></tr>
<tr><td colspan="7">UNIT-IV: Assignment problems: Hungarian method of solving an assignment problem – Unbalanced assignment problems – Traveling Salesman (routing) problem</td></tr>
<tr><td colspan="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.</td></tr>
</table>

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. 2. KantiSwarup,P.K.GuptaandManMohanOperationsResearch, S.Chand&Co,Delhi.
Reference Books	1. Taha, Operation Research, Printice Hall, New Delhi. 2. V.Sundaresan, K.S. Ganapathy Subramanian, &K.Ganesan, Resource Management Techniques (Operations Research), A.R. Publications, NagapattinumDistrict . 3. Kalavathy , Operations Research Vikas Publishing House Pvt .Ltd. 4. Gupta P.K&Hira D.S ,Problems in Operations Research, S.Chand&Co, Delhi 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: Analyseandstudytheconceptsinlinear programmingproblemstooptimize thesolution.

CLO 2: Examine,Analyse,formulateandevaluatetheoptimalsolutionsusingvarious methodsinlinearprogramming.

CLO 3: Evaluatetheoptimalsolutionforvariousindustryorientedproblemsusing quantitativeandqualitativetoolslikeModi's method

CLO 4: Computetheoptimalsolutionbyusing Hungarianmethodtominimizethecost.

CLO 5: Analysetheapplicationofgametheoryin variousfieldsandobtainthebest solutiontooptimizethefunction.

	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="8">ARTIFICIAL INTELLIGENCE & MACHINE LEARNING</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">ELECTIVE COURSE–VI</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"></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 colspan="2">Total</td></tr>
<tr><td>3</td><td colspan="2">-</td><td colspan="2">1</td><td colspan="2">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">• Knowledge on AI Techniques.
• Introduce the AI representations and mappings.
• Study the simple logical facts using reasoning.
• Introducing the Machine Learning and its types.
• Gain knowledge on modelling and Evaluating.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="8">UNIT I-Introduction: AIProblems AItechniques,ProblemSpacesandSearch:Definingtheproblem ofspacesearch-Statespacesearch–ProductionSystems–ProblemCharacteristics.</td></tr>
<tr><td colspan="8">UNIT II-HeuristicSearchtechniques:Generate and Test– HillClimbing–BestFirstsearch,ProblemReduction,ConstraintSatisfaction,Means-endanalysis-Knowledgerepresentation issues:Representationsandmappings–Approaches.</td></tr>
<tr><td colspan="8">UNIT III-Using Predicate Logic: Representation in simple facts in logic – Representation instanceandisaRelationship– Computablefunctionsand predicates–Resolution.RepresentationKnowledge using Rules: Procedural Vs Declarative Knowledge – Logic Programming – ForwardVsBackwardReasoning.</td></tr>
<tr><td colspan="8">UNIT IV-Introduction to Machine Learning: What is Machine Learning? – Types of MachineLearning–ApplicationsofMachineLearning–IssuesinMachineLearning. PreparingtoModel:MachineLearningActivities – TypesofData –Dataqualityandremediation.</td></tr>
<tr><td colspan="8">UNIT V- ModellingandEvaluation:Selectingamodel Trainingamodel–Modelrepresentationand Interpretation–ModelPerformanceandevaluation–Improvingperformanceofamodel.</td></tr>
</table>

