ADAMAS UNIVERSITY

SCHOOL OF ENGINEERING ANDTECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

UNDER GRADUATE PROGRAM

Course Structure and Syllabus
Of

B.TECH (HONS) COMPUTER SCIENCE AND ENGINEERING (CLOUD COMPUTING)

W.e.f. AY 2023-24

ADAMAS UNIVERSITY, KOLKATA
SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

VISION OF THE UNIVERSITY

To be an internationally recognized university through excellence in inter-disciplinary education, research and innovation, preparing socially responsible well-grounded individuals contributing to nation building.

MISSION STATEMENTS OF THE UNIVERSITY

M.S 01: Improve employability through futuristic curriculum and progressive pedagogy with cutting-edge technology

M.S 02: Foster outcomes based education system for continuous improvement in education, research and all allied activities

M.S 03: Instill the notion of lifelong learning through culture of research and innovation

M.S 04: Collaborate with industries, research centres and professional bodies to stay relevant and up-to-date

M.S 05: Inculcate ethical principles and develop understanding of environmental and social realities

CHANCELLOR / VICE CHANCELLOR

ADAMAS UNIVERSITY, KOLKATA
SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

VISION OF THE SCHOOL

To develop well-grounded, socially responsible engineers and technocrats in a way to create a transformative impact on Indian society through continual innovation in education, research, creativity and entrepreneurship.

MISSION STATEMENTS OF THE SCHOOL

M.S. 01: Build a transformative educational experience through disciplinary and inter-disciplinary knowledge, problem solving, and communication and leadership skills.

M.S. 02: Develop a collaborative environment open to the free exchange of ideas, where research, creativity, innovation and entrepreneurship can flourish among individual students.

M.S. 03: Impact society in a transformative way – regionally and nationally - by engaging with partners outside the borders of the university campus.

M.S. 04: Promote outreach programs which strives to inculcate ethical standards and good character in the minds of young professionals.

DEAN / SCHOOL CONCERNED

ADAMAS UNIVERSITY, KOLKATA
SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

VISION OF THE DEPARTMENT

Graduates of the Department of Computer Science and Engineering will be recognized as innovative leaders in the fields of computer science and software engineering. This recognition will come from their work in software development in a myriad of application areas, as well as through their work in advanced study and research. The faculty is, and will continue to be, known for their passion for teaching and for their knowledge, expertise, and innovation in advancing the frontiers of knowledge in computer science and software engineering.

MISSION STATEMENTS OF THE DEPARTMENT

M.S 01: Our mission is to teach and prepare liberally educated, articulate, and skilled computer scientists and software engineers for leadership and professional careers and for advanced study.

M.S 02: A central objective of our program is to contribute to society by advancing the fields of computer science and software engineering through innovations in teaching and research, thus enhancing student knowledge through interactive instruction, global engagement, and experiential learning.

M.S 03: The program will serve as a resource to inform society about innovations related to the production and uses of computers and software.

M.S 04: To impart moral and ethical values, and interpersonal skills to the students.

HEAD OF THE DEPARTMENT **DEAN / SCHOOL CONCERNED**

ADAMAS UNIVERSITY, KOLKATA
SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Name of the Programme: B.TECH (HONS) COMPUTER SCIENCE AND ENGINEERING (CLOUD COMPUTING)

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO 01: Graduates would demonstrate analytical and design skills including the ability to generate creative solutions and foster team-oriented, professionalism through effective communication in their careers.

PEO 02: Graduates would expertise in successful careers based on their understanding of formal and practical methods of application development using the concept of computer programming languages and design principles in national and international level.

PEO 03: Graduates would pursue advanced education, research and development moreover other creative and innovative efforts in Computer Application, as well as other professional careers.

PEO 04: Graduates would implement their exhibiting critical thinking and problem solving skills in professional practices or tackle social, technical and business challenges.

PEO 05: Graduates would illustrate effective work conventionalities and be able to adapt as well as accept to the challenges of a dynamic job environment.

HEAD OF THE DEPARTMENT **DEAN / SCHOOL CONCERNED**

ADAMAS UNIVERSITY, KOLKATA
SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Name of the Programme: B.TECH (HONS) COMPUTER SCIENCE AND ENGINEERING (CLOUD COMPUTING)

GRADUATE ATTRIBUTES/PROGRAMME OUTCOMES

GA 1 / PO 1: Computational knowledge: Acquire Knowledge of mathematical foundations, computer application theory and algorithm principles in the design and modelling of computer based system.
GA 2 / PO 2: Design/development of solutions: Avail appropriately system design notations and apply system design engineering process in order to design, plan, and implement software systems.
GA 3 / PO 3: Conduct investigations of complex problems: Implement document solutions to significant computational problems and apply mathematical and scientific reasoning to a variety of computational problems for the research in the computer application field.
GA 4 / PO 4: Problem analysis: Earn caliber to design, analyze and develop principles in the construction of complex hardware and software design computer systems.
GA 5 / PO 5: The engineer and society: Own Skills of observations and drawing logical inferences from the scientific experiments and develop application programs to meet the desired results including attainable constraints such as social, economic, environmental, functional, and technological.
GA 6 / PO 6: Communication: Assist and manage the execution of a productive project planning through effective communication among range of professional/non-professional audience.
GA 7 / PO 7: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
GA 8 / PO 8: Environment and sustainability: Appraise regarding the social and environmental issues to fulfil the local and global needs and give relevant solutions for them.
GA 9 / PO 9: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
GA 10 / PO 10: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
GA 11 / PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
GA 12 / PO 12: Life-long learning: Understand and adopt emerging technologies, research, strategies for lifelong learning at national and international level.

HEAD OF THE DEPARTMENT | **DEAN / SCHOOL CONCERNED**

ADAMAS UNIVERSITY, KOLKATA
SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Name of the Programme: B.TECH (HONS) COMPUTER SCIENCE AND ENGINEERING (CLOUD COMPUTING)

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO-1: To engage in professional development and to pursue post graduate education in the fields of Information Technology and Computer Applications.

PSO-2: To provide the students about computing principles and business practices in software solutions, outsourcing services, public and private sectors.

PSO-3: Analyze and synthesis computing systems through quantitative and qualitative techniques.

HEAD OF THE DEPARTMENT | **DEAN / SCHOOL CONCERNED**

ADAMAS UNIVERSITY

SCHOOL OF ENGINEERING AND TECHNOLOGY DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

UG Program: B.TECH (HONS) COMPUTER SCIENCE AND ENGINEERING (CLOUD COMPUTING)

COURSE STRUCTURE

FIRST YEAR

(Common for all streams)

<table>
<tr><th colspan="8">SEMESTER I</th></tr>
<tr><th>S.No.</th><th>Course Code</th><th>Course Title</th><th>L</th><th>T</th><th>P</th><th>H</th><th>C</th></tr>
<tr><td>1</td><td>MTH11501</td><td>Engineering Mathematics-I</td><td>3</td><td>1</td><td>0</td><td>4</td><td>4</td></tr>
<tr><td>2</td><td>PHY11201</td><td>Applied Science</td><td>2</td><td>0</td><td>0</td><td>2</td><td>2</td></tr>
<tr><td>3</td><td>CSE11001</td><td>Introduction to Programming#</td><td>2</td><td>0</td><td>0</td><td>2</td><td rowspan="2">2</td></tr>
<tr><td>4</td><td>GEE11001</td><td>Electrical and Electronics Technology#</td><td>2</td><td>0</td><td>0</td><td>2</td></tr>
<tr><td>5</td><td>ENG11053</td><td>English Communication</td><td>1</td><td>0</td><td>2</td><td>3</td><td rowspan="2">2</td></tr>
<tr><td>6</td><td>GEE11012</td><td>Disruptive Technology Innovations</td><td>1</td><td>0</td><td>2</td><td>3</td></tr>
<tr><td>7</td><td>BIT11003</td><td>Life Sciences</td><td>2</td><td>0</td><td>0</td><td>2</td><td>2</td></tr>
<tr><td>8</td><td>DGS11001</td><td>Design Thinking</td><td>1</td><td>0</td><td>2</td><td>3</td><td>2</td></tr>
<tr><td>9</td><td>PHY12202</td><td>Applied Science Lab</td><td>0</td><td>0</td><td>4</td><td>4</td><td>2</td></tr>
<tr><td>10</td><td>CSE12002</td><td>Programming Lab</td><td>0</td><td>0</td><td>4</td><td>4</td><td rowspan="2">2</td></tr>
<tr><td>11</td><td>GEE12002</td><td>Electrical and Electronics Technology Lab</td><td>0</td><td>0</td><td>4</td><td>4</td></tr>
<tr><td>12</td><td>CEE12001/</td><td>Engineering Drawing and CAD</td><td>0</td><td>0</td><td>4</td><td>4</td><td rowspan="2">2</td></tr>
<tr><td>13</td><td>MEE12001</td><td>Engineering Workshop</td><td>0</td><td>0</td><td>4</td><td>4</td></tr>
<tr><th colspan="3">Total</th><th>17</th><th>1</th><th>11</th><th>29</th><th>20</th></tr>
</table>

<table>
<tr><th colspan="8">SEMESTER II</th></tr>
<tr><th>S.No.</th><th>Course Code</th><th>Course Title</th><th>L</th><th>T</th><th>P</th><th>H</th><th>C</th></tr>
<tr><td>1</td><td>MTH11502</td><td>Engineering Mathematics– II</td><td>3</td><td>1</td><td>0</td><td>4</td><td>4</td></tr>
<tr><td>2</td><td>MEE11002</td><td>Engineering Mechanics</td><td>2</td><td>1</td><td>0</td><td>3</td><td>3</td></tr>
<tr><td>3</td><td>EVS11112</td><td>Environmental Science</td><td>2</td><td>0</td><td>0</td><td>2</td><td>2</td></tr>
<tr><td>4</td><td>GEE11001</td><td>Electrical and Electronics Technology</td><td>2</td><td>0</td><td>0</td><td>2</td><td rowspan="2">2</td></tr>
<tr><td>5</td><td>CSE11001</td><td>Introduction to Programming</td><td>2</td><td>0</td><td>0</td><td>2</td></tr>
</table>

6	GEE11012	Disruptive Technology Innovations	1	0	2	3	2
7	ENG11053	English Communication	1	0	2	3	
8	EIC11001	Venture Ideation	2	0	0	2	2
9	GEE12002	Electrical and Electronics Technology Lab	0	0	4	4	2
10	CSE12002	Programming Lab	0	0	4	4	
11	CEE12001	Engineering Drawing and CAD	0	0	4	4	2
12	MEE12001	Engineering Workshop	0	0	4	4	
Total			**17**	**1**	**9**	**27**	**19**

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 # Introduction To Programming / Electrical and Electronics Technology are optional papers

1st Year Credits = 39

SECOND YEAR

SEMESTER III							
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**H**	**C**
1	SDS11510	Engineering Mathematics – III-C	3	1	0	4	4
2	MTH11534	**Professional Core** Discrete Structures and Logic	3	0	0	3	3
3	CSE11103	**Professional Core – I** Principles of Programming Language	3	0	0	3	3
4	CSE11104	**Professional Core – II** Data Structures and Algorithms	3	0	0	3	3
5	CSE11105	**Professional Core – III** Switching Circuits and Logic Design	3	0	0	3	3
-6	CSE12106	**Professional Core Lab - I** Principles of Programming Language Lab	0	0	2	2	1
7	CSE12107	**Professional Core Lab - II** Data Structures and Algorithms Lab	0	0	2	2	2
8	MTH12531	Numerical Techniques Lab	0	0	2	2	2
9	IDP14001	Interdisciplinary Project	0	0	5	5	3
10	SOC14100	Community Service #	0	0	0	0	1
Total			**15**	**1**	**11**	**27**	**25**

#Community Service will be taken up during the summer break after 2nd semester, and will be evaluated in the 3rd semester.

SEMESTER IV							
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**H**	**C**
1	CSE11108	**Professional Core – IV** Database Management Systems	3	0	0	3	3
2	CSE11109	**Professional Core – V** Object Oriented Programming	3	0	0	3	3
3	CSE11110	**Professional Core – VI**	3	0	0	3	3

		Design and Analysis of Algorithms					
4	CSE11111	**Professional Core -VII** Formal Language and Automata Theory	3	0	0	3	3
5	CSE11112	**Professional Core – VIII** Introduction to Artificial Intelligence	3	0	0	3	3
6	PSG11021	Human Values and Professional Ethics	2	0	0	2	2
7	CSE12113	**Professional Core Lab – III** Database Management Systems Lab	0	0	2	2	2
8	CSE12114	**Professional Core Lab – IV** Object Oriented Programming Lab	0	0	2	2	1
9	CSE12166	**Professional Core – VI** Design and Analysis of Algorithms Lab	0	0	2	2	2
10	CSE11175	**Specialization Theory – I** Parallel Processing	3	0	0	3	3
11	CSE12176	**Specialization Lab – I** Parallel Processing Lab	0	0	2	2	1
Total			**20**	**0**	**8**	**28**	**26**

2nd Year Credits: 51

THIRD YEAR

SEMESTER V							
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**H**	**C**
1	CSE11115	**Professional Core – IX** Computer Networks	3	0	0	3	3
2	CSE11116	**Professional Core – X** Computer Organization and Architecture	3	0	0	3	3
3	CSE11117	**Professional Core – XI** Software Engineering	3	0	0	3	3
4	CSE11167	Competitive Programming	3	0	0	3	3
5		**Professional Elective - I**	3	0	0	3	3
	CSE11118	Introduction to Python					
	CSE11119	Optimization and Game Theory					
	CSE11120	Introduction to Data Science					
	CSE11121	Distributed Systems and Cloud					
	CSE11122	Introduction to Cyber Security					
6		**Professional Elective - II**	3	0	0	3	3
	CSE11123	Full Stack Software Development					
	CSE11124	Pattern Recognition and Soft Computing					
	CSE11125	Data Mining and Warehousing					
	CSE11126	Cloud Security					
	CSE11127	Cyber Law and Governance					
7	CSE12128	**Professional Core Lab – V** Computer Networks Lab	0	0	2	2	1
8	CSE12129	**Professional Core Lab – VI** Computer Organization and Architecture Lab	0	0	2	2	1
9	CSE12168	**Professional Core Lab – VII** Software Engineering Lab	0	0	2	2	1
10	CSE12169	Competitive Programming Lab	0	0	2	2	1
11	CSE11177	**Specialization Theory – II** Distributed Database Management	3	0	0	3	3
Total			**21**	**0**	**8**	**29**	**25**

SEMESTER VI							
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**H**	**C**
1	CSE11131	**Professional Core – XII** Web Technology	3	0	0	3	3
2	CSE11132	**Professional Core – XIII** Compiler Design	3	0	0	3	3
3		**Professional Elective - III**	3	0	0	3	3
	CSE11133	Mobile Computing and Android					
	CSE11134	Machine Learning					
	CSE11135	Real-time Analytics					
	CSE11136	Virtualization and Applied Cloud Computing					

	CSE11137	Network Security					
4		**Professional Elective - IV**	3	0	0	3	3
	CSE11138	Application Development with Python					
	CSE11139	Neural Networks and Deep Learning Application					
	CSE11140	Statistical Modelling for Data Analytics					
	CSE11141	Cloud Management					
	CSE11142	Malware Analysis					
5		**Open Elective - I**	3	0	0	3	3
	CEE11029	Disaster Management					
	ECE11046	Digital Signal Processing					
	ECE11048	VLSI System Design					
6	ECO11505	Economics for Engineers	3	0	0	3	3
7	CSE12143	**Professional Core Lab – VIII** Web Technology Lab	0	0	2	2	1
8	CSE15144	**Project Work** Seminar	0	0	2	2	1
9		**Professional Elective Lab - I**	0	0	2	2	1
	CSE12145	Android Application Development Lab					
	CSE12146	Machine Learning Lab					
	CSE12147	Statistical Modelling for Data Analytics Lab					
	CSE12148	Virtualization and Applied Cloud Computing Lab					
	CSE12149	Network Security Lab					
10	CSE11178	**Specialization Theory – III** Big Data on Cloud	3	0	0	3	3
11	CSE12179	**Specialization Lab – II** Big Data on Cloud Lab	0	0	2	2	1
Total			**18**	**0**	**8**	**29**	**25**

3rd Year Credits : 50

FOURTH YEAR

SEMESTER VII							
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**H**	**C**
1	MGT11402	Industrial Management	3	0	0	3	3
2	CSE11150	**Professional Core – XIV** Operating Systems	3	0	0	3	3
3		**Professional Elective - V**	3	0	0	3	3
	CSE11151	Advanced Web Technologies					
	CSE11152	Applied Machine Intelligence					
	CSE11153	Data Analysis					
	CSE11154	Cloud Architecture and Deployment					
	CSE11155	Application Security					
4		**Open Elective - II**	3	0	0	3	3
	PHY11203	Medical Image Processing and Analysis					

	ECE11047	Sensors and Actuators for IOT					
	MEE11071	Robotics and Automation					
5		**Open Elective - III**	3	0	0	3	3
	MEE11060	Computer-Aided Simulation & Analysis					
	ECE11049	Microcontrollers and Interfacing					
	BIT11074	Bioinformatics					
6	CSE12156	**Professional Core Lab – X** Operating Systems Lab	0	0	2	2	2
7		**Professional Elective Lab - II**	0	0	2	2	1
	CSE12157	Advanced Web Technologies Lab					
	CSE12158	Applied Machine Intelligence Lab					
	CSE12159	Data Analysis Lab					
	CSE12160	Cloud Architecture and Deployment Lab					
	CSE12161	Application Security Lab					
8	CSE14162	Summer Internship #	0	0	0	0	2
9	CSE14163	Minor Project	0	0	6	6	3
10	CSE11180	**Specialization Theory – IV** IoT Application Development on Cloud	3	0	0	3	3
11	CSE12181	**Specialization Lab- III** IoT Application Development on Cloud Lab	0	0	2	2	1
Semester VII Total			**18**	**0**	**12**	**30**	**27**

#Summer Internship will be taken up during the summer break after 6th semester, and will be evaluated in the 7th semester.

SEMESTER VIII							
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**H**	**C**
1	CSE11182	**Specialization Theory – V** Cloud Computing Platforms	3	0	0	3	3
2	CSE14164	Industry Work experience/SIRE*/Major Project	0	0	12	12	6
3	CSE15165	Comprehensive Viva Voce	0	0	0	0	2
Semester VIII Total			**3**	**0**	**12**	**15**	**11**

***SIRE: Scientific Investigation and Research Experience**

4th Year Credits: 38

CREDIT DISTRIBUTION (SEMESTER-WISE)

SEM I	**SEM II**	**SEM III**	**SEM IV**	**SEM V**	**SEM VI**	**SEM VII**	**SEM VIII**	**TOTAL**
20	**19**	**25**	**26**	**25**	**25**	**27**	**11**	**178**

CREDIT DISTRIBUTION(YEAR-WISE)

YEAR I	**YEAR II**	**YEAR III**	**YEAR IV**	**TOTAL**
39	**51**	**50**	**38**	**178**

SEMESTER I

MTH11501	Engineering Mathematics-I	L	T	P	C
Version 1.0	Contact Hours - 60	3	1	0	4
Pre-requisites/Exposure	12^{th} level Mathematics				
Co-requisites	--				

Course Objectives

1. To help the student to understand basic concept of abstract and vector algebra with itsuses in engineering science.
2. To give emphasis about concepts of differential calculus and enable students to applythese topics in real life problems.
3. To give the students a perspective to learn integral calculus and its importance inadvanced study in engineering science.
4. To enable students acquire fundamental concept of ordinary differential equation andit's applications in engineering science.

Course Outcomes

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

CO1 Develop the idea of basic concepts of abstract algebra and geometrical idea of vector analysiswith real world applications.

CO2 Explain the fundamental concepts of differential calculus and apply these topics in real lifeproblems

CO3 Illustrate the fundamental concepts of Integral Calculus and apply these topics in real lifeproblems.

CO4 Understand and apply the various solution procedures of Ordinary Differential equations inengineering problems.

Catalog Description

For engineering course, Mathematics is the backbone. Students will be having good engineering skillsif their idea for Mathematics is clear. In this course the focus will be to learn Mathematics in depth which will motivate students to grow their thinking ability for Engineering also. By knowing the theory student will be able to apply that successfully to all kind of problems of Engineering and science. Class participation is a fundamental aspect of this course. Students will be encouraged to actively take part in all group activities (Problem solving, presentation etc.).

Course Content

Unit I: Differential Calculus **[20H]**

Introduction to limit, continuity, derivative for function of one variable, Successive differentiation, Leibnitz's theorem; Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders, Indeterminate forms, Concavity and convexity of a curve, Points of inflexion

Limit, continuity, and differentiability of functions of several variables, partial derivatives and their geometrical interpretation, chain rule, total derivative, derivatives of composite and implicit functions, homogeneous function, Euler's theorem on homogeneous functions, Jacobian of variable transformation, maxima and minima of functions of several variables, Lagrange's method of multipliers.