Practical Course Outline	1. Write a program to implement the Hill Climbing problem 2. Write a program to implement the Towers of Hanoi problem 3. Write a program to implement the Missionaries and Cannibals problem 4. Write a program to implement the 8 queens problem 5. Write a program to implement the A* Algorithm 6. Write a program to Implement the Breadth first algorithm 7. Solving Regression & Classification using Decision Trees 8. Root Node Attribute Selection for Decision Trees using Information Gain 9. Bayesian Inference in Gene Expression Analysis . 10. Pattern Recognition Application using Bayesian Inference
Skills acquired from this course	• Knowledge on AI Techniques • Introducing the Machine Learning and its types. • Gain knowledge on modelling and Evaluating
Recommended Texts	1. ElaineRich"ArtificialIntelligence", McGraw-HillCompanies. 2. SaikatDutt,SubramanianChandramouli,AmitKumarDass,"Machi neLearning",PearsonEducationIndia,2019.
Reference Texts	1. StuartRussell&PeterNorvig,"ArtificialIntelligenceAModernApproach",Peras on, 2ndEdition. 2. VSJanakiRaman,KSarukesi, P. Gopalakrishnan,"Foundationsof ArtificialIntelligentandExpertSystems",MacMillanIndialimited.
Website and e-Learning Source	1. https://www.opentrends.net/en/article/basic-concepts-artificial-intelligence 2. https://data-flair.training/blogs/heuristic-search-ai/ 3. https://www.educba.com/machine-learning-techniques/ 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="7">LINEAR ALGEBRA</td></tr>
<tr><td>Paper Number</td><td colspan="7">CORE PAPER XIII</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"></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 colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td colspan="2">2</td><td colspan="2">--</td><td>6</td></tr>
<tr><td>Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td>Objectives of the Course</td><td colspan="7">• Learntheconceptofvectorspacesand subspaces.
• Explorethedimensionofvectorspaceusingbases andlineardependenceconcepts.
• UnderstandtheconceptofInnerproductspaceanditsproperties.</td></tr>
<tr><td rowspan="5">Course Outline</td><td colspan="7">UNIT-I: VECTOR SPACES– Subspaces – Linear Combinations and linear span - Linear Dependence and Linear independence – Bases – Dimensions</td></tr>
<tr><td colspan="7">UNIT-II: VECTOR SPACES (CONTD): Linear dependence and independenceofvectors,LinearSpan,Bases,DimensionofVectorSpaces.Dualspaces.</td></tr>
<tr><td colspan="7">UNIT-III:INNERPRODUCTSPACES:InnerProduct Space,Definition,Examples,Schwarz inequality, Orthogonal Set, Orthonormal Set, Gram SchmidtOrthogonalizationProcess.</td></tr>
<tr><td colspan="7">UNIT – IV:LINEARTRANFORMATIONS:AlgebraofLineartransformations,Regular and Singular Linear Transformations, Rank of LinearTransformation.</td></tr>
<tr><td colspan="7">UNIT-V:LINEAR TRANSFORMATIONS(CONTD): Characteristic Roots,CharacteristicVectors&Matrices–Canonicalforms–triangularforms.</td></tr>
<tr><td>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>Recommended Text</td><td colspan="7">1. I.N.Herstein, Topics in Algebra, Wiley EasternLtd. Second Edition, 2006.
2. Linear Algebra - Stephen H Friedberg, Arnold J Insel and Lawrence E Spence, 5th edition (2018) Pearson.</td></tr>
</table>

Reference Books	1. N.S.Gopalakrishnan, University Algebra, New Age International Publications, Wiley Eastern Ltd. 2. David C. Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007. 3. S. Lang, Introduction to Linear Algebra, 2nd Ed., Springer, 2005. 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: Findthedimensionofvectorspaceanddistinguishthelineardependentand independentvectorswhichexpandsknowledgeinMatrices.

CLO 3: Evaluatethelength&distance ofvectorsand to constructorthonormalsetsof vectorsthathelpinunderstandingthefewconceptsofmechanics.

CLO 4: Abletocharacterizethelineartransformationasone-one, ontotransformationsand their roleincarrying abasisofvectorspacetoanothervector space.

CLO5: Express linear transformationinmatrixformtomakethecalculationor representationeasier,for analyzingthegivendata.

	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 Correlatio

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="8">COMPLEXANALYSIS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">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"></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">4</td><td colspan="2">2</td><td colspan="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">• To equip the students with the understanding of the fundamental concept of Complex function.
• Understand the concept of mappings and transformations.
• Calculate series expansions for analytical complex-valued functions and evaluate contour integrals & definite integrals.</td></tr>
<tr><td colspan="2" rowspan="4">Course Outline</td><td colspan="8">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.</td></tr>
<tr><td colspan="8">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. .</td></tr>
<tr><td colspan="8">UNIT-III:Complex Integration: Contours-Contour integrals–Cauchy- Goursat Theorem (statementonly)- Cauchy theorem forsimply and multiply connected domains– Cauchy integral formula – Formula for derivatives– Liouville's theorem –Fundamental theorem of Algebra.</td></tr>
<tr><td colspan="8">UNIT – IV:Series and Singularities: Convergence of sequences-Convergence of series –Taylor and LaurentSeries(statementonly)-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.</td></tr>
</table>