Unit II: Integral Calculus **[15H]**

Reduction formulae, Improper integral, convergence of improper integrals, tests of convergence, Beta and Gamma functions, elementary properties, Rectification, double and triple integrals, computations of area, surfaces and volumes, change of variables in double integrals, applications

Unit III: Linear Algebra **[18H]**

Symmetric and skew-symmetric matrices, orthogonal matrices, complex matrices, Hermitian and skew-Hermitian matrices, Unitary matrices, Elementary row and column operations on a matrix, Rank, echelon form, Inverse of a matrix using elementary operations, solution of system of linear equations, Consistency, Characteristic equation, Caley-Hamillton theorem, eigenvalues and eigenvectors, algebraic and geometric multiplicity, diagonalization

Unit IV: Vector Algebra **[7H]**

Scalar and vector fields, Vector product, Scalar triple product and their interpretation, directional derivative, gradient, Curl, divergence

References:

1. Erwyn Kreyszig : Advanced Engineering Mathematics, John Wiley and Sons
2. B.V. Ramana, Higher Engineering Mathematics Tata McGraw-Hill.
3. B.S.Grewal : Higher Engineering Mathematics, Khanna Publications
4. C B Gupta, S R Singh, Mukesh Kumar: Engineering Mathematics, McGraw Hill Publication.
5. R.K.Jain and S.R.K.Iyengar : Advanced Engineering Mathematics, Narosa Publishing House, 2002

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination Scheme:

Components	MTE	Class assessment	ETE
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MTH11501	Engineering Mathematics-I	CO11501.1	2	2	2	2	2	2	3	-	1	-	-	2	3	3	1
		CO11501.2	1	3	3	3	1	2	2	-	2	-	-	2	2	3	3
		CO11501.3	2	2	3	2	3	3	1	-	1	-	-	2	1	3	2
		CO11501.4	3	3	3	2	1	1	3	-	1	-	-	2	3	1	1
		CO11501	2.0	2.5	2.75	2.25	1.75	2.0	2.25	-	1.25	-	-	2.0	2.25	2.5	1.75

PHY11201	Applied Science	L	T	P	C
Version 1.0	Contact Hours - 45	3	0	0	3
Pre-requisites/Exposure	12th level Physics, Chemistry, and Mathematics				
Co-requisites	--				

Course Objectives

- To develop the capability of the students for understanding fundamental aspects of physics.
- To give students theoretical background, the key prerequisite for performing laboratoryexperiments.
- To build up the foundations for further studies in physics and engineering.
- Learn to analyze and evaluate various thermodynamic cycles used for energy production -work and heat, within the natural limits of conversion
- To impart the knowledge of measurement of the rate of a chemical reaction and to gainknowledge of electrochemical procedure.

Course Outcomes

At the end of the course, the student will be able to:

CO1. Understand the basics of vector calculus, its application in mechanics, and different harmonicmotions.

CO2. Demonstrate the knowledge of physical optics and related application.

CO3. Develop the basic concepts of electromagnetic theory and e-m wave.

CO4. Apply fundamental concepts of thermodynamics to engineering applications, estimate thermodynamic properties of substances in gas and liquid states, and determine thermodynamic feasibility and efficiency of various energy related processes.

CO5. Determine the rate law, effect of temperature on the rate of a chemical reaction and determine the activation energy and assess the role of a catalyst on the rate of a chemical reaction, calculatethe cell potential for a nonstandard cell.

Catalog Description

Applied science is a discipline that is used to apply existing scientific knowledge to develop more practical applications, for example: technology or inventions. In applied science different aspects of Mathematical Physics is used to develop information to explain phenomena in the natural world. This information is then put to use for practical endeavours through a controlled Laboratory environment. Applied science is generally engineering, which develops technology, although there might be dialogue between basic science and applied science (research and development).In this course the focus will be on improving the logical learning moved into a physical environment. Classroom activities will be designed to encourage students to play an active role in the construction of their own knowledge and in the design of their own learning strategies. We will combine traditional lectures with other active teaching methodologies, such as group discussions, cooperative group solving problems, analysis of video scenes and debates. Class participation is a fundamental aspect ofthis course.

Basic knowledge in chemistry is essential for understanding various energy-work relationships. Student will be able to develop engine. They will be able to increase the efficiency of an engine. Student will understand the different processes in chemical and physical science and their feasibility. The basic knowledge of the molecular structure and their bonding will impart the knowledge of the reactivity and the application of different molecules. The knowledge of electrochemistry will impart a deep sense in preparing different electrochemical cells and their applications. Students will be encouraged to develop new models. We will apply different methodologies to inspire our students combining traditional classes with modern techniques. They will also take part in different project work in fundamental as well as in practical fields.

Course Content

Module 1: Mechanics **10 lecture hours**

Basic ideas of Vector Calculus Potential energy function - Conservative and non- conservative forces. Conservation laws of energy & momentum. Central and non-central forces, Gravitation, Kepler's Laws, Angular Velocity and Torque, Moment of Inertia, SHM, Damped, Undamped and forced Oscillations (no derivations).

Module 2: Optics **5 lecture hours**

Principle of Superposition and Interference from parallel thin films, Single slit and Double slit diffraction, Diffraction grating, dispersive power of Grating, resolving power of prism and grating. Production of plane polarized light by different methods, Brewster and Malus Laws. Double refraction, Nicol prism, specific rotation.

Module 3: Electromagnetic Theory **10 lecture hours**

Gauss's Law in Electrostatics, Boundary Value problems, Dielectrics, Motion of Charged Particles in crossed electric & magnetic fields, Velocity Selector & Magnetic focussing, Gauss law, continuity equation, Biot-Savart Law and its applications, inconsistency in Ampere's Law, Maxwell's equations (differential and integral forms), Poynting vector, Poynting Theorem (Statement only).

Module 4: Thermodynamics **10 lecture hours**

Importance and scope, definition of system and surroundings: type of systems (isolated, closed and open); extensive and intensive properties; steady state versus equilibrium state; concept of thermal equilibrium and the zeroth law of thermodynamics; thermodynamic coordinates, state of a system, equation of state, state functions and path functions; concept of heat and work (IUPAC convention); first law of thermodynamics, internal energy (U) as a state function; enthalpy as a state function; energy conservation in the living organism; heat changes at constant volume and constant pressure; relation between C_P and C_V using ideal gas; Thermodynamics of Chemical Processes, Concept of entropy, 2^{nd} law of thermodynamics, Idea of Chemical potential, Equilibrium conditions for closed systems.

Module 5: Reaction Kinetics, Catalysis & Electrochemistry **10 lecture hours**

Rate laws, 1^{st}Order reaction & 2^{nd}order reaction, Arrhenius equation, Mechanism and Theories ofreaction rates, kinetic and thermodynamic control of reaction; idea of rate determining step; steady- state approximation; Characteristics and types of Catalyst, Theories of Catalysis, Electrode potential,Redox reaction & Nernst Equation.

Text Books

1. S. P. Kuila, Principles of Engineering Physics (Volume I), New Central Book Agency (P) Ltd.
2. S. P. Kuila, Principles of Engineering Physics (Volume II), New Central Book Agency (P) Ltd.
3. Partha Pratim Das and Abhishek Chakraborty, Engineering Physics
4. S. K. Bhattacharya and Soumen Pal, Engineering Physics (Volume I)
5. S. K. Bhattacharya and Soumen Pal, Engineering Physics (Volume II)
6. Shikha Agarwal, Engineering Chemistry (1^{st} Edition), Cambridge University Press
7. P. W. Atkins, Physical Chemistry, ELBS/Oxford, 10^{th} Edition, 2014

Reference Books

1. Ajoy Ghatak, Optics, Mc-graw Hill
2. David J. Griffiths,Introduction to Electrodynamics, Pearson Education Limited
3. K. Sesha Maheswaramma and MridulaChugh, Engineering Chemistry, Pearson Ed.
4. P. C. Rakshit, Physical Chemistry, Sarat Book House

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination Scheme:

Components	**Internal Assessment**	**MTE**	**ETE**
Weightage (%)	**30**	**20**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
PHY11201	Applied Science	CO11201.1	3	2	1	1	2	1	2	-	1	-	-	2	3	3	3
		CO11201.2	3	1	2	3	2	1	1	-	2	-	-	2	3	1	3
		CO11201.3	3	1	1	2	3	2	1	-	2	-	-	2	3	2	3
		CO1120	3	2	1	2	2	2	1	-	2	-	-	2	2	3	3

		1.4															
		CO1120 1.5	3	2	1	3	3	2	2	-	2	-	-	1	2	1	1
		CO1120 1	3. 0	1. 6	1. 2	2. 2	2. 4	1. 6	1. 4	-	1. 8	-	-	1.8	2.6	2.0	2.6

1=weakly mapped

2= moderately mapped

3=strongly mapped

		L	T	P	C
CSE11001	**Introduction to Programming**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours -45**	**3**	**0**	**0**	**3**
Pre-requisites/Exposure	**10+2 Level Mathematics, Knowledge of Basics of Computer**				
Co-requisites	**Knowledge of Logical Reasoning and Analysis**				

Course Objectives

- To understand the nature of programming as human activity.
- To practice the programming construct to solve multi-dimensional problems.
- To relate and implement mathematical concepts through programming in order to solvecomputational problems.
- To enable students to acquire structure and written expression required for their profession.
- To understand the principles of data storage and manipulation.

Course Outcomes

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

CO1. **Define** basics concepts of programming structure and implement the basics concepts ofProgramming.
CO2. **Solve** various problems using programming language and select the best solution.
CO3. **Apply** modularized solution and design such programs to appraise the solution
CO4. **Understand** the basic usage of memory and construct such memory in terms of array in aprogram.
CO5. **Define** the different data structures for various collection of data.

Catalog Description

Programming skills are mandatory for designing or solving problems through digital device. It is the language through which computational/digital devices are communicated rather interfaced. To develop any software programming language is a must. In present era almost, all aspect of life is somehow largely related to virtualization and digital data/information. Devices from smartphones to other handheld devices, drones, cameras, medical instruments etc. all needs programming at some part. In engineering it has become quintessential for the students/research scholars to learn programming. In this course, students will learn how to solve problems in various domains through a programming language. This course enables students with the basic skills of C Programming Language. Five Different related modules comprise this course. First Unit familiarizes students with basics of computers, algorithmic method to solve problem, introduction to generic programming construct. Basics of C Programming is upto iterative structure is depicted in Unit II. In Unit III students will learn about modularization using functions and one advance concept of C Programming, Pointers. Unit IV will cover one of the most important concepts in C Programming, Array and Strings. Unit V will accomplish this course with the advance concept like Structure, Union and File Handling. After this course students will grow their analytical ability to solve problem and logical skill. Also, this course effectively creates the ability to grasp any other Programming Language in easier manner.

Course Content

Unit I: 4 lecture hours

Basic Concepts of Programming: Introduction to components of a Computer System (disks, memory, processor, where a program is stored and executed, operating systems, compilers, etc.), Idea of Algorithm: steps to solve logical and numerical problems, Representation of Algorithms: Flowchart/Pseudo code with examples, From Algorithms to Programs; source code, variables and memory locations, Syntax and Logical Errors in compilation, Object and Executable code

Unit II: 10 lecture hours

Basics of C Programming : Characters used in C, Identifiers, Keywords, Data type & sizes, Constants &Variables, Various Operators used such as Arithmetic Operators, Relational & Logical Operators, Increment & Decrement Operators, Assignment Operators, Conditional or Ternary Operators, Bitwise Operators & Expressions; Standard Input & Output, formatted input scanf(), formatted output printf( ); Flow of Control, if-else, switch-case, Loop Control Statements, for loop, while loop, do-while loop, nested loop, break, continue, goto, label and exit() function

Unit III: 10 lecture hours

Functions and Pointers: Definition of Function, Declaration or Prototype of Function, Various types of Functions, Call by Value, Call by Reference, Recursion, Tail Recursion, Definition of Pointer, Declaration of Pointer, Operators used in Pointer, Pointer Arithmetic, Functions with Pointer

Unit IV **17 lecture hours**

Arrays and String: Definition, Single and Multidimensional Arrays, Representation of Arrays - Row Major Order, and Column Major Order, Application of arrays – searching and sorting, Sparse Matrices and their representations. Definition of a String, Declaration of a String, Initialization of a String, Various String Handling Functions with example

Structures and Unions: Definition of a Structure, Declaration of a Structure & Structure Variable, Initialization of a Structure, Operators used in Structure, Structure within Structures, Union, Difference between a Structure and a Union

Files: Types of File, File Processing, Handling Characters, Handling Integers, Random File Accessing, Errors During File Processing

Unit V **4 lecture hours**

Overview of Stacks and Queues: Introduction to Stack, Primitive operations on Stack, Real-life applications of Stack, Introduction to Queues, Primitive operations on Queues, Real-life applications of Queues.

Text Books

- Balagurusamy, E., n.d. Programming In ANSI C. 5th ed. Bangalore: mcgraw-hill.
- Gotfreid (196) *Schaum's Outline of Programming with C*, 2 edn., USA: McGraw-Hill
- Brian W. Kernighan, Dennis Ritchie (1988) *C Programming Language*, 2 edn., : Prentice Hall.

Reference Books

- Al Kelley, Ira Pohl (1988) *A Book on C*, 4 edn,: Addision Wesley Longman

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written ExaminationScheme:

Components	**Internal Assessment**	**MTE**	**ETE**
Weightage (%)	**30**	**20**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11001	Introduction to Programming	CO11001.1	2	2	3	3	3	1	3	-	2	-	-	1	3	2	3
		CO11001.2	3	2	2	2	1	1	1	-	2	-	-	3	2	1	3
		CO11001.3	2	2	1	1	1	2	2	-	3	-	-	3	1	1	3
		CO11001.4	3	3	1	3	2	2	3	-	3	-	-	2	1	3	3
		CO11001.5	2	2	3	1	1	3	1	-	2	-	2	3	2	2	1
		CO11001	2.4	2.2	2.0	2.0	1.6	1.8	2.0	-	2.4	-	2.0	2.4	1.8	1.8	2.6

GEE11001	Electrical and Electronics Technology	L	T	P	C
Version 1.0	Contact Hours -45	3	0	0	3
Pre-requisites/Exposure	Basic idea about basic mathematics				
Co-requisites	Basic idea of semiconductor devices and electromagnetism				

Course Objectives

- To familiarize with passive components, active components and measuring instruments.
- To familiarize the working of diodes, transistors, MOSFETS and integrated circuits.
- To implement mini projects based on concept of electronics circuit concepts.
- To understand d-c network theorems and apply these theorems to calculate thevoltage, current and power for a given circuit.
- To explain the concept of active power, reactive power, power factor, quality factor, steady state sinusoids.

Course Outcomes

At the end of the course, the student will be able to:

CO1. Apply knowledge about different passive components used in electronic industry for commonapplication.

CO2. Illustrate with the working of different active components to demonstrate basic electroniccircuits.

CO3. Design circuits using passive and active components for strengthening fundamental idea about basic electronics.

CO4. Describe the basic construction of measuring instruments used in electronic measurements.

CO5. Apply the Network theorems to calculate the voltage, current and power for a given circuit.

CO6.Explain Active Power, Reactive Power, Power factor, Quality factor, average and effective values of Sinusoids, complex representation of impedances and draw the Phasor diagram.

CO7. Understand the three-phase power measurement.

CO8. Explain PN Junction Diode in Forward Biased, Reverse Biased Condition, Breakdown in PN Junction Diodes and Different Configurations of a Transistor and its Characteristics.

CO9. Demonstrate digital logic circuit and switching circuits using MOSFET.

Catalog Description

Present technology requires necessary knowledge of ELECTRONICS in most fields. Avionics, Autotropic, Agrotronics, Physics, Process Chemistry, Health Services, etc., already employ components or even whole systems based on Electronics. Thus, there is an increasing number ofprofessionals in these and many otherfields who need adequate knowledge and training. Taken this into account, ADAMAS has developed the Basic Electronics and Electricity Integrated Laboratory, capable of covering different levels of difficulty. It is based on a series of self-taught modules, each one referring to a specific area of Electronics.

Course Content

Module 1: 7 lecture hours

D.C. Circuit Analysis and Network Theorems: Concept of network, Active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, R, Land C as linear elements, source transformation, Kirchoff's Law, mesh analysis and nodalanalysis, star-delta transformation, network theorems: Thevenin's theorem, Norton's theorem, maximum power transfer theorem, network analysis with dependent sources.

Module 2: 6 lecture hours

Steady State Analysis of Single Phase A.C. Circuits: Sinusoidal, square and triangular waveforms- average and effective value, form the peak factors, concept of phasor, phasor representation of sinusoidal voltage and current, analysis of series-parallel RLC circuits. Apparent, active and reactive powers, power factor, causes and problems of low power factor, power factor improvement, resonance in series and parallel circuits, bandwidth and quality factors.

Module 3: 6 lecture hours

Three Phase A.C. Circuits: Its necessity and advantages, meaning of phases equence, star and delta connections, balanced supply and balanced load, line and phase voltage/current relation, three phase power measurements, two wattmeter method.

Module 4: 6 lecture hours

Basics of Semi-Conductors and PN Junction: Introduction; Carrier Concentrations- the FermiLevel; Electron and Hole Concentrational Equilibrium; Temperature Dependence of Carrier Concentration; Drift an d diffusion current; The Hall Effect; Optical Absorption, Luminescence; PN Junction Diode in Equilibrium Conditions; PN Junction Diode in Forward Biased and Reverse BiasedCondition; Breakdown in PN Junction Diodes.

Module 5: 6 lecture hours

Bipolar Junction Transistors: Introduction, Types: NPN and PNP; Current Components; Early Effect Ebber's Moll Model; Different Configurations of a Transistor and its Characteristics; Transistor as an Amplifier (CE, CB, CC); Transistor as a Switch.

Module 6: 6 lecture hours

Field Effect Transistors: Introduction, JFET and MOSFET, Realization of digital logic circuit using MOSFET (AND, OR, NOT etc.), Realization of switching circuit using MOSFET.

Module 7: 7 lecture hours

Electronics Instruments & Digital Electronics Fundamental:
Signal generator, Multimeter, operation of CRO and its application. Number systems, Conversionsand codes, Logic gates and truth tables.

Text book:

- Electronic Devices & Circuit Theory: Boyelstad &Nashelsky
- Electronics Fundamental and application: D.Chattopadhyay and P CRakshit
- Electronic Principle: Albert PaulMalvino
- Digital circuits and design by S Salivahanan and SArivazhagan
- V. N. Mittal and A. Mittal, *Basic Electrical Engineering*, Tata McGraw-Hill PublishingCompany Ltd,2006

Reference book:

- Electronic Circuits, Discrete and Integrated- Charles Belove and Donald L.Schilling
- PrinciplesofElectricalEngineeringandElectronics-VKMehta,RohitMehta, SChandandCompany,New Delhi
- Solid State Electronic Devices- Ben G. Streetman and Sanjay Kumar Banerjee,PHI.
- Fundamental of Digital Circuits by Anand Kumar 2nd Eddition,PHI LearningPal, Rajendra and Korlahalli, J.S. (2011) Essentials of Business Communication. Sultan Chand & Sons. ISBN: 9788180547294.
- Theodore Wildi,*ElectricMachines, Drives and Power Systems*, Pearson,2005.
- Vincent Del Toro, *Electrical Engineering Fundamentals*, 2nd Ed., Prentice Hall India Learning Pvt. Ltd.,1989.
- J. Millman, C. Halkias and C. D. Parikh, *Millman's Integrated Electronics: Analog and DigitalCircuits and Systems*, 2nd Ed., McGraw Hill Education,2017.
- D.P.Leach,A.P.Malvino and G.Saha, *Digital Principles and Applications*, 8thEd.,McGraw Hill Education, 2014.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written ExaminationScheme:

Components	Internal Assessment	MTE	ETE
Weightage (%)	30	20	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	P O 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
GEE11	Electric	CO1100	1	2	3	3	2	3	3	2	3	-	-	2	3	3	1

001	al and Electronics Technology	1.1														
		CO1100 1.2	3	3	2	3	1	1	3	-	3	2	3	2	3	2	1
		CO1100 1.3	3	3	2	2	2	3	2	-	2	-	-	3	1	1	1
		CO1100 1.4	3	2	3	3	1	3	2	-	3	-	-	2	2	1	1
		CO1100 1.5	2	3	1	2	3	3	2	-	1	-	-	2	1	1	2
		CO1100 1.6	3	2	2	1	3	1	3	-	1	-	-	3	3	2	3
		CO1100 1.7	1	1	2	3	3	2	3	-	1	-	-	1	2	2	3
		CO1100 1.8	1	2	1	2	1	3	3	-	1	-	-	2	3	2	2
		CO1100 1.9	3	2	1	3	3	2	1	-	2	-	-	1	1	1	3
		CO1100 1	2.22	2.22	1.89	2.44	2.11	2.33	2.44	2.0	1.89	2.0	3.0	2.0	2.11	1.67	1.89

1=weakly mapped

2= moderately mapped

3=strongly mapped

ENG11053	**English Communication**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 45**	**3**	**0**	**0**	**3**
Pre-requisites/Exposure	**12th level English**				
Co-requisites	**--**				

Course Objectives

- To know the importance and techniques of communication skills in order to improve professionalskills
- To enhance the knowledge of the students on vocabulary, syntax, and grammatical skills
- To improve writing skills by applying writing techniques, tools in practice sessions
- To achieve an overall enhancement in terms of reading, listening and speaking

Course Outcomes:

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

CO1. Understand basics of communication processes and to know the practical implications and itschallenges at the workplace

CO2. Spell out the practical uses of English grammar and to use grammar correctly andunambiguously.

CO3. Demonstrate different formats of business communication like reports, letters, and othertechnical writings

CO4. Develop competence in speaking, reading, listening and writing in English.

Catalog Description

Effective communication is one of the basic requirements of a successful career. Both verbal and nonverbal communication is important to exchange ideas among the employees within the organization and outside the organization as well. In this course, the focus will be on improving LSRW skills, i.e. listening, speaking, reading and writing. Students will learn how to communicate effectively through prescribed syllabus. Classroom activities will be designed to encourage students toplay an active role in the construction of their own knowledge and in the design of their own learning strategies. We will combine traditional lectures with other active teaching methodologies, such as group discussions, role play, small skit enactments, analysis of video scenes and debates. Class participation is a fundamental aspect of this course. Students will be encouraged to actively take partin all group activities and to give an oral group presentation. Students will be expected to interact with media resources, such as, web sites, videos, DVDs, and newspapers etc.

Course Content

Module I: **6 lecture hours**

Communication Level 1: Basics of Communication, Means of Communication, Barriers of Communication

Module II: **6 lecture hours**

Grammar and Syntax Level 1:Tense: types and uses, Idioms, One Word Substitutes, Discussion on the use of Articles and related exercises, Discussion on the use of Prepositions and related exercises, Exercises on Sentence –Making (Syntax), Practice exercises on Voice change, Class Exercises on Synonyms and Antonyms.

Module III: **6 lecture hours**

Reading and Listening Skills Level 1: Introduction to listening skills: purposes and practice, Discussion on types of listening: difference between listening and hearing, Active listening: introduction listening exercises, Elementary level listening exercise, Intermediate level listening exercise, Advance level listening exercise, Introduction to Reading Skills, Strategies of reading, Skimming, Scanning and Summarizing, Comprehension exercises.

Module IV: **6 lecture hours**

Speaking Skills Level 1: Introduction to Speaking Skills: Mother tongue influence, Discussion on various kinds of narrative styles and techniques: Welcome speech, Vote of Thanks, Farewell Speech, Debate and Elocution, Class Exercises on Descriptive narration, Practical Exercises on Narration styles, Presentation of small skits, Practicing Extempore in the class, Mock practices of Group discussion, Practicing speaking in pairs, Mock practice of job interviews.

Module V: **6 lecture Hours**

Writing Skills Level 1: Business letters: definition, types and format, Practice exercises, Business reports: definition, types and format, Practice exercises, CV and Application letters: types and formats, Practice exercises, Compositions: Essays, precis paragraph writing

Text Books:

1. Kaul Asha. Effective Business Communication. PHI Learning Pvt Ltd. 2014.
2. Wren and Martin. High School Grammar And Composition. S. Chand, 1995.
3. Gupta, A. English Reading Comprehension. Ramesh Publishing House, 2009.

Reference Book:

- Lewis, Norman. Word Power Made Easy. Anchor: 2014.
- Riordan, Daniel G & Pauley Steven A. :Technical Report Writing Today. 2004.
- Hamp-Lyons and Heasely, B . Study Writing; A Course in Written English. For Academic and Professional Purposes, Cambridge Univ. Press, 2006.
- Quirk R., Greenbaum S., Leech G., and Svartik, J. A Comprehensive Grammar of the Englishlanguage, Longman:London, 1985.
- Balasubramaniam, T. A Textbook of English Phonetics for Indian Students. Macmillan: 2012.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written ExaminationScheme:

Components	Class Assessment	Mid-Term	ETE
Weightage (%)	30	20	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ENG11053	English Communication	CO11053.1	1	2	3	3	3	2	3	-	1	3	-	3	2	1	3
		CO11053.2	1	3	1	3	3	1	1	-	3	2	-	3	3	2	2
		CO11053.3	2	1	2	2	1	2	3	3	1	-	-	1	3	3	3
		CO11053.4	1	2	2	3	3	2	2	3	3	-	-	3	3	3	3
		CO11053	1.25	2.0	2.0	2.75	2.5	1.75	2.25	3.0	2.0	2.5	-	2.5	2.75	2.25	2.75

1=weakly mapped; 2= moderately mapped; 3=strongly mapped

GEE11012	**Disruptive Technology Innovations**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 45**	**1**	**0**	**2**	**2**
Pre-requisites/Exposure					
Co-requisites	--				

Unit 1: AI/ML lecture:10

Introduction To Artificial Intelligence, Definition And Brief History Of Ai, Key Ai Concepts And Terminology, Importance And Impact Of Ai In Various Industries, Machine Learning Basics, Distinction Between Ai And Ml, Types Of Machine Learning: Supervised, Unsupervised, And Reinforcement, The Role Of Data In Machine Learning, Evaluation Metrics In Ml, Natural Language Processing (Nlp), Text Preprocessing And Tokenization, Basic Sentiment Analysis,applications Of Nlp In Real-world Scenarios, Generative Ai And Large Language Models, Introduction To Generative Ai, What Are Large Language Models?, Ai In Business And Industry, How Ai Is Transforming Various Industries (E.G., Healthcare, Finance, Retail), Case Studies Of Successful Ai Implementations, Business Opportunities And Challenges In Ai Adoption, Ai Ethics And Bias, The Importance Of Ethics In Ai, Ethical Considerations In Ai Development And Deployment

Unit 2: Data Analytics With Tools: lecture:6

Introduction To Data Analytics, The Importance Of Data In Decision-making, Types Of Data (Structured Vs. Unstructured), Role Of Data Analytics In Various Industries, Data Collection And Preprocessing, Data Collection Methods, Data Cleaning And Quality Assessment, Dealing With Missing Data, Data Transformation And Feature Engineering, Introduction To Data Analytics Tools, Overview Of Popular Data Analytics Tools, Introduction To Microsoft Excel For Data Analysis, Data Visualization With Advanced Tools (E.G., Tableau, Power Bi)

Unit 3:IOT lecture:10

Introduction To Iot, Definition And Concept Of The Internet Of Things, Significance And Impact On Various Industries, Iot Architecture And Components Overview, Iot Hardware Components (Sensors, Actuators, Microcontrollers), Basocs Of Cloud Computing And Iot, Sensors And Actuators, Types Of Sensors (Temperature, Humidity, Motion, Etc.), Sensor Characteristics And Selection Criteria, Actuators And Their Role In Iot Systems, Practical Sensor And Actuator Examples, Iot Applications In Healthcare, Remote Patient Monitoring, Wearable Health Devices, Smart Citie, Agriculture And Environmental Monitoring, Augmented Reality (Ar) And Virtual Reality (Vr) In Iot, Digital Twins In Iot, Basics Of Arduino And Raspberry Pi, Hardware Components And Capabilities, Programming With Arduino Ide And Raspberry Pi, Hands-on Exercises With Arduino And Raspberry Pi

Unit 4: Cyber Security lecture:9

Introduction To Cybersecurity, Definition And Scope Of Cybersecurity, Historical Perspective And Evolution Of Cybersecurity, Cyber Threats And The Need For Protection, Overview Of Common Cyber Threats (Malware, Phishing, Ransomware, Etc.), Social Engineering Attacks, Confidentiality, Integrity, And Availability (Cia) Triad, Risk Assessment And Management, Security Policies And Procedures, Cybersecurity Best Practices, Security Technologies And Tools, Introduction To Antivirus Software, Firewalls And Intrusion

Detection/Prevention Systems (Ids/Ips), Encryption And Secure Communication, Application Of Cybersecurity In Business, Healthcare, Finance, Critical Infrastructure, Emerging Trends In Cybersecurity (Ai In Cybersecurity, Iot Security, Etc.)

Unit 5: Robotic Process Automation lecture:6

Definition Of Robotics And Automation, Historical Overview Of Robotics, Types Of Robots And Their Applications, Role Of Automation In Various Industries, Current Trends And Future Prospects, Robot Anatomy, And Components, Sensors: Proximity, Vision, Force, Touch, Etc, Actuators And Motors: Dc Motors, Servos, Stepper Motors, Robot Programming: Python, C++, Etc, Introduction To Computer Vision, Types Of Robot End-effectors/Grippers, Pick-and-place Operations, Introduction To Cobots (Collaborative Robots), Safety Considerations And Standards, Emerging Trends And Research Areas: Soft Robotics, Swarm Robotics, Bio-inspired Robotics, Industry 4.0 And Smart Factories.

Unit 6: Additive Manufacturing (Am) And Rapid Prototyping (Rp) lecture:6
Evolution And History Of Am And Rp, Basic Principles Of Am And Rp, Comparison With Traditional Manufacturing Methods, Applications And Benefits Of Am And Rp, Stereolithography (Sla), Fused Deposition Modeling (Fdm), Selective Laser Sintering (Sls), Selective Laser Melting (Slm), Electron Beam Melting (Ebm), Materials For Am: Polymers, Metals, Ceramics, And Composites Used In Am, Applications Of Am And Rp: Aerospace And Automotive Industries, Medical And Healthcare Applications, Consumer Goods And Electronics, Art And Fashion, Customization And Personalization, Tooling And Jigs.

Relationship Between COs and POs/PSOs

COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO1: Understand key concepts and applications of disruptive technologies in AI/ML, IoT, and Cybersecurity.	3	3	2	2	3	1	1	-	-	2	1	2	3	2	3
CO2: Apply knowledge of data analytics tools and methods for effective decision-making.	3	3	3	2	3	1	1	-	2	-	2	2	3	2	2
CO3: Develop prototypes and IoT	3	2	3	3	3	-	2	-	2	1	3	2	3	3	3

solutions using hands-on exercises with Arduino and Raspberry Pi.															
CO4: Understand cybersecurity threats and apply protection mechanisms in real-world scenarios.	3	3	3	3	3	3	2	2	1	1	2	3	3	3	3
CO5: Analyze and implement automation solutions using Robotic Process Automation.	3	3	3	2	3	1	-	-	-	-	3	2	3	2	2
CO6: Understand the principles and applications of Additive Manufacturing (AM) and Rapid Prototyping (RP).	3	3	3	3	3	1	1	-	2	-	3	3	3	2	2

Legend for Mapping

1. **1 = Weakly Mapped**
2. **2 = Moderately Mapped**
3. **3 = Strongly Mapped**

BIT11003	Life Sciences	L	T	P	C
Version 1.0	Contact Hours - 45	3	0	0	3
Pre-requisites/Exposure	Class 12 Biology				
Co-requisites	-				

Course Objectives:

- To acquire the knowledge about the cell structure and interaction with neighboring cells inbiological system.
- To gain the knowledge about the genetic switches and oscillators and evolutionary dynamics.
- To acquire the knowledge about the transport of molecules in different cellular compartments.
- To gain the knowledge about dynamics of different systems in human body.
- To understand the application and significance of different techniques of medicalbiotechnology.

Course Outcomes

At the end of the course, the student will be able to:

CO1. Explain the structure and functions cell organelles and their interrelationship

CO2. Analyze the genetic switches and evolutionary dynamics of living system

CO3. Determine the mode of transport of molecules in biological system numerically

CO4. Contrast between the different networks of human body and other physiological systems andcan summarize consequences of physiological disorders.

CO5. Choose different techniques of medical biotechnology on human body to analyze the malfunction of different human system during diseased conditions.

Catalog Description

Cell is the structural and functional unit of living organism, it is well known throughout the universe, but mystery the molecular mechanism for performing the different kinds of functions of cell organelle(along with their development in both plant and animal system) and their integration into a beneficial outcome for living organism and as well as the outcome of physiological responses is almost unknown. So the course consists of structure function relationship of cell organelles, trafficking of different molecules between different cellular compartments and their secretion, creation of physiological responses and their assessment by several kinds of instrumentation techniques whichcan create a common platform between science of engineering and biological science.

Course Content:

Unit I: Cell biology & Communication: [7 hours lecture]

Structure, function, and synthesis of cellular membranes and organelles; cell growth and cancer; cytoskeleton and extracellular matrix; cell cycle; transport, receptors, and cell signaling; functions of specialized cell types.

Unit II: Genetics & Systems Biology [4 hours lecture]

Genetic switches and oscillators, cell-to-cell interactions, cellular and genetic networks, and evolutionary dynamics.

Unit III: Transport & Flow in Biological Systems [7 hours lecture]

Diffusion, osmosis, facilitated, and active transport; Heat Conduction and Radiation; Fluid Dynamics;Heat and Mass Transfer. Electromechanical and physicochemical interactions in cells andbiomaterials.

Unit IV: Human Physiology & Diseases [10 hours lecture]

Anatomical, physiological and pathological features of the cardiovascular, respiratory and renal systems. Identifications of deficiencies and diseases from blood, urine and feces; genetic disorders andgene therapy.

Unit V: Neurophysiology [10 hours lecture]

Neuron structure and function; Regeneration of nerve; flow and transport of signals from one neuron to other; Nervous system; Aging and its effect on brain; Behavioral functions of the brain - emotion,memory, learning and consciousness; Disorders of the nervous system and treatment.

Unit VI: Medical Biotechnology [7 hours lecture]

Understanding the handling and usefulness of electrocardiograms, ultrasound images, X-ray images, magnetic resonance images (MRI), computerized tomography (CT) or computerized axial tomography (CAT) images, glucose sensors, and other biosensors.

Text Books

- Biology for Engineers by Arthur T. Johnson. CRC Press, 1 edition, 2010.
- New Biology for Engineers and Computer Scientists by Aydin Tozeren and Stephen W. Byers. Pearson, 1 edition, 2003.

Reference Books

- Applied Cell and Molecular Biology for Engineers by Gabi Nindl Waite and Lee R. Waite. McGraw-Hill Education, 1 edition, 2007.
- Samson Wright's Applied Physiology.

Modes of Examination: Assignment/Quiz/Project/Presentation/Written Examination Scheme:

Components	Class Assessment	Mid Term	End Term
Weightage (%)	**30**	**20**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
BIT11003	Life Sciences	CO11003.1	1	2	3	2	2	2	3	-	3	-	-	2	2	2	1
		CO11003.2	1	2	2	3	3	2	3	-	1	-	-	2	2	2	2
		CO11003.3	2	3	2	3	2	3	3	3	2	-	-	2	3	3	1
		CO11003.4	3	3	3	1	2	2	3	-	1	-	-	2	1	3	3
		CO11003.5	2	3	3	2	2	3	3	2	3	-	-	3	1	2	1
		CO11003	1.8	2.6	2.6	2.2	2.2	2.4	3.0	2.5	2.0	-	-	2.2	1.8	2.4	1.6

DGS11001	**Design Thinking**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 30**	**2**	**0**	**0**	**2**
Pre-requisites/Exposure	**Knowledge of analyzing society problems and product usage problems and a zeal to improve the current situation, in addition to knowing to using laptop/computers, internet, social media interaction, file sharing and uploading, email and communication etiquettes.**				
Co-requisites	-				

Course Objectives

- To enable students to acquire knowledge, imagination and be more assertive on opinions on problems in society.
- To enable students to learn basics of research, data collection, analysis, brainstorming to find solutions to issues.
- To make them understand Design Thinking methodologies to problems in field of study and other areas as well.
- To help students to understand future Engineering positions with scope of understanding dynamics of working between inter departments of a typical OEM.

Course Outcomes

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

CO1. Examine design thinking concepts and principles

CO2. Practice the methods, processes, and tools of design thinking

CO3. Apply the Design Thinking approach and model to real world scenarios

CO4. Analyze the role of primary and secondary research in the discovery stage of designthinking

Catalog Description

Design thinking course is a completely online course offered to the first year UG programs across all streams. This course is designed to help understand the steps followed in the process of designing a solution to a problem.

Course Content

Unit I: 2 Lecture Hours

WHAT IS DESIGN THINKING: Designers seek to transform problems into opportunities. Through collaboration, teamwork, and creativity, they investigate user needs and desires on the way to developing human-centered products and/or services. This approach is at the very heart of design thinking.

Unit II: 4 Lecture Hours

THE DESIGN THINKING MODEL:A tool that helps guide you along a design thinking path. The model does this by providing a series of activities that that will help you effectively design a product, service or solution to a user's need. The model presents the approach as a process, allowing us to look at each step – or phase – along the journey to the development of a final design.

Unit III: 4 Lecture Hours

PHASE 1: DISCOVER: Begin the design thinking process with the Discover phase, where you will identify the specific problem your design is intended to solve, as well as important usability aspects from those who will use your design. Discovery can be performed through a variety of different research methods which you will learn in this module.

Unit IV: 4 Lecture Hours

PHASE 2: DEFINE: In the Define phase, you come to understand the problem. We often refer to this as framing the problem. You can do this by using a variety of tools, including storytelling, storyboarding, customer journey maps, personas, scenarios, and more.

Unit V: 4 Lecture Hours

PHASE 3: DEVELOP: Turn your attention to solving the problem. In this phase you brainstorm custom creative solutions to the problems previously identified and framed. To do this, you conceptualize in any way that helps, putting ideas on paper, on a computer, or anywhere whereby theycan be considered and discussed.

Unit VI: **4 Lecture Hours**

PHASE 4: DELIVER: This phase is all about testing and building concepts. Here you take all of the ideas that have been discussed to this point and bring them a little closer to reality by building a concept; something that makes it easier for a user to experience a design. This concept is referred to asa prototype.

Unit VII: **4 Lecture Hours**

PHASE 5: ITERATE: You will test the prototype of your design solution, collecting and acting on feedback received. These actions may mean minor or major revisions to your design, and are repeated as often as necessary until a solution is reached. Tools such as focus groups and questionnaires are used to help you collect feedback that can help with your final design.

Unit VIII: **4 Lecture Hours**

BEYOND DESIGN THINKING: The Design Thinking Model is a tool that helps guide you along a design thinking path. The model does this by providing a series of activities that that will help you effectively design a product, service or solution to a user's need. The model presents the approach as aprocess, allowing us to look at each step – or phase – along the journey to the development of a final design.

Reference Books

- Brown, Tim. "What We Can Learn from Barn Raisers." Design Thinking: Thoughts by TimBrown. Design Thinking, 16 January 2015. Web. 9 July 2015.
- Knapp, Jake. "The 8 Steps to Creating a Great Storyboard." Co.Design. Fast Company & Inc.,21 Dec. 2013. Web. 9 July 2015.
- van der Lelie, Corrie. "The Value of Storyboards in the Product Design Process." Journal ofPersonal and Ubiquitous Computing 10.203 (2006): 159–162. Web. 9 July 2015. [PDF].
- Millenson, Alisson. "Design Research 101: Prototyping Your Service with a Storyboard."Peer Insight. Peer Insight, 31 May 2013. Web. 9 July 2015.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
DGS11001	Design Thinking	CO11001.1	3	3	3	1	3	1	3	-	2	-	3	1	3	3	2
		CO11001.2	3	3	3	3	2	2	3	-	2	-	-	2	3	1	1
		CO11001.3	2	3	2	3	3	3	2	-	2	-	-	3	2	3	3
		CO11001.4	3	1	3	3	3	3	1	-	2	-	-	3	3	2	3
		CO11001	2.75	2.5	2.75	2.5	2.75	2.25	2.25	-	2.0	-	3.0	2.25	2.75	2.25	2.25

PHY12202	**Applied Science Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 30**	**0**	**0**	**2**	**1**
Pre-requisites/Exposure	**Basics of knowledge of higher secondary level physics & Chemistry**				
Co-requisites					

Course Objectives

- To understand the experiments on general properties of matter.
- To apply the knowledge of physical optics in different practical experiments.
- To analyse different experiments on electrical and electronic science.
- To explore different experiments related to fundamental knowledge on quantum mechanics.
- To impart a scientific approach and to familiarize the applications of chemistry in the field oftechnology
- gain knowledge about different types of qualitative and quantitative estimation

Course Outcomes

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

CO1: Understand about the elastic and other general properties of matter and their measurements.

CO2: Illustrate the knowledge of physical optics and experimental techniques to verify them.

CO3: Develop the basic concepts related to electrical circuits.

CO4: Outline the fundamental knowledge of basic quantum mechanics and few experimentsrelated to it.

CO5: Illustrate the basic information about semiconductor material and devices.

CO6: Develop the qualitative idea of thermo-electric currents and technique to measure it.

CO7: Understand and practice different techniques of quantitative chemical analysis generate experimental skills and apply these skills to various analyses

CO8: Analyze the quality of water by determining its hardness & alkalinity.

CO9: Utilize the fundamental laboratory techniques for analyses such as titrations

Catalog Description

Applied Science Lab is used to apply existing scientific knowledge to develop more practical applications, for example: technology or inventions. In applied Science Lab different aspects of basic and modern physics has been explored. Applied Science Lab is generally developing technology, although there might be dialogue between basic science and applied science (research and development). In this course the focus will be on improving the logical learning moved into a physical environment.

Chemistry lab is a place where laboratory sessions is to enable the learners/students to get hands-on experience on the principles discussed in theory sessions and to understand the applications of these concepts in engineering. The course also includes theory on sampling, analyses of real samples, risk assessment of chemical experiments, important steps and procedures in analytical chemistry, and evaluation/interpretation of results.