	UNIT-V:Applications of Residues:EvaluationofImproperIntegrals $(i)\int_0^{2\pi} \mathrm{f}(\cos\theta, \sin\theta)\mathrm{d}\theta$ $(ii)\int_{-\infty}^{\infty} f(x)dx where f(x) = \frac{g(x)}{h(x)}.$ (iii) $\int_{-\infty}^{\infty} f(x)\sin mx\, dx$ & $\int_{-\infty}^{\infty} f(x)cosmxdx\ where f(x) = \frac{g(x)}{h(x)}$
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1.R.V.ChurchillandJ.W.Brown(2014),ComplexVariablesandApplications(8th edition)McGraw HillInternationalBookCo.,New York 2.S.Arumugam,A.ThangapandianIssac,A.Somasundaram,ComplexAnalysis,Scitechpublications,Chennai. 3.T.K. ManicavachagamPillay,Dr.S.P.Rajagopalan,Dr.R.Sattanathan,ComplexAnalysis, S.ViswanathanprintersandPublishers, pvt.Ltd,(2011).
Reference Books	1. S. Ponnusamy and H. Silverman, Complex variables with applications, Birkhauser, 2006. 2. Theodore W. Gamelan, Complex Analysis, Springer Verlag, 2008 3. Joseph Bak and Donald J. Newman, Complex analysis, 2nd Ed., Undergraduate Texts in Mathematics, Springer-Verlag New York, Inc., New York, 1997. 4. Richard A. Silverman, Introductory Complex Analysis. Dover Publications, 1972.
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: Evaluatedifferenttypesofcontourintegralsusingresiduetheorem.

	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="7">DISCRETE MATHEMATICS AND GRAPH THEORY</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">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"></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>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td>2</td><td colspan="2">--</td><td colspan="2">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">• Evaluatebasiclogicstatementsincludingcompoundstatements,implications,inverses,converses,andcontrapositives usingtruthtables andthe properties oflogic.
• Appreciatethebasicprinciplesoflattices,anditsproperties.
• Simplifyexpressionusing thepropertiesofBooleanalgebra;basicprinciplesofBooleanalgebra
• Learncoreideasofgraphdefinitionand graphoperationsingraphtheory.
• StudythetheoremofEulerianandHamiltoniangraphs.</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="7">ropositional Calculus Tautology and contradiction – Equivalenceof formulae – law –Tautological implications - Normal forms – Disjunctive normal forms – Conjunctive normalforms.</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit II:Lattices-Introduction–Principleofduality-PropertiesofLattices – subLattice– DistributiveLatticemodularlattices–Boundedlattice-Complementedlattice</td></tr>
<tr><td colspan="2"></td><td colspan="7">UnitIII:Boolean Algebra Definition – Other basic laws of Boolean Algebra –
Principle of duality forBooleanAlgebras–ATOMdefinition-ATOMICBooleanalgebra –
FiniteBooleanAlgebra.Boolean expression – Definition – Boolean function – Literal –
Minterm and Maxterm,Normalforms andCanonicalforms.</td></tr>
<tr><td colspan="2"></td><td colspan="7">Unit IV:. Graphs, Subgraphs and Connectedness Introduction – Definition and examples – Degrees –Subgraphs – Isomorphisms – Walks, Trails and Paths – Connectedness and Components –blocks –Connectivity.</td></tr>
</table>

	Unit V: Eulerianand HamiltonianGraphsIntroduction-Euleriangraphs–Hamiltoniangraphs
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	Dr.S.P.Rajagopalan,Dr.R.Sattanathan,DiscreteMathematics, MarghamPublications,Chennai-17
Reference Books	1. Dr.M.K.Venkataraman,Dr.S.SridharanandDr.M. Chandrasekeran,DiscreteMathematics,theNationalPublishingCompany. 2. SeymourLipschutz,MarcLarasLipson, VarshaH.Patil,DiscreteMathematics(Schaum'sOutlines)SeymourLipschutz(2017).Trembley 3. J.P.Tremblay&R.Manohar,"DiscreteMathematicalStructureswithApplication stoComputerScience",Tata Mcgraw–HillPublicationCo.limited,New Delhi,2003. 4. Ralph.P.Grimaldi,"DiscreteandCombinatorialMathematics:AnAppliedIntrod uction"4th edition,PearsonEduncationAsia,Delhi2002.
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 Booleanalgebra.

CLO 4: Learntounderstand, analyseanddevelopastrongbackgroundingraphTheory

CLO 5: Identifythe knowledgeofEulerianandHamiltoniantheoremusing terminologyofgraphs.

	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="7">OPERATIONS RESEARCH – II</td></tr>
<tr><td>Paper Number</td><td colspan="7">ELECTIVECOURSE–VII</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>III</td><td>Credits</td><td>3</td><td>Course Code</td><td></td></tr>
<tr><td>Semester</td><td>VI</td><td colspan="4"></td></tr>
<tr><td colspan="2">Instructional Hours per week</td><td colspan="2">Lecture
4</td><td colspan="2">Tutorial
1</td><td>Lab Practice
--</td><td>Total
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 develop computational skills
• To develop logical thinking in formulating industry oriented problems
• To apply these techniques in real life situations.</td></tr>
<tr><td colspan="2" rowspan="3">Course Outline</td><td colspan="6">UNIT-IInventory 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.
Model I: Economic lot size model with uniform rate size demand, Infinite rate of production and no shortages.(Derivation excluded - simple problems)
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)</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)
Model IV: Purchase Inventory model with – One price break – Two price breaks. (derivation excluded),Newspaper boy problem (Derivation excluded - simple problems)</td></tr>
<tr><td colspan="6">UNIT-III: Queuing theory- General concepts and definitions- Classification of queues-Poisson process, Models (No derivations, only problems)</td></tr>
</table>