Course Content

Experiments: Physics

- Determination of Young's Modulus of a Beam by traveling microscope by FLEXUREmethod.
- Carry Foster's Method to Determine Resistance of a Given Coil.
- Determination of the Coefficient of viscosity of water by Poiseulle's Capillary Flow method.
- To determine the wavelength of sodium light by forming Newton's Ring.
- Determination of Rigidity Modulus by dynamical method.
- Determine the Plank's constant using photocell.
- To verify Stefan's law by electrical method.
- To study the temperature dependence of reverse saturation current in a junction diode andhence to determine the Band gap.
- Determination of specific charge (e/m) of electron by J.J. Thomson's method.
- Determination of the Rydberg constant by studying hydrogen or helium spectrum.
- Determination of dielectric constant of a given dielectric material.

- Determination of Hall coefficient of Semiconductor.
- Study current – voltage characteristic load response of photovoltaic solar cells.

Experiments: Chemistry (Any Four)

- Determination of total hardness of water by complexometric titration method
- Determination of carbonate and bicarbonate in water
- Estimation of iron (ferrous ion in Mohr salt) by permanganometry.
- Determination of strength of an unknown HCl solution with standardized NaOH solution byconductometric titration.
- Dissolved oxygen by Winkler's method

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written ExaminationScheme:

Components	**Class Assessment**	**End Term**
Weightage (%)	**50**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
PHY12 202	Applied Science Lab	CO12202.1	2	3	2	2	3	1	3	-	2	-	-	2	2	3	3
		CO12202.2	3	1	1	1	1	3	2	-	1	-	-	2	3	1	3
		CO12202.3	3	3	2	3	3	1	3	-	3	-	-	3	2	2	2
		CO12202.4	3	1	2	1	1	1	1	-	1	-	-	1	1	2	3
		CO12202.5	3	2	2	1	2	1	1	-	1	-	-	2	1	2	3
		CO12202.6	2	3	1	3	2	3	1	-	2	-	-	3	1	3	2
		CO12202.7	2	2	3	2	1	2	1	-	3	-	-	3	3	3	2
		CO12202.8	2	1	3	3	1	2	2	-	2	-	-	2	2	1	2
		CO12202.9	2	2	3	3	2	3	2	-	3	-	-	2	1	3	3
		CO12202	2.44	2.0	2.11	2.11	1.78	1.89	1.78	-	2.0	-	-	2.22	1.78	2.22	2.56

CSE12002	**Programming Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours -45**	**0**	**0**	**3**	**2**
Pre-requisites/Exposure	**10+2 Level Mathematics, Knowledge of Basics of Computer**				
Co-requisites	**Knowledge of Logical Reasoning and Analysis**				

Course Objectives

- To comprehend the practical nature of programming by solving through computer systems.
- To practice the programming construct to solve multi-dimensional problems.
- To relate and implement mathematical concepts through programming in order to solvecomputational problems.
- To enable students to acquire structure and written expression required for their profession.
- To understand the principles of data storage and manipulation.

Course Outcomes

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

CO1. List and memorize various Unix commands. Also, students be able to construct various basicprograms and appraise them.

CO2. Design and execute iterative statement in a program. Also, students be able to differentiateamong different iterative structure.

CO3. Construct such programs that used to define user defined functions and to design libraryfunctions.

CO4. Apply array concept in 1-Dimensional and 2-Dimensional construct. Hence be able to designstring functions to cater to various character array related problem.

CO5. Apply the concept of Stack, Queue, and Linked List and appraise them in different cases.

Catalog Description

Practical Programming skills are mandatory for designing or solving problems through digital device by implementation. To develop any software the behaviour of a programming language is a must through problem solving. In present era almost, all aspect of life is somehow largely related to virtualization and digital data/information. Devices from smartphones to other handheld devices, drones, cameras, medical instruments etc. all needs programming at some part. In engineering it has become quintessential for the students/research scholars to learn programming. In this course, students will learn how to solve problems in various domains through a programming language. This course enables students with the basic skills of C Programming Language. Five Different related modules comprise this course. First Unit familiarizes students with basics of computers, algorithmic method to solve problem, introduction to generic programming construct. Basics of C Programming isupto iterative structure is depicted in Unit II. In Unit III students will learn about modularization usingfunctions and one advance concept of C Programming, Pointers. Unit IV will cover one of the most important concepts in C Programming, Array and Strings. Unit V will accomplish this course with theadvance concept like Structure, Union and File Handling. After this course students will grow their analytical ability to solve problem and logical skill. Also, this course effectively creates the ability to grasp any other Programming Language in easier manner. In all these modules related programming problems are practiced to understand the syntactical and semantical correctness of a program. Gradually students become more comprehensive through the progress of the course.

Course Content

Experiments:

- Familiarization with LINUX commands and vi editor.
- Programs to demonstrate Decision Making, Branching and Looping, Use of break andcontinue statement etc.
- Implementation involving the use of Arrays with subscript, String operations and pointers.
- Implementation involving the use Functions and Recursion.
- Implementation involving the use Structures and Files.
- Implementation based on Stack Queues and Linked List for example Insertion and Deletion.

Text Books

- Balagurusamy, E., n.d. Programming In ANSI C. 5th ed. Bangalore: McGraw-hill.
- Gotfreid (196) *Schaum's Outline of Programming with C*, 2nd ed., USA: McGraw-Hill

- Brian W. Kernighan, Dennis Ritchie (1988) *C Programming Language*, 2nd ed., : Prentice Hall.
- Das Sumitabha, UNIX Concepts and Applications, 4th Ed., New Delhi, Tata McGraw-Hill

Reference Books

- Al Kelley, Ira Pohl (1988) *A Book on C*, 4th ed. Addision Wesley Longman

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination Scheme:

Components	**Internal Assessment**	**ETE**
Weightage (%)	**50**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12002	Programming Lab	CO12002.1	1	1	2	2	3	1	3	-	2	-	-	3	1	2	3
		CO12002.2	3	1	3	2	2	3	2	-	1	-	-	3	2	1	3
		CO12002.3	3	2	3	1	2	1	3	-	3	-	-	2	1	3	3
		CO12002.4	3	2	2	2	2	1	3	-	2	-	-	1	1	1	3
		CO12002.5	2	2	1	1	3	2	2	-	2	-	3	2	2	3	3
		CO12002	2.4	1.6	2.2	1.6	2.4	1.6	2.6	-	2.0	-	3.0	2.2	1.4	2.0	3.0

1=weakly mapped
2= moderately mapped
3=strongly mapped

GEE12002	Electrical and Electronics Technology Lab	L	T	P	C
Version 1.0	Contact Hours -45	0	0	3	2
Pre-requisites/Exposure	Class 12^{th} Level physics				
Co-requisites					

Course Objectives

- To study basic electronic components
- To observe characteristics of electronic devices
- To study basic electrical circuits

Course Outcomes

On completion of this course, the students will be able to:

CO1. **Show** different meters and instruments for measurement of electronic quantities and understand network theorems.

CO2. **Apply** the characteristics of different semiconductor devices like diode, BJT, FET etc and carbon tungsten filament lamps experimentally.

CO3. **Demonstrate** various application circuits using diodes

CO4. **Experiment with** the R-L-C circuits

CO5. **Illustrate** the three phase circuits

Catalog Description

Present technology requires necessary knowledge of ELECTRONICS in most fields. Avionics, Autotronics, Agrotronics, Physics, Process Chemistry, Health Services, etc., already employ components or even whole systems based on Electronics. Thus, there is an increasing number of professionals in these and many other fields who need adequate knowledge and training. Taken this into account, ADAMAS has developed the Basic Electronics and Electricity Integrated Laboratory, capable of covering different levels of difficulty. It is based on a series of self-taught modules, each one referring to a specific area of Electronics.

Course Content:

List of experiments (Electrical Part):

- Verification of Thevenin's theorem and Norton's theorem.
- Verification of Superposition theorem.
- Verification of Maximum power transfer theorem.
- Study of R-L-C series circuit.
- Study of R-L-C parallel circuit.
- Performance study of fluorescent, LED, tungsten and carbon lamps.
- Measurement of power in a three-phase circuit using two-watt meter method.

List of experiments (Electronics Part):

- Familiarization of bread board and electronics elements such as R, L, C, diode, and BJT etc.
- Familiarization of Function generator and measuring instruments such as CRO and multimeter.
- Study the V-I characteristic of PN junction diode and find knee voltage.
- Study the input and output characteristic of bipolar junction transistor (BJT): Common emitter (CE) configuration
- Study the transfer and drain characteristic of junction field-effect transistor (JFET), hence determine the drain resistance, transconductance factor, amplification factor.
- Study the transfer and drain characteristic of MOSFET, hence determine the drain resistance, transconductance factor, amplification factor.
- Realization of digital logic circuit using MOSFET (AND, OR, NOT etc.).

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/Written ExaminationScheme:

Components	Internal Assessment	ETE
Weightage (%)	50	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
GEE12002	Electrical and Electronics Technology Lab	CO12002.1	3	3	3	2	2	2	3	-	1	-	-	2	1	1	1
		CO12002.2	1	2	3	1	2	2	3	-	1	-	-	3	3	2	1
		CO12002.3	3	3	2	3	2	2	1	-	3	-	-	3	3	1	1
		CO12002.4	3	3	2	2	1	1	1	-	3	-	-	3	3	2	1
		CO12002.5	2	2	2	3	2	2	1	-	2	-	-	2	3	1	1
		CO12002	2.4	2.6	2.4	2.2	1.8	1.8	1.8	-	2.0	-	-	2.6	2.6	1.4	1.0

1=weakly mapped

2= moderately mapped

3=strongly mapped

Course Objectives

CEE12001	**Engineering Drawing and CAD**	**L**	**T**	**P**	**C**
Version1.0		**0**	**0**	**4**	**2**
Pre-requisites/Exposure					
Co-requisites	**--**				

- To comprehend general projection theory, with an emphasis on the use of orthographic projection to represent three-dimensional objects in two-dimensional views.
- To understand the application of industry standards and techniques applied in engineering drawing.
- To apply auxiliary or sectional views to most practically represent engineered parts.
- To Dimension and explain two-dimensional engineering drawings.
- To employ freehand 3D pictorial sketching to aid in the visualization process and to efficiently communicate ideas graphically.

Course Outcomes

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

- **Identify** the principle and significance of engineering drawing along with all the possible geometrical shapes.
- **Infer** the principle and concept of projection of Points, Lines and Planes over Auxiliary Planes.
- **Demonstrate** the principle and concept of Projection of Regular Solids.
- **Illustrate** Sections and Sectional Views of Right Angular Solids and Regular Solids.
- **Interpret** Isometric projection.

Catalog Description

In this fundamental course, students will be introduced to the basics of engineering drawing. Terms and definitions used in industries, such as manufacturing and construction, may also be covered. Specific skills introduced in this course may include sketching, geometric construction, auxiliary drawing, computing dimensions and lettering. Students will be also introduced to computer-aided drawing (CAD) software or techniques.

Course Content

Module 1 **Contact Hr. 9**

Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales.

Module 2 **Contact Hr. 9**

Orthographic Projections covering, Principles of Orthographic Projections Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes.

Module 3 **Contact Hr. 8**

Projections of Regular Solids covering, those inclined to both the Planes- Auxiliary Views.

Module 4 **Contact Hr. 9**

Sections and Sectional Views of Right Angular Solids covering, Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone.

Module 5 **Contact Hr. 10**

Isometric Projections covering, Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions;

Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions

Reference Books

1. Engineering Drawing, N. D. Bhat, Charotar Publishing House (2012).
2. Shah, M.B. & B.C. Rana (2008), Engineering Drawing and Computer Graphics, Pearson Education.
3. Engineering Drawing & Graphics using Autocad, T. Jeyapoovan, Vikas Publishing House Pvt. Ltd.-Noida; Third edition (2010).
4. https://nptel.ac.in/courses/112103019/

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	**Class Assessment**	**End Term**
Weightage (%)	**50**	**50**

Relationship between the Course Outcomes (COs), Program Outcomes (POs)& PSOs

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEE12001	Engineering Drawing and CAD	CO12001.1	1	2	2	2	1	1	2	-	1	-	-	3	1	1	1
		CO12001.2	3	3	3	1	2	2	3	-	3	-	-	2	1	2	3
		CO12001.3	1	1	3	2	3	2	2	-	2	-	-	3	3	2	3
		CO12001.4	1	1	3	1	3	2	2	-	3	-	-	2	1	3	2
		CO12001.5	2	3	2	2	3	3	2	-	2	-	-	2	1	1	2
		CO12001	1.6	2.0	2.6	1.6	2.4	2.0	2.2	-	2.2	-	-	2.4	1.4	1.8	2.2

1=weakly mapped 2= moderately mapped 3=strongly mapped

		L	T	P	C
MEE12001	**Engineering Workshop**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours -60**	**0**	**0**	**4**	**2**
Pre-requisites/Exposure	**12th level Physics, Engineering Mechanics**				
Co-requisites	**--**				

Course Objectives:

- To develop a skill in dignity of labor, precision, safety at work place, team working anddevelopment of right attitude.
- To acquire skills in basic engineering practice
- To identify the hand tools and instruments
- To gain measuring skills
- To develop general machining skills in the students

Course Outcomes:

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

CO1 Demonstrate the basic operations in pattern and mould making.
CO2 Experiment with different metal fitting works
CO3 Show basic forging and welding works
CO4 Understand the operations of machine tools
CO5 Select the appropriate tools required for specific operation
CO6 Understand the safety measures required to be taken while using the tools

Catalog Description:

Engineering Workshop is a place where students acquire knowledge on the operation of various processes involved in manufacturing and production. The Workshop Practice course makes students competent in handling practical work in engineering environment. Students will be expected to be familiar with engineering problems related to practical field.

Course Content

	List of Experiments (Any ten)
1	To make a single piece pattern from the given work piece and dimensions.
2	To make a double piece match pattern from the given dimensions.
3	To make a single piece cylindrical (solid) pattern from the given dimensions.
4	To make a cone from sheet metal as per given dimensions.
5	To make a frustum from sheet metal as per given dimensions.
6	To prepare a sand mould, given the single piece pattern and casting.
7	To prepare a sand mould, given the double piece match pattern and casting with different dimensions and shape
8	To make a square fitting from the given mild steel piece and the dimensions.
9	To make a square fitting from the given mild steel piece and the dimensions.
10	To make a single 'V' butt joint between two metal plates by using ARC welding.
11	To make a square butt joint between metal plates by using gas welding.
12	To perform various types of machining operations (cantering, facing and turning) on a given mild steel rod followed by the given dimensions.
13	To perform various types of machining operations (chamfering, grooving, thread cutting, andknurling) on a given mild steel rod followed by the given dimensions.

Reference Books

- Workshop Technology by S.K. Garg, 3rd Edition, LP

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written ExaminationScheme:

Components	**Class Assessment**	**End Term**
Weightage (%)	**50**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MEE12001	Engineering Workshop	CO12001.1	3	2	1	2	2	3	1	-	2	-	-	1	3	3	1
		CO12001.2	3	3	3	2	1	1	3	-	3	-	-	3	1	2	3
		CO12001.3	3	1	1	2	3	1	2	-	3	-	-	2	3	3	2
		CO12001.4	2	2	3	1	3	1	3	-	2	-	-	2	3	2	2
		CO12001.5	2	3	1	2	2	1	2	-	2	-	-	2	1	2	2
		CO12001.6	2	1	3	1	1	2	2	-	3	-	-	1	1	1	3
		CO12001	2.5	2.0	2.0	1.67	2.0	1.5	2.17	-	2.5	-	-	1.83	2.0	2.17	2.17

1=weakly mapped 2= moderately mapped 3=strongly mapped

SEMESTER II

MTH11502	**Engineering Mathematics- II**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours -60**	**3**	**1**	**0**	**4**
Pre-requisites/Exposure	**12th level Mathematics & Engineering Mathematics I**				
Co-requisites	**--**				

Course Objectives

- To help the student to understand the basic concepts of matrix theory with its uses inengineering science.
- To give emphasis about concepts of Eigen value and Eigen vector, vector space and linear transformation and enable students to apply these topics for analysing the engineering problems.
- To help the student to understand the use of vector calculus in engineering.
- To give the students a perspective to learn about functions of complex variables, pole, and residues and their importance in advanced study of engineering science.
- To enable students to acquire the knowledge of different transformation techniques and their applications in engineering science.

Course Outcomes

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

CO1	Apply the knowledge of matrix theory for finding solution of a related engineering problem
CO2	Illustrate the Eigen value(s) and Eigen vector(s) of a matrix
CO3	Explain the concept of vector space and linear transformation between the vector spaces
CO4	Build the knowledge of vector calculus and apply it for solving related problems
CO5	Develop the concept of complex variable and its application
CO6	Outline the Fourier series representation of a function
CO7	Make use of appropriate transformation technique for solving differential equation o difference equation

Course Description

For any engineering program, Mathematics is the backbone. With a sound knowledge in fundamental mathematics, an engineering student can become a very skilful engineer. In this course, the focus will be on learning Mathematics in depth, which will motivate students to grow their thinking ability in different fields of engineering. Students will be able to apply this knowledge to tackle almost all kinds of problems in engineering and science successfully. Class participation is a fundamental aspect of this course. Students will be encouraged to actively take part in all group activities (Problem solving, presentation etc.).

Course Content

Unit I: Sequences and Series [15H]

Sequences and their limits, convergence of series, Convergence Test (comparison test, Ratio test, Root test), Absolute and conditional convergence, Alternating series, Power series

Periodic functions, Definition of Fourier series, Euler's formulae, Dirichlet conditions, Change of interval, Even and odd functions, half range Fourier Sine & Cosine series

Unit II: Complex Variables [15H]

Limit, continuity, differentiability and analyticity of complex functions, Cauchy-Riemann equations, derivatives of analytic functions, line integrals in complex plane, Cauchy’s integral theorem, independence of path, existence of indefinite integral, Cauchy’s integral formula, Taylor’s series, Laurent’s series, zeros and singularities, Residue theorem

Unit III: Ordinary Differential Equations [20H]

Formation of ODE, order and degree, First order ODE, Method of separation of variables, Exact and non-exact equations, linear and Bernoulli’s form, second order differential equations with constant coefficients, Complementary functions and Particular Integral, D-operator, method of variation of parameters, general linear differential equations with constant coefficients, Cauchy-Euler's equations, Simultaneous differential equations

Unit IV: Vector Calculus [10H]

Ordinary Integrals of Vectors, Line, surface and volume integrals of Vector fields, Gauss' divergence theorem, Green's and Stokes Theorems and their applications

References:

- Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons
- B.V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill
- David C. Lay, Linear algebra and its application, (Latest edition), Pearson publication, New Delhi
- B. S. Grewal, Higher Engineering Mathematics, Khanna Publications
- C B Gupta, S R Singh, and Mukesh Kumar, Engineering Mathematics, Mc Graw Hill Publication
- R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written ExaminationScheme:

Components	**MTE**	**Internal Assessment**	**ETE**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MTH11502	Engineering Mathematics- II	CO11502.1	3	2	2	2	1	2	2	-	2	-	-	1	1	3	1
		CO11502.2	1	2	3	2	2	3	1	-	3	-	-	2	2	1	2
		CO11502.3	3	3	1	3	1	1	3	-	2	-	-	2	1	1	1
		CO11502.4	2	1	3	1	1	3	3	-	2	-	-	3	2	1	2
		CO11502.5	2	3	3	2	2	2	1	-	2	-	-	1	1	3	2
		CO11502.6	2	2	2	1	3	3	3	-	2	-	-	1	1	2	1
		CO11502.7	3	2	2	3	2	2	1	-	2	-	-	3	3	1	3
		CO11502	2.29	2.14	2.29	2.0	1.71	2.29	2.0	-	2.14	-	-	1.86	1.57	1.71	1.71

MEE11002	Engineering Mechanics	L	T	P	C
Version 1.0	Contact Hours - 45	3	0	0	3
Pre-requisites/Exposure	12th level Physics, Mathematics				
Co-requisites	--				

Course Objectives

- To enable learners to solve force problems related to practical world.
- To be able to determine the centroid, centre of gravity and moment of inertia.
- To learn the effect of friction on equilibrium.
- To learn kinematics, kinetics of particle and rigid body, related principles.
- To introduce the concepts of Dynamic motion.

Course Outcomes

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

CO1. Apply conditions of equilibrium of bodies subjected to forces
CO2. Determine the centroid, centre of gravity and moment of inertia of various one dimensional and two-dimensional objects
CO3. Analyze motion under the effect of dry friction
CO4. Apply the concept of virtual work for bodies in equilibrium
CO5. Apply the D'Alembert's Principle for reducing the problem of kinetics to equivalent staticsproblem.

Catalog Description

Engineering Mechanics. This is a basic first level course to learn rigid body mechanics covering both statics and dynamics. Statics covers free body diagrams, equilibrium of rigid bodies, analysis of trusses and beams, discussion on friction, virtual work and stability. Students will be expected to be familiar with engineering problems related to practical field.

Course Content

Module 1 **11 lecture hours**

Basics of Statics and Concurrent Forces

Statics of Particles: Force System: Force, classification & representation, force as a vector, composition and resolution of forces, principle of superposition and transmissibility of forces.

Statics of Rigid bodies: Equilibrium of coplanar force system, free body diagrams, determination of reactions, equilibrium of a body under three forces, Lami's theorem. Moment of a force about a point and an axis, moment of coplanar force system, Varignan's theorem.