	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- most likely Time - Pessimistic time- Expected time-variance- Rules for finding variance of events problems in PERT.
	UNIT-V:Sequencing Problem – n jobs through 2 machines – n jobs through 3machines –njobsthroughmmachines.
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 2. KantiSwarup,P.K.GuptaandManMohanOperationsResearch,S.Chand&Co,Delhi.
Reference Books	1. Taha, Operation Research, Printice Hall, New Delhi. 2. V.Sundaresan, K.S. Ganapathy Subramanian, &K.Ganesan, Resource Management Techniques (Operations Research), A.R. Publications, NagapattinumDistrict . 3. Kalavathy , Operations Research Vikas Publishing House Pvt .Ltd. 4. Gupta P.K&Hira D.S ,Problems in Operations Research, S.Chand& b Co, Delhi 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: Studyandanalyse the concepts of various inventory modelsto minimizethecost.

CLO 2: Analyseandevaluatetheprofitusing inventorymodels.

CLO 3: Analysethevariousqueueingmodelsandevaluatethevarioussystem performance measuresofQueueing to maximize the profit.

CLO 4: Analyseand ensureoptimumutilizationofhuman and otherresources.

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="8">DATA SCIENCE</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">ELECTIVE COURSE VIII</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>III</td><td>Credits</td><td>3</td><td>Course Code</td><td></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>4</td><td colspan="2">1</td><td>--</td><td colspan="2">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">• Knowledge on Data Science and its benefits.
• Introduce the Data Science process.
• Study the simple Algorithms and modeling.
• Introducing the Hadoop frame work.
• Gain knowledge by using case study.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="8">UNIT I-IntroductiontoDataScience– Benefitsand uses – Facetsofdata– Datascienceprocess–Bigdataecosystemanddatascience.</td></tr>
<tr><td colspan="8">UNIT II-The Data science process – Overview – research goals - retrieving data - transformation –ExploratoryDataAnalysis– Modelbuilding.</td></tr>
<tr><td colspan="8">UNIT III-Algorithms - Machine learning algorithms – Modeling process – Types – Supervised –Unsupervised-Semi-supervised.</td></tr>
<tr><td colspan="8">UNIT IV-Introduction to Hadoop – framework – Spark – replacing MapReduce– NoSQL – ACID –CAP–BASE–types.</td></tr>
<tr><td colspan="8">UNIT V- CaseStudy– PredictionofDisease-Setting research goals- Dataretrieval–preparation-exploration-Diseaseprofiling – presentationandautomation.</td></tr>
</table>

Practical Course Outline	1. Demonstrate the working of "id" and "type" functions. 2. Find all prime numbers within a given range. 3. Print n terms of Fibonacci series using iteration. 4. Demonstrate use of slicing in string. 5. Compute the frequency of the words from the input. The output should output after sorting thekey alphanumerically. 6. Write a program that accepts a comma separated sequence of words as input and prints thewords in a comma-separated sequence after sorting them alphabetically. 7. Demonstrate use of list & related functions. 8. Demonstrate use of Dictionary & related functions. 9. Demonstrate use of tuple & related functions. 10. Implement stack using list. 11. Implement queue using list. 12. Read and write from a file. 13. Copy a file.
Skills acquired from this course	• Introduce the Data Science process. • Study the simple Algorithms and modeling. • Gain knowledge by using case study.
Recommended Text	DavyCielen,ArnoD.B.Meysman,MohamedAli,"IntroducingDataScience",manningpublications2016.
Reference Texts	1. RogerPeng, "TheArtofDataScience",lulu.com2016. 2. MurtazaHaider, "GettingStartedwithDataScience–MakingSense OfDatawithAnalytics",IBMpress,E-book. 3. DavyCielen,ArnoD.B.Meysman,MohamedAli,"Introducing DataScience:BigData,MachineLearning,andMore,UsingPython Tools",DreamtechPress2016. 4. AnnalynNg,KennethSoo,"Numsense!DataScienceforTheLaym an:NoMathAdded",2017,1stEdition. 5. CathyO'Neil,RachelSchutt,"DoingDataScienceStraightTalkfromth eFrontline",O'ReillyMedia 2013. 6. LillianPierson,"DataScience forDummies",2017,2ndEdition.
Website and e-Learning Source	• https://intellipaat.com/blog/tutorial/data-science-tutorial/ • https://www.guru99.com/data-science-tutorial.html • 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