Module 2: **11 lecture hours**

Parallel and Distributed Forces

Parallel forces in a plane, Distributed Parallel forces in a plane, couple, resolution of a force into a force and a couple, moment of a couple.

Centroid and Moment of Inertia: Determination of centre of gravity, centre of mass and centroid by direct integration and by the method of composite bodies, area moment of inertia of composite plane figures and mass moment of inertia, radius of gyration, parallel axis theorem, Pappas theorems, polar moment of inertia.

Module 3: **6 lecture hours**

Friction: Introduction to wet and dry friction, laws of dry friction, cone of friction, block friction, ladder friction, wedge friction, application of friction in machines.

Module 4: **4 lecture hours**

Virtual Work Virtual displacement, principle of virtual work.

Module 5: **8 lecture hours**

Introduction to Dynamics Laws of motion, Projectile motion, D'Alembert's Principle, Work andenergy, impulse and momentum, impact of bodies.

Text Books

- Engineering Mechanics [Vol-I & II] by Meriam&Kraige, 5th ed. – Wiley India
- Engineering Mechanics by S.S. Bhavikatti and K.G. Rajashekarappa – New Age International
- Mechanics of Solids by Crandall,Dahl and Sivakumar-MC Graw Hill ,5th Edition 2015,New Delhi

Reference Books

- Engineering Mechanics: Statics & Dynamics by I.H.Shames, 4th ed. – PHI
- Engineering Mechanics by Timoshenko, Young and Rao, Revised 4th ed. – TMH

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written ExaminationScheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MEE11002	Engineering Mechanics	CO11002.1	2	2	2	1	1	2	1	-	2	-	-	3	3	2	3
		CO11002.2	2	3	3	2	2	3	3	-	3	-	-	2	2	2	3
		CO11002.3	2	3	2	2	3	2	2	-	3	-	-	3	1	2	1
		CO11002.4	2	3	3	2	1	3	1	-	1	-	-	1	2	2	2
		CO11002.5	3	2	2	1	1	2	1	-	2	-	-	3	3	1	3
		CO11002	2.2	2.6	2.4	1.6	1.6	2.4	1.6	-	2.2	-	-	2.4	2.2	1.8	2.4

1=weakly mapped

2= moderately mapped

3=strongly mapped

EVS11112	Environmental Science	L	T	P	C
Version 1.1	Contact Hours – 30	2	0	0	2
Pre-requisites/Exposure	Basic physics, chemistry, mathematics of +2 level.				
Co-requisites	--				
Academic year	2022-23				

Course Objectives

- To understand the intrinsic relation between humans and the environment, our position in the ecosystem around us
- To comprehend the significance of the biodiversity surrounding us.
- To figure out the importance and need for energy resources, various sources of energy, renewable and non-renewable sources, conventional and unconventional sources.
- To have basic concepts about sustainability, our dependence on nature, and the consequences of overexploitation.
- To enable students to appreciate the importance and how much we owe to the earth systems for our survival.
- To have a basic concept about the types of pollution and mitigation procedures.
- To have an overall idea about the environmental legal framework in our country and about the EIA and environmental audit procedures.

Course Outcomes: On completion of this course, the students will be able to

CO 1: Compare between various types of ecosystems, ecosystem dynamics, perceive and appreciate the surrounding nature.

CO 2: Perceive the intrinsic relation between humans and the environment, our position in the ecosystem around us, and the importance of biodiversity.

CO 3: Identify the presence of various pollutants, their significance, and impacts, and develop the underlying concepts involved in various air pollution prevention and mitigation measures.

CO 4: Estimate the importance of natural resources including energy resources.

CO 5: Relate to the legal framework in our country for safeguarding the environment including pollution prevention, control, management, and wildlife management.

Catalog Description

To distinguish between various types of ecosystems, ecosystem dynamics, perceive and appreciate the surrounding nature and feel connected, develop the concept of the innate relationship of humans and biodiversity, need for conservation, and different conservation strategies. The students will be developed in a way so that they can spontaneously comprehend the importance of studying the various air pollutants, their significance, and impacts, and develop the underlying concepts involved in various air pollution prevention and mitigation measures, understand fundamental water chemistry, deduce the relationship between various water pollutants, and understand the principles of various water and wastewater treatment procedures. They will understand the routes of generation, classification, management, and environmental significance of solid waste, apply the basic concepts of waste management in their daily lives, understand the need of the 5Rs of waste management, the importance of waste minimization.

Detailed syllabus

Unit I: Resources

Multidisciplinary nature of environmental sciences; scope and importance; need for public awareness; concept of sustainability and sustainable development

Forest resources: Function of forests, cause and effects of deforestation, case studies.

Water resources: distribution of water, hydrological cycle, use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies

Food Resources: World food problems and environmental concern, Food security, case studies

Energy resources: Concept of energy, SI Units of Work, Heat and Power, World energy use, Energy consumption pattern in India and U.S., Environmental aspects of energy utilization Renewable and non-renewable sources; Fossil fuel: types, use and environmental impacts, Solar energy: Solar Radiation – Passive and active solar systems – Flat Plate and Concentrating Collectors – Solar direct Thermal Application– Fundamentals of Solar Photo Voltaic Conversion- advantages and disadvantages of Solar Power generation, Solar energy status in India; Wind Energy: site selection, Wind turbine: basic working principle and types, Wind energy status in India, advantages and disadvantages of Wind Power generation; Hydroelectric power : How is it generated, advantages and disadvantages; Biomass energy: various types, generations of biofuel, Biogas plants, Bio diesel; Geothermal Energy: source, advantages and disadvantages, Nuclear Power: nuclear fission, moderation of reaction, nuclear reactor: pressurized water reactor, advantages and disadvantages

Unit II: Ecosystems and Biodiversity and its conservation

Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Food chains, food webs and ecological pyramids, energy flow, ecological succession, Levels of Biodiversity: genetic, species and ecosystem diversity. Biogeographical classification of India, Values of biodiversity, Biodiversity at global, National and local levels, India as a mega-diversity nation, Biodiversity hotspots, Threats to Biodiversity, In-situ and Ex-situ conservation of Biodiversity

Unit III: Environmental Pollution and Waste Management

Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution, marine pollution; case studies. Nuclear hazards and human health risks.

Sources and generation of solid wastes, their characterization, chemical composition and classification. Different methods of disposal and management of solid wastes, Recycling of waste material. Waste minimization technologies.

Unit IV: Global Issues and Environmental Acts if India

Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents, habitat loss, Holocene Extinction.

International agreements on Environmental conservation and pollution prevention.

Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and Control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. Waste Management Rules, 2016 and other important acts.

<u>Text Books:</u>

1. Principles of Environmental Science, 4th edition by Cunningham, W.P. and Cunningham, M.A. (2002), Tata McGraw-Hill Publishing Company, New Delhi

2. Basic Environmental Engineering & Elementary Biology by Monidranath Patra and Rahul Kumar Singha, Aryan Publishing house

3. Introduction to Environmental Engineering and Science, by Masters, G.M., Prentice Hall of India, Second Indian Reprint.

<u>Reference Books:</u>

1 Wastewater Engineering: Treatment and Reuse, 4th Edition, Metcalf and Eddy, Inc. McGraw-Hill, Inc., New York, 2002

2 Environmental Engineering", Howard S. Peavy, Donald R. Rowe and George Tchobanoglous, McGraw-Hill Education (India) Private Limited, New Delhi

3 Introduction to Environmental Engineering, 2nd Ed. by Davis, M. L. and Cornwell D. A. McGraw Hill, Singapore.

4 Environmental Sciences: The Environment and Human Impact by Jackson, A.R.W. and Jackson, J.M., Longman Publishers

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs):

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
EVS11112	Environmental Science	CO11112.1	1	3	1	3	2	3	2	-	2	-	-	3	1	3	1
		CO11112.2	1	3	1	1	2	2	1	-	2	-	-	3	3	1	1
		CO11112.3	1	2	2	1	1	3	1	-	1	-	-	1	3	3	3
		CO11112.4	2	2	1	1	3	3	2	-	1	-	-	1	3	3	1
		CO11112.5	3	2	2	3	2	2	3	-	3	-	-	1	1	3	1
		CO11112	1.6	2.4	1.4	1.8	2.0	2.6	1.8	-	1.8	-	-	1.8	2.2	2.6	1.4

1=weakly mapped; 2= moderately mapped; 3=strongly mapped

GEE11001	Electrical and Electronics Technology	L	T	P	C
Version 1.0	Contact Hours -45	3	0	0	3
Pre-requisites/Exposure	Basic idea about basic mathematics				
Co-requisites	Basic idea of semiconductor devices and electromagnetism				

Course Objectives

- To familiarize with passive components, active components and measuring instruments.
- To familiarize the working of diodes, transistors, MOSFETS and integrated circuits.
- To implement mini projects based on concept of electronics circuit concepts.
- To understand d-c network theorems and apply these theorems to calculate thevoltage, current and power for a given circuit.
- To explain the concept of active power, reactive power, power factor, quality factor, steady state sinusoids.

Course Outcomes

At the end of the course, the student will be able to:

CO1. Apply knowledge about different passive components used in electronic industry for commonapplication.

CO2. Illustrate with the working of different active components to demonstrate basic electroniccircuits.

CO3. Design circuits using passive and active components for strengthening fundamental idea about basic electronics.

CO4. Describe the basic construction of measuring instruments used in electronic measurements.

CO5. Apply the Network theorems to calculate the voltage, current and power for a given circuit.

CO6.Explain Active Power, Reactive Power, Power factor, Quality factor, average and effective values of Sinusoids, complex representation of impedances and draw the Phasor diagram.

CO7. Understand the three-phase power measurement.

CO8. Explain PN Junction Diode in Forward Biased, Reverse Biased Condition, Breakdown in PN Junction Diodes and Different Configurations of a Transistor and its Characteristics.

CO9. Demonstrate digital logic circuit and switching circuits using MOSFET.

Catalog Description

Present technology requires necessary knowledge of ELECTRONICS in most fields. Avionics, Autotropic, Agrotronics, Physics, Process Chemistry, Health Services, etc., already employ components or even whole systems based on Electronics. Thus, there is an increasing number ofprofessionals in these and many otherfields who need adequate knowledge and training. Taken this into account, ADAMAS has developed the Basic Electronics and Electricity Integrated Laboratory, capable of covering different levels of difficulty. It is based on a series of self-taught modules, each one referring to a specific area of Electronics.

Course Content

Module 1: 7 lecture hours

D.C. Circuit Analysis and Network Theorems: Concept of network, Active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, R, Land C as linear elements, source transformation, Kirchoff's Law, mesh analysis and nodalanalysis, star-delta transformation, network theorems: Thevenin’s theorem, Norton’s theorem, maximum power transfer theorem, network analysis with dependent sources.

Module 2: 6 lecture hours

Steady State Analysis of Single Phase A.C. Circuits: Sinusoidal, square and triangular waveforms- average and effective value, form the peak factors, concept of phasor, phasor representation of sinusoidal voltage and current, analysis of series-parallel RLC circuits. Apparent, active and reactive powers, power factor, causes and problems of low power factor, power factor improvement, resonance in series and parallel circuits, bandwidth and quality factors.

Module 3: 6 lecture hours

Three Phase A.C. Circuits: Its necessity and advantages, meaning of phases equence, star and delta connections, balanced supply and balanced load, line and phase voltage/current relation, three phase power measurements, two wattmeter method.

Module 4: 6 lecture hours

Basics of Semi-Conductors and PN Junction: Introduction; Carrier Concentrations- the FermiLevel; Electron and Hole Concentrational Equilibrium; Temperature Dependence of Carrier Concentration; Drift an d diffusion current; The Hall Effect; Optical Absorption, Luminescence; PN Junction Diode in Equilibrium Conditions; PN Junction Diode in Forward Biased and Reverse BiasedCondition; Breakdown in PN Junction Diodes.

Module 5: 6 lecture hours

Bipolar Junction Transistors: Introduction, Types: NPN and PNP; Current Components; Early Effect Ebber's Moll Model; Different Configurations of a Transistor and its Characteristics; Transistor as an Amplifier (CE, CB, CC); Transistor as a Switch.

Module 6: 6 lecture hours

Field Effect Transistors: Introduction, JFET and MOSFET, Realization of digital logic circuit using MOSFET (AND, OR, NOT etc.), Realization of switching circuit using MOSFET.

Module 7: 7 lecture hours

Electronics Instruments & Digital Electronics Fundamental:

Signal generator, Multimeter, operation of CRO and its application. Number systems, Conversionsand codes, Logic gates and truth tables.

Text book:

- Electronic Devices & Circuit Theory: Boyelstad &Nashelsky
- Electronics Fundamental and application: D.Chattopadhyay and P CRakshit
- Electronic Principle: Albert PaulMalvino
- Digital circuits and design by S Salivahanan and SArivazhagan
- V. N. Mittal and A. Mittal, *Basic Electrical Engineering*, Tata McGraw-Hill PublishingCompany Ltd,2006

Reference book:

- Electronic Circuits, Discrete and Integrated- Charles Belove and Donald L.Schilling
- PrinciplesofElectricalEngineeringandElectronics-VKMehta,RohitMehta, SChandandCompany,New Delhi
- Solid State Electronic Devices- Ben G. Streetman and Sanjay Kumar Banerjee,PHI.
- Fundamental of Digital Circuits by Anand Kumar 2nd Eddition,PHI LearningPal, Rajendra and Korlahalli, J.S. (2011) Essentials of Business Communication. Sultan Chand & Sons. ISBN: 9788180547294.
- Theodore Wildi,*ElectricMachines, Drives and Power Systems*, Pearson,2005.
- Vincent Del Toro, *Electrical Engineering Fundamentals*, 2nd Ed., Prentice Hall India Learning Pvt. Ltd.,1989.
- J. Millman, C. Halkias and C. D. Parikh, *Millman's Integrated Electronics: Analog and DigitalCircuits and Systems*, 2nd Ed., McGraw Hill Education,2017.
- D.P.Leach,A.P.Malvino and G.Saha, *Digital Principles and Applications*, 8thEd.,McGraw Hill Education, 2014.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written ExaminationScheme:

Components	Internal Assessment	MTE	ETE
Weightage (%)	30	20	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
GEE11	Electric	CO1100	1	2	3	3	2	3	3	2	3	-	-	2	3	3	1

001	al and Electronics Technology	1.1															
		CO11001.2	3	3	2	3	1	1	3	-	3	2	3	2	3	2	1
		CO11001.3	3	3	2	2	2	3	2	-	2	-	-	3	1	1	1
		CO11001.4	3	2	3	3	1	3	2	-	3	-	-	2	2	1	1
		CO11001.5	2	3	1	2	3	3	2	-	1	-	-	2	1	1	2
		CO11001.6	3	2	2	1	3	1	3	-	1	-	-	3	3	2	3
		CO11001.7	1	1	2	3	3	2	3	-	1	-	-	1	2	2	3
		CO11001.8	1	2	1	2	1	3	3	-	1	-	-	2	3	2	2
		CO11001.9	3	2	1	3	3	2	1	-	2	-	-	1	1	1	3
		CO11001	2.22	2.22	1.89	2.44	2.11	2.33	2.44	2.0	1.89	2.0	3.0	2.0	2.11	1.67	1.89

1=weakly mapped

2= moderately mapped

3=strongly mapped

CSE11001	**Introduction to Programming**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours -45**	**3**	**0**	**0**	**3**
Pre-requisites/Exposure	**10+2 Level Mathematics, Knowledge of Basics of Computer**				
Co-requisites	**Knowledge of Logical Reasoning and Analysis**				

Course Objectives

- To understand the nature of programming as human activity.
- To practice the programming construct to solve multi-dimensional problems.
- To relate and implement mathematical concepts through programming in order to solvecomputational problems.
- To enable students to acquire structure and written expression required for their profession.
- To understand the principles of data storage and manipulation.

Course Outcomes

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

CO1. **Define** basics concepts of programming structure and implement the basics concepts ofProgramming.
CO2. **Solve** various problems using programming language and select the best solution.
CO3. **Apply** modularized solution and design such programs to appraise the solution
CO4. **Understand** the basic usage of memory and construct such memory in terms of array in aprogram.
CO5. **Define** the different data structures for various collection of data.

Catalog Description

Programming skills are mandatory for designing or solving problems through digital device. It is the language through which computational/digital devices are communicated rather interfaced. To develop any software programming language is a must. In present era almost, all aspect of life is somehow largely related to virtualization and digital data/information. Devices from smartphones to other handheld devices, drones, cameras, medical instruments etc. all needs programming at some part. In engineering it has become quintessential for the students/research scholars to learn programming. In this course, students will learn how to solve problems in various domains through a programming language. This course enables students with the basic skills of C Programming Language. Five Different related modules comprise this course. First Unit familiarizes students with basics of computers, algorithmic method to solve problem, introduction to generic programming construct. Basics of C Programming is upto iterative structure is depicted in Unit II. In Unit III students will learn about modularization using functions and one advance concept of C Programming, Pointers. Unit IV will cover one of the most important concepts in C Programming, Array and Strings. Unit V will accomplish this course with the advance concept like Structure, Union and File Handling. After this course students will grow their analytical ability to solve problem and logical skill. Also, this course effectively creates the ability to grasp any other Programming Language in easier manner.

Course Content

Unit I: 4 lecture hours

Basic Concepts of Programming: Introduction to components of a Computer System (disks, memory, processor, where a program is stored and executed, operating systems, compilers, etc.), Idea of Algorithm: steps to solve logical and numerical problems, Representation of Algorithms: Flowchart/Pseudo code with examples, From Algorithms to Programs; source code, variables and memory locations, Syntax and Logical Errors in compilation, Object and Executable code

Unit II: 10 lecture hours

Basics of C Programming : Characters used in C, Identifiers, Keywords, Data type & sizes, Constants &Variables, Various Operators used such as Arithmetic Operators, Relational & Logical Operators, Increment & Decrement Operators, Assignment Operators, Conditional or Ternary Operators, Bitwise Operators & Expressions; Standard Input & Output, formatted input scanf(), formatted output printf( ); Flow of Control, if-else, switch-case, Loop Control Statements, for loop, while loop, do-while loop, nested loop, break, continue, goto, label and exit() function

Unit III: 10 lecture hours

Functions and Pointers: Definition of Function, Declaration or Prototype of Function, Various types of Functions, Call by Value, Call by Reference, Recursion, Tail Recursion, Definition of Pointer, Declaration of Pointer, Operators used in Pointer, Pointer Arithmetic, Functions with Pointer

Unit IV **17 lecture hours**

Arrays and String: Definition, Single and Multidimensional Arrays, Representation of Arrays - Row Major Order, and Column Major Order, Application of arrays – searching and sorting, Sparse Matrices and their representations. Definition of a String, Declaration of a String, Initialization of a String, Various String Handling Functions with example

Structures and Unions: Definition of a Structure, Declaration of a Structure & Structure Variable, Initialization of a Structure, Operators used in Structure, Structure within Structures, Union, Difference between a Structure and a Union

Files: Types of File, File Processing, Handling Characters, Handling Integers, Random File Accessing, Errors During File Processing

Unit V **4 lecture hours**

Overview of Stacks and Queues: Introduction to Stack, Primitive operations on Stack, Real-life applications of Stack, Introduction to Queues, Primitive operations on Queues, Real-life applications of Queues.

Text Books

- Balagurusamy, E., n.d. Programming In ANSI C. 5th ed. Bangalore: mcgraw-hill.
- Gotfreid (196) *Schaum's Outline of Programming with C*, 2 edn., USA: McGraw-Hill
- Brian W. Kernighan, Dennis Ritchie (1988) *C Programming Language*, 2 edn., : Prentice Hall.

Reference Books

- Al Kelley, Ira Pohl (1988) *A Book on C*, 4 edn,: Addision Wesley Longman

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written ExaminationScheme:

Components	**Internal Assessment**	**MTE**	**ETE**
Weightage (%)	**30**	**20**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11001	Introduction to Programming	CO11001.1	2	2	3	3	3	1	3	-	2	-	-	1	3	2	3
		CO11001.2	3	2	2	2	1	1	1	-	2	-	-	3	2	1	3
		CO11001.3	2	2	1	1	1	2	2	-	3	-	-	3	1	1	3
		CO11001.4	3	3	1	3	2	2	3	-	3	-	-	2	1	3	3
		CO11001.5	2	2	3	1	1	3	1	-	2	-	2	3	2	2	1
		CO11001	2.4	2.2	2.0	2.0	1.6	1.8	2.0	-	2.4	-	2.0	2.4	1.8	1.8	2.6

GEE11012	**Disruptive Technology Innovations**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 45**	**1**	**0**	**2**	**2**
Pre-requisites/Exposure					
Co-requisites	--				

Unit 1: AI/ML lecture:10

Introduction To Artificial Intelligence, Definition And Brief History Of Ai, Key Ai Concepts And Terminology, Importance And Impact Of Ai In Various Industries, Machine Learning Basics, Distinction Between Ai And Ml, Types Of Machine Learning: Supervised, Unsupervised, And Reinforcement, The Role Of Data In Machine Learning, Evaluation Metrics In Ml, Natural Language Processing (Nlp), Text Preprocessing And Tokenization, Basic Sentiment Analysis,applications Of Nlp In Real-world Scenarios, Generative Ai And Large Language Models, Introduction To Generative Ai, What Are Large Language Models?, Ai In Business And Industry, How Ai Is Transforming Various Industries (E.G., Healthcare, Finance, Retail), Case Studies Of Successful Ai Implementations, Business Opportunities And Challenges In Ai Adoption, Ai Ethics And Bias, The Importance Of Ethics In Ai, Ethical Considerations In Ai Development And Deployment

Unit 2: Data Analytics With Tools: lecture:6

Introduction To Data Analytics, The Importance Of Data In Decision-making, Types Of Data (Structured Vs. Unstructured), Role Of Data Analytics In Various Industries, Data Collection And Preprocessing, Data Collection Methods, Data Cleaning And Quality Assessment, Dealing With Missing Data, Data Transformation And Feature Engineering, Introduction To Data Analytics Tools, Overview Of Popular Data Analytics Tools, Introduction To Microsoft Excel For Data Analysis, Data Visualization With Advanced Tools (E.G., Tableau, Power Bi)

Unit 3:IOT lecture:10

Introduction To Iot, Definition And Concept Of The Internet Of Things, Significance And Impact On Various Industries, Iot Architecture And Components Overview, Iot Hardware Components (Sensors, Actuators, Microcontrollers), Basocs Of Cloud Computing And Iot, Sensors And Actuators, Types Of Sensors (Temperature, Humidity, Motion, Etc.), Sensor Characteristics And Selection Criteria, Actuators And Their Role In Iot Systems, Practical Sensor And Actuator Examples, Iot Applications In Healthcare, Remote Patient Monitoring, Wearable Health Devices, Smart Citie, Agriculture And Environmental Monitoring, Augmented Reality (Ar) And Virtual Reality (Vr) In Iot, Digital Twins In Iot, Basics Of Arduino And Raspberry Pi, Hardware Components And Capabilities, Programming With Arduino Ide And Raspberry Pi, Hands-on Exercises With Arduino And Raspberry Pi

Unit 4: Cyber Security lecture:9

Introduction To Cybersecurity, Definition And Scope Of Cybersecurity, Historical Perspective And Evolution Of Cybersecurity, Cyber Threats And The Need For Protection, Overview Of Common Cyber Threats (Malware, Phishing, Ransomware, Etc.), Social Engineering Attacks, Confidentiality, Integrity, And Availability (Cia) Triad, Risk Assessment And Management, Security Policies And Procedures, Cybersecurity Best Practices, Security Technologies And Tools, Introduction To Antivirus Software, Firewalls And Intrusion

Detection/Prevention Systems (Ids/Ips), Encryption And Secure Communication, Application Of Cybersecurity In Business, Healthcare, Finance, Critical Infrastructure, Emerging Trends In Cybersecurity (Ai In Cybersecurity, Iot Security, Etc.)

Unit 5: Robotic Process Automation lecture:6

Definition Of Robotics And Automation, Historical Overview Of Robotics, Types Of Robots And Their Applications, Role Of Automation In Various Industries, Current Trends And Future Prospects, Robot Anatomy, And Components, Sensors: Proximity, Vision, Force, Touch, Etc, Actuators And Motors: Dc Motors, Servos, Stepper Motors, Robot Programming: Python, C++, Etc, Introduction To Computer Vision, Types Of Robot End-effectors/Grippers, Pick-and-place Operations, Introduction To Cobots (Collaborative Robots), Safety Considerations And Standards, Emerging Trends And Research Areas: Soft Robotics, Swarm Robotics, Bio-inspired Robotics, Industry 4.0 And Smart Factories.

Unit 6: Additive Manufacturing (Am) And Rapid Prototyping (Rp) lecture:6
Evolution And History Of Am And Rp, Basic Principles Of Am And Rp, Comparison With Traditional Manufacturing Methods, Applications And Benefits Of Am And Rp, Stereolithography (Sla), Fused Deposition Modeling (Fdm), Selective Laser Sintering (Sls), Selective Laser Melting (Slm), Electron Beam Melting (Ebm), Materials For Am: Polymers, Metals, Ceramics, And Composites Used In Am, Applications Of Am And Rp: Aerospace And Automotive Industries, Medical And Healthcare Applications, Consumer Goods And Electronics, Art And Fashion, Customization And Personalization, Tooling And Jigs.

Relationship Between COs and POs/PSOs

COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1: Understand key concepts and applications of disruptive technologies in AI/ML, IoT, and Cybersecurity.	3	3	2	2	3	1	1	-	-	2	1	2	3	2	3
CO2: Apply knowledge of data analytics tools and methods for effective decision-making.	3	3	3	2	3	1	1	-	2	-	2	2	3	2	2
CO3: Develop prototypes and IoT	3	2	3	3	3	-	2	-	2	1	3	2	3	3	3

solutions using hands-on exercises with Arduino and Raspberry Pi.															
CO4: Understand cybersecurity threats and apply protection mechanisms in real-world scenarios.	3	3	3	3	3	3	2	2	1	1	2	3	3	3	3
CO5: Analyze and implement automation solutions using Robotic Process Automation.	3	3	3	2	3	1	-	-	-	-	3	2	3	2	2
CO6: Understand the principles and applications of Additive Manufacturing (AM) and Rapid Prototyping (RP).	3	3	3	3	3	1	1	-	2	-	3	3	3	2	2

Legend for Mapping

1. **1 = Weakly Mapped**
2. **2 = Moderately Mapped**
3. **3 = Strongly Mapped**

ENG11053	**English Communication**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 45**	**3**	**0**	**0**	**3**
Pre-requisites/Exposure	**12th level English**				
Co-requisites	**--**				

Course Objectives

- To know the importance and techniques of communication skills in order to improve professional skills
- To enhance the knowledge of the students on vocabulary, syntax, and grammatical skills
- To improve writing skills by applying writing techniques, tools in practice sessions
- To achieve an overall enhancement in terms of reading, listening and speaking

Course Outcomes:

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

CO1. Understand basics of communication processes and to know the practical implications and its challenges at the workplace

CO2. Spell out the practical uses of English grammar and to use grammar correctly and unambiguously.

CO3. Demonstrate different formats of business communication like reports, letters, and other technical writings

CO4. Develop competence in speaking, reading, listening and writing in English.

Catalog Description

Effective communication is one of the basic requirements of a successful career. Both verbal and nonverbal communication is important to exchange ideas among the employees within the organization and outside the organization as well. In this course, the focus will be on improving LSRW skills, i.e. listening, speaking, reading and writing. Students will learn how to communicate effectively through prescribed syllabus. Classroom activities will be designed to encourage students to play an active role in the construction of their own knowledge and in the design of their own learning strategies. We will combine traditional lectures with other active teaching methodologies, such as group discussions, role play, small skit enactments, analysis of video scenes and debates. Class participation is a fundamental aspect of this course. Students will be encouraged to actively take part in all group activities and to give an oral group presentation. Students will be expected to interact with media resources, such as, web sites, videos, DVDs, and newspapers etc.

Course Content

Module I: 6 lecture hours

Communication Level 1: Basics of Communication, Means of Communication, Barriers of Communication

Module II: 6 lecture hours

Grammar and Syntax Level 1:Tense: types and uses, Idioms, One Word Substitutes, Discussion on the use of Articles and related exercises, Discussion on the use of Prepositions and related exercises, Exercises on Sentence –Making (Syntax), Practice exercises on Voice change, Class Exercises on Synonyms and Antonyms.

Module III: 6 lecture hours

Reading and Listening Skills Level 1: Introduction to listening skills: purposes and practice, Discussion on types of listening: difference between listening and hearing, Active listening: introduction listening exercises, Elementary level listening exercise, Intermediate level listening exercise, Advance level listening exercise, Introduction to Reading Skills, Strategies of reading, Skimming, Scanning and Summarizing, Comprehension exercises.

Module IV: 6 lecture hours

Speaking Skills Level 1: Introduction to Speaking Skills: Mother tongue influence, Discussion on various kinds of narrative styles and techniques: Welcome speech, Vote of Thanks, Farewell Speech, Debate and Elocution, Class Exercises on Descriptive narration, Practical Exercises on Narration styles, Presentation of small skits, Practicing Extempore in the class, Mock practices of Group discussion, Practicing speaking in pairs, Mock practice of job interviews.

Module V: 6 lecture Hours

Writing Skills Level 1: Business letters: definition, types and format, Practice exercises, Business reports: definition, types and format, Practice exercises, CV and Application letters: types and formats, Practice exercises, Compositions: Essays, precis paragraph writing

Text Books:

1. Kaul Asha. Effective Business Communication. PHI Learning Pvt Ltd. 2014.

2. Wren and Martin. High School Grammar And Composition. S. Chand, 1995.

3. Gupta, A. English Reading Comprehension. Ramesh Publishing House, 2009.

Reference Book:

- Lewis, Norman. Word Power Made Easy. Anchor: 2014.
- Riordan, Daniel G & Pauley Steven A. :Technical Report Writing Today. 2004.
- Hamp-Lyons and Heasely, B . Study Writing; A Course in Written English. For Academic and Professional Purposes, Cambridge Univ. Press, 2006.
- Quirk R., Greenbaum S., Leech G., and Svartik, J. A Comprehensive Grammar of the English language, Longman:London, 1985.
- Balasubramaniam, T. A Textbook of English Phonetics for Indian Students. Macmillan: 2012.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination Scheme:

Components	**Class Assessment**	**Mid-Term**	**ETE**
Weightage (%)	**30**	**20**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ENG11053	English Communication	CO11053.1	3	2	1	3	2	2	3	-	3	3	-	2	1	1	1
		CO110	1	3	2	1	3	2	3	-	1	2	-	2	1	2	2

		53.2															
		CO110 53.3	2	1	1	2	3	3	2	3	2	-	-	3	1	1	1
		CO110 53.4	2	2	1	1	1	1	3	2	2	-	-	3	1	2	3
		CO110 53	2.0	2.0	1.25	1.75	2.25	2.0	2.75	2.5	2.0	2.5	-	2.5	1.0	1.5	1.75

1=weakly mapped; 2= moderately mapped; 3=strongly mapped

		L	T	P	C
EIC11001	**Venture Ideation**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours -30**	**2**	**0**	**0**	**2**
Pre-requisites/Exposure	**Basic knowledge of English and computer applications such as Internet Explorer and MS Office**				
Co-requisites	**--**				

Course Objectives

- To help the students understand the way to be an Entrepreneur
- To identify the right business opportunity
- To empower students to perform a technical feasibility study and therebydeveloping a prototype
- To help students in identifying their customers using primary and secondaryresearch methods.
- Expose students to various factors of market and competition with the help ofmarket feasibility study, forecasting techniques, business model canvass and insights about financial statements.
- To prepare students with finalizing their entrepreneurial Portfolio

Course Outcomes

On completion of this course, the students will be able to:

CO1. Assess personal capacity in the context of the entrepreneurial process
CO2. Assess characteristics of successful entrepreneurs and entrepreneurial formsand processes
CO3. Apply resources, research and tools for Entrepreneurial ventures CO4. Analyze and apply opportunity identification techniques, feasibility, terminology, processes and models
CO5. Develop Ideation and planning documents for entrepreneurial venture

Catalog Description

Over the last decade, the core of our economy has been transitioning from one of industrial might, large monolithic corporations and mass production towards one of networks, flexible enterprises comprising many smaller units and unique value. This new economy is based on innovation originating in creativity and design; it is also disrupting long-standing and established employment patterns and bringing to the fore the importance of entrepreneurship. This core unit will bring together creativity, design and entrepreneurship at the conceptual and more practical level. It aims to explore the nature, determinants and consequences of creativity, design and entrepreneurship as well as the interaction between them.

Course Content

Unit 1. Introduction **6 hours**

Preview of the Course, Introduction to the Course, Guest Lecture with U.S. Secretary of Commerce Penny Pritzker – Meaning of Innovation, Entrepreneurial opportunities, Factors influencing the feasibility of an innovation, Innovation strategy: technology- push or market-pull, Product-market fit, How to develop a business model,

Walkthrough of the business model canvas, Welcome to Innovation for Entrepreneurs:From Idea to Marketplace.

Unit 2. Customer Discovery and Validation **6 hours**

Customer types, Customer archetypes, Customer segments and business models, Customer segments, value propositions, product features, value mapping, interviewingcustomer, insights of your customers.

Unit 3: Product Understanding and Marketing. **6 hours**

Customer value, The DNA of customer-centricity, Crossing the chasm, Qualitative and quantitative marketing research, importance and methods of market segmentation, Focusing on the target market, Beyond the chasm, Strategic implications of beyond thechasm, E-commerce: The internet as a selling platform.

Unit 4. Prototyping and Testing. **6 hours**

Planning for prototyping, Rapid prototyping and development, Lean startup MVPs, Choosing a wire framing/UX prototyping tool, Anatomy of an experience map, What you'll learn from user testing, Analytics and insight, Troubleshooting your customer discovery, Levels of a product/service.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Components	Mid Term	Presentation/Assignment	End Term
Weightage (%)	20	30	50

Relationship between the Program Outcomes (POs), Program Specific Outcomes (PSOs) and Course Outcomes (COs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
EIC11001	Venture Ideation	CO11001.1	2	2	3	2	2	2	1	-	3	-	2	1	2	3	3
		CO11001.2	3	3	1	1	3	2	3	-	1	-	3	2	2	2	3
		CO11001.3	3	2	1	1	1	2	3	2	1	-	2	2	2	3	1
		CO11001.4	2	1	1	2	2	2	2	3	3	-	2	1	3	3	2
		CO11001.5	2	1	2	3	1	3	3	2	2	-	2	3	3	1	1
		CO11001	2.4	1.8	1.6	1.8	1.8	2.2	2.4	2.33	2.0	-	2.2	1.8	2.4	2.4	2.0

1 = weakly mapped 2 = moderately mapped 3 = strongly mapped

		L	T	P	C
GEE12002	**Electrical and Electronics Technology Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours -45**	**0**	**0**	**3**	**2**
Pre-requisites/Exposure	**Class 12th Level physics**				
Co-requisites					

Course Objectives

- To study basic electronic components
- To observe characteristics of electronic devices
- To study basic electrical circuits

Course Outcomes

On completion of this course, the students will be able to:

CO1. **Show** different meters and instruments for measurement of electronic quantities and understand network theorems.

CO2. **Apply** the characteristics of different semiconductor devices like diode, BJT, FET etc and carbon tungsten filament lamps experimentally.

CO3. **Demonstrate** various application circuits using diodes

CO4. **Experiment with** the R-L-C circuits

CO5. **Illustrate** the three phase circuits

Catalog Description

Present technology requires necessary knowledge of ELECTRONICS in most fields. Avionics, Autotronics, Agrotronics, Physics, Process Chemistry, Health Services, etc., already employ components or even whole systems based on Electronics. Thus, there is an increasing number of professionals in these and many other fields who need adequate knowledge and training. Taken this into account, ADAMAS has developed the Basic Electronics and Electricity Integrated Laboratory, capable of covering different levels of difficulty. It is based on a series of self-taught modules, each one referring to a specific area of Electronics.

Course Content:

List of experiments (Electrical Part):

- Verification of Thevenin's theorem and Norton's theorem.
- Verification of Superposition theorem.
- Verification of Maximum power transfer theorem.
- Study of R-L-C series circuit.
- Study of R-L-C parallel circuit.
- Performance study of fluorescent, LED, tungsten and carbon lamps.
- Measurement of power in a three-phase circuit using two-watt meter method.

List of experiments (Electronics Part):

- Familiarization of bread board and electronics elements such as R, L, C, diode, and BJT etc.
- Familiarization of Function generator and measuring instruments such as CRO and multimeter.
- Study the V-I characteristic of PN junction diode and find knee voltage.
- Study the input and output characteristic of bipolar junction transistor (BJT): Common emitter (CE) configuration
- Study the transfer and drain characteristic of junction field-effect transistor (JFET), hence determine the drain resistance, transconductance factor, amplification factor.
- Study the transfer and drain characteristic of MOSFET, hence determine the drain resistance, transconductance factor, amplification factor.
- Realization of digital logic circuit using MOSFET (AND, OR, NOT etc.).

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/Written ExaminationScheme:

Components	Internal Assessment	ETE
Weightage (%)	**50**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
GEE12002	Electrical and Electronics Technology Lab	CO12002.1	3	3	3	2	2	2	3	-	1	-	-	2	1	1	1
		CO12002.2	1	2	3	1	2	2	3	-	1	-	-	3	3	2	1
		CO12002.3	3	3	2	3	2	2	1	-	3	-	-	3	3	1	1
		CO12002.4	3	3	2	2	1	1	1	-	3	-	-	3	3	2	1
		CO12002.5	2	2	2	3	2	2	1	-	2	-	-	2	3	1	1
		CO12002	2.4	2.6	2.4	2.2	1.8	1.8	1.8	-	2.0	-	-	2.6	2.6	1.4	1.0

1=weakly mapped

2= moderately mapped

3=strongly mapped

CSE12002	**Programming Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours -45**	**0**	**0**	**3**	**2**
Pre-requisites/Exposure	**10+2 Level Mathematics, Knowledge of Basics of Computer**				
Co-requisites	**Knowledge of Logical Reasoning and Analysis**				

Course Objectives

- To comprehend the practical nature of programming by solving through computer systems.
- To practice the programming construct to solve multi-dimensional problems.
- To relate and implement mathematical concepts through programming in order to solvecomputational problems.
- To enable students to acquire structure and written expression required for their profession.
- To understand the principles of data storage and manipulation.

Course Outcomes

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

CO1. List and memorize various Unix commands. Also, students be able to construct various basicprograms and appraise them.

CO2. Design and execute iterative statement in a program. Also, students be able to differentiateamong different iterative structure.

CO3. Construct such programs that used to define user defined functions and to design libraryfunctions.

CO4. Apply array concept in 1-Dimensional and 2-Dimensional construct. Hence be able to designstring functions to cater to various character array related problem.

CO5. Apply the concept of Stack, Queue, and Linked List and appraise them in different cases.

Catalog Description

Practical Programming skills are mandatory for designing or solving problems through digital device by implementation. To develop any software the behaviour of a programming language is a must through problem solving. In present era almost, all aspect of life is somehow largely related to virtualization and digital data/information. Devices from smartphones to other handheld devices, drones, cameras, medical instruments etc. all needs programming at some part. In engineering it has become quintessential for the students/research scholars to learn programming. In this course, students will learn how to solve problems in various domains through a programming language. This course enables students with the basic skills of C Programming Language. Five Different related modules comprise this course. First Unit familiarizes students with basics of computers, algorithmic method to solve problem, introduction to generic programming construct. Basics of C Programming isupto iterative structure is depicted in Unit II. In Unit III students will learn about modularization usingfunctions and one advance concept of C Programming, Pointers. Unit IV will cover one of the most important concepts in C Programming, Array and Strings. Unit V will accomplish this course with theadvance concept like Structure, Union and File Handling. After this course students will grow their analytical ability to solve problem and logical skill. Also, this course effectively creates the ability to grasp any other Programming Language in easier manner. In all these modules related programming problems are practiced to understand the syntactical and semantical correctness of a program. Gradually students become more comprehensive through the progress of the course.

Course Content

Experiments:

- Familiarization with LINUX commands and vi editor.
- Programs to demonstrate Decision Making, Branching and Looping, Use of break andcontinue statement etc.
- Implementation involving the use of Arrays with subscript, String operations and pointers.
- Implementation involving the use Functions and Recursion.
- Implementation involving the use Structures and Files.
- Implementation based on Stack Queues and Linked List for example Insertion and Deletion.

Text Books

- Balagurusamy, E., n.d. Programming In ANSI C. 5th ed. Bangalore: McGraw-hill.
- Gotfreid (196) *Schaum's Outline of Programming with C*, 2nd ed., USA: McGraw-Hill

- Brian W. Kernighan, Dennis Ritchie (1988) *C Programming Language*, 2nd ed., : Prentice Hall.
- Das Sumitabha, UNIX Concepts and Applications, 4th Ed., New Delhi, Tata McGraw-Hill

Reference Books

- Al Kelley, Ira Pohl (1988) *A Book on C*, 4th ed. Addision Wesley Longman

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination Scheme:

Components	Internal Assessment	ETE
Weightage (%)	**50**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12002	Programming Lab	CO12002.1	1	1	2	2	3	1	3	-	2	-	-	3	1	2	3
		CO12002.2	3	1	3	2	2	3	2	-	1	-	-	3	2	1	3
		CO12002.3	3	2	3	1	2	1	3	-	3	-	-	2	1	3	3
		CO12002.4	3	2	2	2	2	1	3	-	2	-	-	1	1	1	3
		CO12002.5	2	2	1	1	3	2	2	-	2	-	3	2	2	3	3
		CO12002	2.4	1.6	2.2	1.6	2.4	1.6	2.6	-	2.0	-	3.0	2.2	1.4	2.0	3.0

1=weakly mapped

2= moderately mapped

3=strongly mapped

Course Objectives

CEE12001	Engineering Drawing & CAD	L	T	P	C
Version1.0		0	0	4	2
Pre-requisites/Exposure	-				
Co-requisites	--				

- To comprehend general projection theory, with an emphasis on the use of orthographic projection to represent three-dimensional objects in two-dimensional views.
- To understand the application of industry standards and techniques applied in engineering drawing.
- To apply auxiliary or sectional views to most practically represent engineered parts.
- To Dimension and explain two-dimensional engineering drawings.
- To employ freehand 3D pictorial sketching to aid in the visualization process and to efficiently communicate ideas graphically.

Course Outcomes

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

- **Identify** the principle and significance of engineering drawing along with all the possible geometrical shapes.
- **Infer** the principle and concept of projection of Points, Lines and Planes over Auxiliary Planes.
- **Demonstrate** the principle and concept of Projection of Regular Solids.
- **Illustrate** Sections and Sectional Views of Right Angular Solids and Regular Solids.
- **Interpret** Isometric projection.

Catalog Description

In this fundamental course, students will be introduced to the basics of engineering drawing. Terms and definitions used in industries, such as manufacturing and construction, may also be covered. Specific skills introduced in this course may include sketching, geometric construction, auxiliary drawing, computing dimensions and lettering. Students will be also introduced to computer-aided drawing (CAD) software or techniques.

Course Content

Module 1 **Contact Hr. 9**

Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales.

Module 2 **Contact Hr. 9**

Orthographic Projections covering, Principles of Orthographic Projections Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes.

Module 3 **Contact Hr. 8**

Projections of Regular Solids covering, those inclined to both the Planes- Auxiliary Views.

Module 4 **Contact Hr. 9**

Sections and Sectional Views of Right Angular Solids covering, Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone.

Module 5 **Contact Hr. 10**

Isometric Projections covering, Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions;

Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions

Reference Books

1. Engineering Drawing, N. D. Bhat, Charotar Publishing House (2012).
2. Shah, M.B. & B.C. Rana (2008), Engineering Drawing and Computer Graphics, Pearson Education.
3. Engineering Drawing & Graphics using Autocad, T. Jeyapoovan, Vikas Publishing House Pvt. Ltd.-Noida; Third edition (2010).
4. https://nptel.ac.in/courses/112103019/

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Class Assessment	End Term
Weightage (%)	**50**	**50**

Relationship between the Course Outcomes (COs), Program Outcomes (POs)& PSOs

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEE12001	Engineering Drawing & CAD	CO12001.1	3	2	2	3	1	2	2	-	3	-	-	3	2	2	3
		CO12001.2	2	2	2	2	2	3	1	-	3	-	-	3	2	2	1
		CO12001.3	2	3	3	1	1	1	2	-	2	-	-	3	2	3	2
		CO12001.4	1	2	2	2	2	3	2	-	3	-	-	2	2	2	3
		CO12001.5	1	3	1	2	1	1	2	-	2	-	-	3	1	2	1
		CO12001	1.8	2.4	2.0	2.0	1.4	2.0	1.8	-	2.6	-	-	2.8	1.8	2.2	2.0

		L	T	P	C
MEE12001	**Engineering Workshop**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours -60**	**0**	**0**	**4**	**2**
Pre-requisites/Exposure	**12th level Physics, Engineering Mechanics**				
Co-requisites	**--**				

Course Objectives:

- To develop a skill in dignity of labor, precision, safety at work place, team working anddevelopment of right attitude.
- To acquire skills in basic engineering practice
- To identify the hand tools and instruments
- To gain measuring skills
- To develop general machining skills in the students

Course Outcomes:

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

CO1 Demonstrate the basic operations in pattern and mould making.
CO2 Experiment with different metal fitting works
CO3 Show basic forging and welding works
CO4 Understand the operations of machine tools
CO5 Select the appropriate tools required for specific operation
CO6 Understand the safety measures required to be taken while using the tools

Catalog Description:

Engineering Workshop is a place where students acquire knowledge on the operation of various processes involved in manufacturing and production. The Workshop Practice course makes students competent in handling practical work in engineering environment. Students will be expected to be familiar with engineering problems related to practical field.

Course Content

	List of Experiments (Any ten)
1	To make a single piece pattern from the given work piece and dimensions.
2	To make a double piece match pattern from the given dimensions.
3	To make a single piece cylindrical (solid) pattern from the given dimensions.
4	To make a cone from sheet metal as per given dimensions.
5	To make a frustum from sheet metal as per given dimensions.
6	To prepare a sand mould, given the single piece pattern and casting.
7	To prepare a sand mould, given the double piece match pattern and casting with different dimensions and shape
8	To make a square fitting from the given mild steel piece and the dimensions.
9	To make a square fitting from the given mild steel piece and the dimensions.
10	To make a single 'V' butt joint between two metal plates by using ARC welding.
11	To make a square butt joint between metal plates by using gas welding.
12	To perform various types of machining operations (cantering, facing and turning) on a given mild steel rod followed by the given dimensions.
13	To perform various types of machining operations (chamfering, grooving, thread cutting, andknurling) on a given mild steel rod followed by the given dimensions.

Reference Books

- Workshop Technology by S.K. Garg, 3rd Edition, LP

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written ExaminationScheme:

Components	**Class Assessment**	**End Term**
Weightage (%)	**50**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MEE12001	Engineering Workshop	CO12001.1	3	2	1	2	2	3	1	-	2	-	-	1	3	3	1
		CO12001.2	3	3	3	2	1	1	3	-	3	-	-	3	1	2	3
		CO12001.3	3	1	1	2	3	1	2	-	3	-	-	2	3	3	2
		CO12001.4	2	2	3	1	3	1	3	-	2	-	-	2	3	2	2
		CO12001.5	2	3	1	2	2	1	2	-	2	-	-	2	1	2	2
		CO12001.6	2	1	3	1	1	2	2	-	3	-	-	1	1	1	3
		CO12001	2.5	2.0	2.0	1.67	2.0	1.5	2.17	-	2.5	-	-	1.83	2.0	2.17	2.17

1=weakly mapped 2= moderately mapped 3=strongly mapped

SEMESTER III

SDS11510	**Engineering Mathematics III-C**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 60 Hours**	**3**	**1**	**0**	**4**
Pre-requisite/Exposure	**12^{th} level Mathematics**				
Co-requisite					

Course Objectives:

To introduce the concepts of descriptive statistics

To reinforce the concepts of probability

To demonstrate the applications of sampling and statistical inference

To establish the importance of hypothesis testing in experiments

Course Outcomes:

After completion of the course the students will be able to

CO1 :	Formulate descriptive statistics for real world problems
CO2 :	Explain the concepts of probability
CO3 :	Apply sampling and statistical inference in several problems
CO4 :	Compute significance based on hypothesis testing during experiments

Course Description:

Concepts of statistics and probability is extremely important for computer scientists as it is relevant for conducting several experiments and their validation. Several applications are built to interpret, analyse and infer from data. Moreover several real world phenomena are probabilistic in nature thus rendering the concepts and statistics and probability vital for students.

Content:

Unit-I: Descriptive statistics **15 Lecture Hours**

Measures of central tendency - mean, median and mode, geometric and harmonic means and their limitations, Measure of variations - quantiles, percentiles, quartiles, variance and standard deviation, standard errors of estimates, inter-quartile range, skewness, moment.

Correlation and Regression: Introduction to correlation analysis, Karl Pearson correlation coefficient, Rank Correlation, Regression Analysis, fitting straight lines, method of least square, regression coefficients, properties of regression coefficients and applications.

Unit-II: Introduction to probability **15 Lecture Hours**

Events and their probabilities, Rules of probability, Combinatorics, Conditional probability and independence, Total probability, Bayes' rule and applications.

Random variables, Distribution of a random variable, expectation, variance and standard deviation of probability distribution, standard discrete distributions – Bernoulli, binomial, geometric, Poisson, Poisson approximation of binomial distribution. Probability density function, Cumulative distribution function, standard continuous distribution – uniform, exponential, normal distribution. Bivariate distribution.

Unit-III: Sampling and Statistical Inference **15 Lecture Hours**

Population and Sample, Sampling with and without replacement, Random samples, Population parameters, Sample statistics, Sampling distribution of means, Sampling distribution of variances, Case where population variances are unknown.

Point estimate and Interval Estimates, Unbiased estimates and efficient estimates, Confidence Interval estimates of population parameters, Maximum likelihood estimates.

Unit-IV: Test of Hypothesis and Significance **15 Lecture Hours**

Statistical hypothesis, Null and Alternative hypothesis, Type I and Type II errors, Level of Significance, One-Tailed and Two-Tailed tests, p value. Special tests of significance for large samples and small samples (F, chi- square, z, t-test).

Text Books:

1. Fundamentals of Statistics- vol. I, A. M. Gun, M. K. Gupta, B. Dasgupta, world Press.
2. Vijay K. Rohatgi, A.K. Md. Ehsanes Saleh, An Introduction to Probability and Statistics, Second edition, Wiley.
3. T N Srivastava and ShailagaRego, Statistics for Management, McGraw Hill **Education.**

Reference Books:

1. Statistical Methods (Volume I & II), N. G. Das, Mc GrawHill Education
2. Fundamentals of Mathematical Statistics, S.C. Gupta, V. K. Kapoor, Sultan Chand & Sons.

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination

Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
SDS11510	Engineering Mathematics III-C	CO11510.1	3	2	3	3	2	1	3	-	1	-	-	3	3	1	1
		CO11510.2	3	3	3	2	3	1	2	-	2	-	-	3	3	1	3
		CO11510.3	2	3	3	2	1	2	3	-	1	-	-	1	2	3	1
		CO11510.4	2	2	2	3	3	2	3	-	1	-	-	3	2	1	3
		CO115100	2.5	2.5	2.75	2.5	2.25	1.5	2.75	-	1.25	-	-	2.5	2.5	1.5	2.0

1 = Weakly Mapped, 2 = Moderately Mapped, 3= Strongly Mapped

MTH11534	**Discrete Structures and Logic**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours -45**	**3**	**0**	**0**	**3**
Pre-requisites/Exposure	**Engineering Mathematics I & II**				
Co-requisites					

Course Objectives:

To introduce the concepts of logic

To reinforce the concepts of set theory

To demonstrate the applications of permutations and combinations

To establish the importance of graph theory in computer science

Course Outcomes:

After completion of the course the students will be able to

CO1 : Formulate propositional and first order logic

CO2 : Explain the concepts of set theory

CO3 : Apply permutation and combinations in several problems

CO4 : Develop algorithms for graphs and trees

Course Description:

Computer science is driven by data represented as discrete structures and algorithms defined by logic. This course will cover the basic concepts of propositional and first order logic, followed by set theory definitions and applications. Next basic counting strategies, permutations and combinations will be explored alongside graph theory concepts

Course Content

Unit – I :

Propositional Logic: Encoding, reasoning and deductions. Truth tables, satisfiability and validity. Tautology, Contradictions, Contingency, Propositional equivalences, Inverse, Converse, and Contra-positive, Conjunctive normal form, Disjunctive normal form.

First Order Logic: Predicates, quantifiers and interpretations. Logical deduction, Rules of Inference: Addition, Conjunction, Simplification, Modus Ponens, Modus Tollens, Disjunctive and Hypothetical Syllogism, Constructive and Destructive Dilemma. **[15L]**

Unit II :

Set Theory: Discrete versus continuous mathematics. Relevance to Computer Science, Relations: Definition and properties, equivalence relations and partitions, partial orders, lattices. Functions: Definition and properties (injective, surjective, bijective), composite and inverse functions, recursive functions. Finite and infinite sets, countable sets. Uncountable sets, Cantor's diagonal argument, and the power-set theorem. Applications in Computer Science - Unsolvability of problems.

[15L]

Unit III:

Basic Counting: Sum and product rules. Permutations and combinations with and without repetition. Binomial and multinomial theorems. Catalan Numbers.

Combinatorics: Basics: pigeonhole principle and applications; Counting methods: principle of inclusion exclusion, proving combinatorial identities, combinatorial arguments, permutations, derangements. mathematical induction; Recurrence: Linear recurrences, Generating Functions.

[12L]

Unit IV:

Graph Theory:

Graphs : Graph models, terminologies and special types of graphs, graph representation, vertex degrees and counting, degree-sum formula, subgraphs, isomorphism, cuts and connectivity, Euler and Hamiltonian Paths, shortest path problems, planar graphs, graph colouring, Traveling Salesman Problem and NP-Completeness

Trees : Introduction, applications, tree traversal, spanning tree, minimum spanning tree. **[18L]**

Text Books

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw - Hill.
2. V Somasundaram, Discrete Mathematics with Graph Theory and Combinatory, Tata McGraw- Hill.
3. T. Veeraranjan, Discrete Mathematics with Graph Theory and Combinatorics, Tata McGraw- Hill.

Reference Books

1. Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press.
2. Discrete Mathematics for Computer Science", Illustrated Edition, Kenneth Bogart, Clifford Stein, Robert L. Drysdale, Key College Publishing.

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
MTH11534	Discrete Structures and Logic	CO11534.1	2	3	2	3	3	3	3	-	3	-	-	3	1	2	1
		CO11534.2	2	2	2	2	2	2	3	-	2	-	-	3	2	1	3
		CO11534.3	3	3	2	2	2	2	3	-	2	-	-	3	1	2	1

		CO11534.4	2	2	2	3	1	1	2	-	3	-	-	3	3	3	3
		CO11534	2.25	2.5	2.0	2.5	2.0	2.0	2.75	-	2.5	-	-	3.0	1.75	2.0	2.0

1 = Weakly Mapped, 2 = Moderately Mapped, 3= Strongly Mapped

		L	T	P	C
CSE11103	**Principles of Programming Language**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45 Hours**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Knowledge on programming basics**				
Co-requisite	**NIL**				

Course Objectives:

- To motivate students to solve the problems in engineering using the concepts of object-oriented programming.
- To enable students to apply OOP concepts in building solutions to real-world problems
- To help the student to acquire knowledge of software development
- To enable students to debug simple C++ programs.
- To enable students to execute C++ programs successfully.

Course Outcomes:

On the completion of this course the student will be able to

- Discuss fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- Understand fundamentals of object-oriented programming in C++, including defining classes, invoking methods, using class libraries, etc.
- Explain important topics related to functions and pointers.
- Understand the scope of variables and utility of exception handling.
- Utilise the OOP knowledge to create, debug and run simple C++ programs.

Course Description:

This course introduces students to C++ programming language, a dominant language in the industry today. Students will be taught the fundamentals of programming. These concepts are applicable to programming in any language. Topics covered include basic principles of programming using C++, algorithmic and procedural problem solving, program design and development, basic data types, control structures, functions, arrays, pointers, and introduction to classes for programmer-defined data types.

Course Content:

Unit-I **09 Lecture Hours**

C Refresher: Procedural programming, variables, data types, operators, conditions, loops, functions, arrays, pointers, strings and structures

Unit-II **09 Lecture Hours**

Introduction to OOP: Need for OOP Paradigm, Procedural programming vs object oriented programming, object oriented concepts.

Class concept in OOP: Difference between C structure and class, specifying a class, defining member functions: inside and outside class, scope resolution operator, Array within a class, array of objects, Static data members and member functions, Object as function arguments, returning objects, Friend function

Unit-III **09 Lecture Hours**

Functions: Main function, function prototyping, inline functions, reference variables, call by reference ,Defaults arguments, function overloading, Math library functions.

Pointers: memory allocation for objects, pointer to members, pointer to object, this pointer local classes.

Constructor and destructor: Constructor, types of constructors: default, parameterized and copy constructor, constructor overloading, constructor with default parameter, dynamic initialisation of objects, destructor

Operator overloading and Type Conversion: Defining operator overloading, overloading unary and binary operator, Data Conversion: Basic to User Defined , User defined to basic, Conversion from one user-defined to other.

Unit-IV **09 Lecture Hours**

Scope: Local and global scope, Inheritance and polymorphism: Base class, derived class, visibility modes, derivation and friendship, Types of inheritance, Containership, virtual function binding, pure virtual functions, Abstract class, pointer to derived class.

Console IO operations: C++ stream classes, Unformatted IO operations, formatted IO operations, managing output with manipulators.

Exceptions: Run time errors, exception handling using try, catch and throw, Working with files: Classes for file stream operations, opening and closing files, File opening modes, file Pointers, Error handling during file operations, command line arguments, templates

Unit-V **09 Lecture Hours**

Problem solving with C++: Case study for problem solving on various real life systems like Bank, Library, Hospital, Hotel, Employee management system etc.

Text Books:

Bjrane Stroustrup, “C++ Programming language” , Pearson education Asia

Reference Books:

Yashwant Kenetkar,”Let us C++”,Oxford University Press

B.A. Forouzan and R.F. Gilberg, Compiler Science,”A structured approach using C++” Cengage Learning, New Delhi.

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination

Examination Scheme:

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11103	Principles of Programming Language	CO11103.1	2	2	2	2	1	2	1	-	1	-	-	3	3	1	1
		CO11103.2	3	3	2	3	1	3	2	-	1	-	-	2	2	2	1
		CO11103.3	2	3	2	2	3	3	2	-	1	-	-	3	2	2	2
		CO11103.4	2	3	2	2	3	2	3	-	1	-	-	2	1	2	2
		CO11103.5	3	1	2	2	3	3	2	-	1	-	-	2	3	2	3
		CO11103	2.4	2.4	2.0	2.2	2.2	2.6	2.0	-	1.0	-	-	2.4	2.2	1.8	1.8

1 = Weakly Mapped, 2 = Moderately Mapped, 3 = Strongly Mapped

CSE11104	**Data Structures and Algorithms**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45 Hours**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Programing Concepts in C**				
Co-requisite	**Logical Ability**				

Course Objectives:

- Introduce the fundamental concept of data structures
- To emphasize the importance of data structures in developing and implementing efficient algorithms.
- Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs.

Course Outcomes:

On the completion of this course the student will be able to

- Define the concept of Dynamic memory management, data types, and algorithms.
- Illustrate advantages and disadvantages of specific algorithms and data structures.
- Solve bugs in program, recognize needed basic operations with data structures.
- Interpret algorithms and data structures in terms of time and memory complexity of basic operations.
- Compare the computational efficiency of the principal algorithms for sorting, searching, and hashing.

Course Description:

Study of advanced programming topics focused on logical structures of data as well as the design, implementation and analysis of algorithms operating on these structures. Students will gain the fundamental concept of data structures and to emphasize the importance of data structures in developing and implementing efficient algorithms.

Course Content:

Unit-I **5 Lecture Hours**

INTRODUCTION: Data and Information, Representation of Data, Data Type, Data Structure, Classifications of Data Structures, Application of Data Structures, Abstract Data Type, Operations Perform on Data Structure, Overview of Different Data Structures, Algorithm, Types of Algorithm, Algorithm Development Life Cycle.

ARRAY AND STRING : Array, One-dimensional array, Address calculation in One-dimensional array

Multi-dimensional array, Address calculation in two-dimensional array, Operations Perform on Array, Applications of Array, Representation of Polynomials , Sparse Matrix, Strings, Array of strings, Operations Perform on Strings. Pointer Declaration, Address of Operator, Indirection Operator, Null Pointer, void Pointer, Generic Functions, Dangling Pointer, Arithmetic Operation with Pointer, Pointer to Pointer, Pointers and Arrays, Array of Pointers, Pointer to an Array , Pointer to Function, Passing addresses to Function, Function returning Pointer, Dynamic Memory Allocation, Creating one-dimensional array, Creating two-dimensional array, Pointers, Arrays and Strings.

Unit-II **10 Lecture Hours**

STACK AND QUEUE: Stack, Operations on Stack, Stack Representation with Array, Stack Representation with Linked List, Processing of function calls, ,Evaluation of Arithmetic expressions, Queue, Operations on Queue, Queue Representation with Array, Queue Representation with Linked List, Application of Queue, Drawback of Linear Queue Circular Queue, Circular Queue Representation with Array, Dequeue, Operation on DeQueue, Priority Queue, Representation of Priority Queue.

LINKED LIST: Limitations of Array, Linked List, Singly Linked list, Operations on Singly linked list, Representation of polynomials using linked list, Circular Linked list, Operation on Circular Link List, Josephus Problem, Doubly Linked list, Operation on Doubly Link List, Circular Doubly Linked List, Disadvantages of Linked List

Unit-III : **15Lecture Hours**

TREE: Terminology of Tree, Binary Tree, Strictly Binary Tree, Extended Binary Tree, Complete Binary Tree, Full Binary Tree, Skewed Binary Tree, Binary Expression Tree, Balanced Binary Tree, Threaded Binary Tree, Properties of Binary Tree, Representation of Binary Tree, Binary Tree Traversal, Binary Search Tree, Operations on Binary Search Tree, Heap, Operations on Heap, AVL Tree, Operations on AVL Tree,

GRAPH: Terminology of Graph, Terminology of a Directed Graph, Operations on Graph, Representation of Graph, Graph Traversal, Spanning Trees and Minimum Spanning Trees, Kruskal’s Algorithm, Prim’s Algorithm.

Unit-IV **10 Lecture Hours**

SEARCHING AND SORTING: Linear Search, Binary Search, Interpolation Search, Bubble Sort, Insertion Sort

Selection Sort, Quick Sort, Merge Sort, Heap Sort, Radix Sort, Shell Sort, Time complexity of Sorting Algorithms

RECURSION: Recursion Essentials, Infinite Regress, Depth of Recursion, Recursion Tree, Types of Recursion, Factorial, Fibonacci Sequence, GCD, Integer Power, Tower of Hanoi, Non-attacking Eight Queens, Converting Recursive function to Iterative.

Unit-V **5 Lecture Hours**

HASHING: Hash Table, Hash Function, Division Method, Mid Square method, Folding method

Collision Resolution, Linear Probing, Quadratic Probing, Double Hashing, Separate Chaining, Load Factor

FILE STRUCTURE: Elements of File System, Category of File Organisation, Sequential File Organisation

Heap File Organisation, Hash File Organisation, Index Sequential File Organisation

Primary Index, Secondary Index.

Text Books:

Fundamentals of Data Structures, Illustrated Edition by Ellis Horowitz, SartajSahni and Computer Science Press.
Introduction To Algorithms, Thomas H.Cormen, Thomas H Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein.

Reference Books:

Algorithms, Data Structures, and Problem Solving with C++, Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company.
How to Solve it by Computer, 2nd Impression by R. G. Dromey, Pearson Education.

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11104	Data Structures and Algorithms	CO11104.1	3	3	3	3	2	2	1	-	2	-	-	2	2	1	3
		CO11104.2	2	2	2	3	3	2	2	-	2	-	-	1	1	1	1
		CO11104.3	3	3	3	2	1	3	3	-	1	-	-	2	1	1	2
		CO11104.4	2	2	2	2	1	3	2	-	2	-	-	1	2	1	1
		CO11104.5	2	3	2	3	2	2	3	-	1	-	-	3	3	2	3
		CO11104	2.4	2.6	2.4	2.6	1.8	2.4	2.2	-	1.6	-	-	1.8	1.8	1.2	2.0

1 = Weakly Mapped, 2 = Moderately Mapped, 3 = Strongly Mapped

CSE11105	**Switching Circuit and Logic Design**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45 Hours**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Basic Electronics, Modern Physics**				
Co-requisite	**Digital Electronics**				

Course Objectives:

- To introduce an overview of logic families.To introduce an overview of logic families.
- To develop students for building k-map.
- To provide the students a detailed analysis of sequential circuit.
- To introduce the students to formalize with ASM chart.

Course Outcomes:

On the completion of this course the student will be able to

- **Understand** and construct the basic design principles of logic gate.
- **Understand** the different fabrication techniques used in Bipolar, CMOS and PLA.
- **Formaliz**e with Mealy and Moore machine.
- **Construct** ROM design.
- **Realize** the ASM Charts

Course Description:

This course will discuss the basic background of switching circuits, and discuss techniques for mapping the theory to actual hardware circuits. Synthesis and minimization techniques of combinational and sequential circuits shall be discussed in detail. Designing circuits using high-level functional blocks shall also be discussed.

Course Content:

Unit-I **7 Lecture Hours**

Switching Circuits:

Logic families: TTL, nMOS, CMOS, dynamic CMOS and pass transistor logic (PTL) circuits, inverters and other logic gates, area, power and delay characteristics, concepts of fan-in, fan-out and noise margin.

Unit-II **10 Lecture Hours**

Switching theory:

Switching algebra, logic gates, switching functions, truth tables and switching expressions, minimization of completely and incompletely specified switching functions, Karnaugh map and Quine-McCluskey method, multiple output minimization, representation and manipulation of functions using BDD's, two-level and multi-level logic circuit synthesis.

Unit-III **7 Lecture Hours**

Combinational logic circuits:

Realization of Boolean functions using NAND/NOR gates, Decoders, multiplexers. logic design using ROMs, PLAs and FPGAs. Case studies, fault diagnosis of combinational circuits

Unit-IV **15 Lecture Hours**

Sequential circuits:

Clocks, flip-flops, latches, counters and shift registers, finite-state machine model, Mealy and Moore machines, synthesis of synchronous sequential circuits, Conversion of Mealy m/c to Moore m/c and vice-versa, minimization and state assignment, Incompletely specified m/c's, asynchronous sequential circuit synthesis.

Unit-V **6 Lecture Hours**

ASM charts:

Representation of sequential circuits using ASM charts, synthesis of output and next state functions, data path control path partition-based design.

Text Books:

H. Taub and D. Schilling, Digital Integrated Electronics, McGraw-Hill.

Reference Books:

Z. Kohavi, Switching and Finite Automata Theory, Tata McGraw-Hill
Randy H. Katz and Gaetano Borriello, Contemporary Logic Design, Prentice Hall of India

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11105	Switching Circuit and Logic Design	CO11105.1	2	2	2	1	1	3	1	-	1	-	-	3	2	2	3
		CO11105.2	2	3	2	3	1	2	3	-	2	-	-	1	3	2	2
		CO11105.3	2	2	1	2	1	3	3	-	1	-	-	3	1	1	1
		CO11105.4	3	3	3	1	3	1	1	-	3	-	-	1	2	2	1
		CO11105.5	3	2	3	2	3	2	2	3	1	-	-	2	1	1	2
		CO11105	2.4	2.4	2.2	1.8	1.8	2.2	2.0	3.0	1.6	-	-	2.0	1.8	1.6	1.8

1 = Weakly Mapped

2 = Moderately Mapped

3 = Strongly Mapped

CSE12106	**Principles of Programming Language Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 30 Hours**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure	**Knowledge on programming basics**				
Co-requisite	**NIL**				

Course Objectives:

- To motivate students to solve the problems in engineering using the concepts of object-oriented programming.
- To enable students to apply OOP concepts in building solutions to real-world problems.
- To help the student to acquire knowledge of software development
- To enable students to debug simple C++ programs.
- To enable students to execute C++ programs successfully.

Course Outcomes:

On the completion of this course the student will be able to

- **Define** classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem.
- **Apply** fundamentals of object-oriented programming in C++, including defining classes, invoking methods, using class libraries, etc.
- **Explain** important topics related to functions and pointers.
- **Understand** the scope of variables and utility of exception handling..
- **Utilise** the OOP knowledge to create, debug and run simple C++ programs.

Course Description:

This course introduces students to C++ programming language, a dominant language in the industry today. Students will be taught the fundamentals of programming. These concepts are applicable to programming in any language. Topics covered include basic principles of programming using C++, algorithmic and procedural problem solving, program design and development, basic data types, control structures, functions, arrays, pointers, and introduction to classes for programmer-defined data types..

Course Content:

Unit-I **09 Lecture Hours**

Write a C program to find factorial of a number.

Write a C program to find roots of a quadratic equation.

Write a C program to find whether the number is Armstrong.

Unit-II **09 Lecture Hours**

Write a C++ program that demonstrate the basic class program to get department, name and salary of an employee.

Write a C++ program that to calculate area of circle, square, rectangle and triangle using switch-case statements

Write a C++ program to that accepts number from user and displays all the factors of that number.

Unit-III **09 Lecture Hours**

Write a C++ Program to swap two numbers using pointers.

Write a C++ Program to add two numbers using pointers.

Write a C++ Program to find length of string using pointer.

Unit-IV **09 Lecture Hours**

Write a C++ Program to show multiple inheritance

Write a C++ Program to show multilevel inheritance

Write a C++ Program to fetch the content of an existing file and display its contents.

Unit-V **09 Lecture Hours**

Write a C++ Program to read the name and roll numbers of students from keyboard and write them into a file and then display it.

Define a class "Time" that contains following data members and member functions.

Data members: 1. Hours 2. Minutes 3. Seconds

Member Functions: 1. To get time from user 2. To display time on the screen 3. To calculate sum of two time objects. Write a C++ program that can read values of Time for two objects T1 and T2, calculate sum and display sum using defined member functions

Create class "Sales" having following data members and member functions:

Data Members: 1. Name of Salesman 2. Sales of Salesman

Member functions to calculate commission 1. Commission is Rs. 10 per thousand if sales are at least Rs. 25000 or more 2. Commission is Rs. 5 otherwise. Write a C++ program that calculate and print name and sales of salesman.

Text Books:

Bjrane Stroustrup, "C++ Programming language" , Pearson education Asia

Reference Books:

Yashwant Kenetkar,"Let us C++",Oxford University Press

B.A. Forouzan and R.F. Gilberg,CompilerScience,"A structured approach using C++" Cengage Learning, New Delhi.

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination

Examination Scheme:

Components	Internal	End Term
Weightage (%)	**50**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12106	Principles of Programming Language Lab	CO12106.1	2	2	1	1	1	2	2	-	1	-	-	2	1	2	3
		CO12106.2	2	2	3	3	3	1	2	-	2	-	-	2	1	1	3
		CO12106.3	3	2	3	2	2	3	3	-	1	-	-	1	1	2	2
		CO1210	3	2	1	3	1	3	1	-	1	-	-	2	3	2	3

		6.4															
		CO12106.5	3	3	2	2	3	1	1	-	1	-	-	2	3	2	1
		CO12106	2.6	2.2	2.0	2.2	2.0	2.0	1.8	-	1.2	-	-	1.8	1.8	1.8	2.4

1 = Weakly Mapped

2 = Moderately Mapped

3 = Strongly Mapped

CSE12107	**Data Structures and Algorithm Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 30 Hours**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure	**Knowledge on programming basics**				
Co-requisite	**NIL**				

Course Objectives:

The objective of the course is to teach programming (with an emphasis on problem solving) and introduce elementary data structures. The student should, at a rudimentary level, be able to prove correctness (loop invariants, conditioning, etc).

Course Outcomes:

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

CO1. **Explain** asymptotic performance of the algorithms.

CO2. **Illustrate** Linear data structures and their applications such as Stacks, Queues and Linked Lists

CO3. **Solve** and understand Non-Linear Data Structures and their Applications such as Trees and Graphs

CO4. **Interpret** searching and sorting algorithms.

Course Description:

Data Structures (also called Data Structures and Algorithms in some places) is a core course in all computer science undergraduate curricula. The course is the basis for understanding several data structures and also algorithms that operate on them. The course forms the foundation for almost all computer science subjects: compilers, operating systems, databases, AI and software engineering.

Course Content:

List of Programs:

1. Write a menu based C program to insert a node at the beginning, after a specified position, at the end of a singly linked list.

2. Write a menu based C program to delete a node from the beginning, from a specified position, from the end of a singly linked list.

3. Write a menu based C program to display the data part of the nodes in reverse order, reverse the list and sort the elements of a singly linked list.

4. Write a menu based C program to insert a node at the beginning, after a specified position, at the end of a doubly linked list.

5. Write a menu based python program to delete a node from the beginning, from a specified position, from the end of a doubly linked list.

6. Write a menu based C program to display the data part of the nodes in reverse order, reverse the list and sort the elements of a doubly linked list.

7. Write a menu based C program to insert, delete and display operation of a linear queue by using singly linked list.

8. Write a menu based C program to insert, delete and display operation of a linear queue by using an array.

9. Write a menu based C program to implement push, pop and display operation of a linear queue by using singly linked list.

10. Write a menu based C program to implement push, pop and display operation of a linear queue by using an array.

11. Write a menu based C program to implement insert, delete and display operation of a circular queue by using an array.

12. Write a menu based C program to implement insert, delete and traverse operation of a binary search tree using doubly linked list.

13. Write a menu based C program to implement linear search, binary search and interpolation search algorithm.

14. Write a menu based C program to implement bubble sort, selection sort, and quick sort, merge sort, insertion sort, heap sort and radix sort algorithm.

15. Implement Tree Traversals, BFS, Graph Traversal, Shortest path and some topics on Spanning Tree using C.

Text Books:

1. Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, SartajSahni and Computer Science Press.

2. Introduction To Algorithms", Thomas H.Cormen, Thomas H Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein.

Reference Books:

1. Algorithms, Data Structures, and Problem Solving with C++, Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company.

2. How to Solve it by Computer, 2nd Impression by R. G. Dromey, Pearson Education.

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	**Internal**	**End Term**
Weightage (%)	**50**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12107	Data Structures and Algorithm Lab	CO12107.1	2	2	3	1	1	2	3	-	2	-	-	3	2	3	3
		CO12107.2	2	2	2	2	1	2	1	-	3	-	-	1	2	3	2
		CO12107.3	3	3	3	3	2	1	3	-	1	-	-	3	3	1	3
		CO12107.4	3	3	2	3	2	3	2	-	3	-	-	1	2	3	1
		CO12107.5	3	2	2	2	1	3	3	-	3	-	-	1	2	2	1
		CO12107	2.6	2.4	2.4	2.2	1.4	2.2	2.4	-	2.4	-	-	1.8	2.2	2.4	2.0

1 = Weakly Mapped
2 = Moderately Mapped
3 = Strongly Mapped

MTH12531	Numerical Techniques Lab	L	T	P	C
Version 1.0	**Contact Hours- 30**	**0**	**0**	**2**	**1**
Pre-requisites/Exposure	**Numerical Techniques and C/MATLAB Programming Language**				
Co-requisites	**--**				

Course Objectives

The primary objective of this course is to provide students hands on experience of implications of the various techniques used in numerical computations through understanding algorithms and writing computer programs. These techniques include solving non-linear equations and system of linear equations, computing numerical interpolation and numerical integrations, and solving ordinary differential equations. The ultimate goal of this course is to enhance the skill to critically think, model and solve any mathematical problems.

Course Outcomes

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

- Numerically solve non-linear equations related to univariate problems
- Numerically solve system of linear equation related to multivariate problems
- Obtain interpolated value of a function that is known at a finite number of points
- Numerically compute values of any definite integrals
- Solve initial value problems representing systems with spatial/temporal variations

Course Description

Numerical computations play a crucial role in solving simple to complex problems in science and engineering. Growing power and efficiency of the modern computers has made the numerical computations more sophisticated, accurate and powerful. Practical knowledge of numerical computation techniques is very essential for modern science and engineering. This lab course is designed for under graduate students to provide them comprehensive knowledge and practical experience of solving various mathematical problems using suitable numerical techniques. In this course students will learn algorithms and write computer programs for the numerical techniques towards solving problems. The course includes techniques for solving non-linear equations and system of linear equations, computing interpolations and integrations of functions, and solving ordinary differential equations.

Course Content

Write a C / MATLAB program to execute the following:

- The root of non-linear equation using Bisection method.
- The root of non-linear equation using false position method.
- The root of non-linear equation using Newton Raphson method.
- Interpolate values using Newton‘s forward Interpolation method.
- Interpolate values using Newton‘s backward Interpolation method.
- Interpolate values using Lagrange‘s interpolation method.
- Solve a system of linear equation using gauss-elimination method.
- Solve a system of linear equation using gauss-seidel method.
- Evaluate the integral using different numerical integration rules.
- Solve an ordinary differential equation using different numerical methods.

Text Books

- Cleve Moler, *Numerical Computing with MATLAB, Electronic edition:* The MathWorks, Inc., Natick, MA, 2004, http://www.mathworks.com/moler. Print edition: SIAM, Philadelphia, 2004.http://ec-securehost.com/SIAM/ot87.html
- T. Veerarajan, T. Ramachandran , Numerical Methods with Programs in C , Tata McGraw-Hill Publications.
- S. Dey, S. Gupta , Numerical Methods, McGraw Hill Education.

Reference Books

- B.S. Grewal, Numerical Methods in Engineering & Science: with Programs in C & C++, 11th Ed., Khanna Publishers, 2013.
- R. Garg, R. S. Goel, Numerical techniques: Computing with C and MATLAB, CBS publishers, 2018.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	MTE	ETE
Weightage (%)	50	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MTH12531	Numerical Techniques Lab	CO12531.1	2	3	2	3	2	3	1	-	3	-	-	2	3	2	3
		CO12531.2	2	3	2	3	1	3	3	-	1	-	-	1	2	3	2
		CO12531.3	2	2	2	2	1	1	1	-	3	-	-	2	3	2	2
		CO12531.4	3	2	3	1	2	2	3	-	3	-	-	1	2	1	1
		CO12531.5	2	2	2	1	1	3	3	-	3	-	-	2	3	1	3
		CO12531	2.2	2.4	2.2	2.0	1.4	2.4	2.2	-	2.6	-	-	1.6	2.6	1.8	2.2

IDP14001	Interdisciplinary Projects	L	T	P	C
Version 1.0	Contact Hours- 75	0	0	5	3
Pre-requisites/Exposure	Numerical Techniques and C/MATLAB Programming Language				
Co-requisites	--				

Course Objectives

This course will develop a student's knowledge of and appreciation for the

- interdisciplinary nature of knowledge and learning
- importance and value of integrating knowledge and perspectives from multiple disciplines as a means to evaluating and understanding complex topics, problems, issues, phenomena, and events
- competencies learned during the educational process and to apply these competencies in a real-world application

Course Outcomes

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

CO1. recognize the unique advantages of integrative research and learning
CO2. understand the fundamentals of research methods and practices of various academic disciplines
CO3. demonstrate an understanding of current issues and concerns
CO4. realize the importance of ethics in research process
CO5. understand the inter-disciplinary systems of research documentation

Typical Progress Roadmap

- After discussion with the Project Advisor(s), each student shall prepare an initial outline of their assigned project indicating the major sections of discussion, list the principal research sources for each section, and explain the overall objective of the project, including a justification of the interdisciplinary nature of the work.
- Each student shall meet with the Project Advisor(s)regularly as per the weekly Time-Table. Other meetings may be scheduled at the discretion of the Project Advisor(s) at mutually agreed upon timings.
- Typically, the progress will include a combination of industrial and academic mentoring , self study sessions, case studies, trend studies, presentation by students, interactive sessions, industrial visits etc.
- Regular submission of progress reports shall be required of each student-group as notified through the Project Advisor(s) from time to time.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Students will be evaluated by team participation and a team presentation at the end of the project.
Interactive & continuous, task/assignment- based evaluation methodology will be applied for the course.

Components	ETE
Weightage (%)	100

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IDP14001	Interdisciplinary Projects	CO14001.1	3	3	3	2	2	3	3	-	3	-	-	3	3	1	1
		CO14001.2	2	2	3	2	1	1	2	-	1	-	-	2	1	2	3
		CO14001.3	2	2	3	3	2	3	2	-	3	-	-	1	3	3	1

		CO14001.4	3	2	3	1	1	3	3	3	1	-	-	2	1	3	2
		CO14001.5	3	1	1	1	2	2	3	-	2	3	2	3	1	3	3
		CO14001	2.6	2.0	2.6	1.8	1.6	2.4	2.6	3.0	2.0	3.0	2.0	2.2	1.8	2.4	2.0

SOC14100	Community Service	L	T	P	C
Version 1.0		0	0	0	1
Pre-requisites/Exposure	Basic knowledge of English and computer applications such as Internet Explorer and MS Office				
Co-requisites	--				

Objectives:

1. To involve the students in working within specific communities to engage them into essential internal social structures.
2. To involve passionate students to help struggling and marginalized groups to achieve a sense of self-respect and develop confidence in each other.
3. To develop a hands-on approach for real-world experience.

Course Outcomes:

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

CO1. **Identify** the indispensable and relevant social issues of Indian as well as global context.
CO2. **Construct** a questionnaire schedule, plan and execute field work.
CO3. **Create** a report after serving the social issue.

Catalog Description:

To prepare students for ethical decision making guided by empathy, care, values and principles course on Community Service has rich potentiality. In this course the focus will be on developing psychosomatic skill, intellectual ability, leadership ability and collaboration with others along with problem solving attitude. This course includes specific activities like identifying and defining a social issue, preparing a plan for field work, collecting photographs and testimonies from the marginalized section of the society and serving the issue with utmost care. Classes will be conducted by lecture as well as power point presentation as per requirement. Students will strongly grab the basic problems of the society via field work and discussions with the course coordinator.

Course Content:

Unit-I

Introduction to the course. A brief on social issues facing the society with both global and Indian examples.

Unit II:

Minimum 24 hours of field work on a social issue and helping the marginalized / affected community / cause with photographs and testimonies.

Unit III:

Submission of individual reflection on the social service rendered.

The benefits that accrue to the students are

A.) Subjective

- Psychosomatic benefits : Volunteering increases overall life satisfaction and also helps to relive stress and acts as an anti-depressant.
- Intellectual benefits: Enhances knowledge through new experiences, and develops communication skills.
- Career benefits: Enhances career prospects by acquisition of work-related skills, builds good references for employers and provides a forum to network with future potential employers. It also The experience allows gained helps students to take up leadership positions. Letters of recommendation can also be easily sought. Research shows that students who indulge in volunteer word perform better in studies as it invigorates their passion for learning
- Personal benefits: Real world skills like leadership, problem-solving, collaboration with others, time management and communication skills, learn patience and empathy.
- Connect learning to real world and enables deeper and lifelong learning.

B.) Community

1. Collective benefits: Strong interpersonal bonds are created, and leads to increased civic and social awareness and responsibility.

Text Books:

- Tadevosyan, Gohar & Schoenhuth, Michael. Participatory Research Approach : Principles, Challenges and Perspectives. http://ysu.am/files/01G_Tadevosyan_M_Schoenhuth.pdf
- Bergold, Jarg & Thomas Stefan. Participatory Research Methods: A Methodological Approach in Motion http://www.qualitative-research.net/index.php/fqs/article/view/1801/3334

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Continuous Assessment	ETE
Weightage (%)	50	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
SOC14100	Community Service	CO14100.1	1	1	2	3	3	3	2	-	2	-	-	2	3	2	2
		CO14100.2	2	3	1	2	1	1	2	2	3	3	-	3	3	1	1
		CO14100.3	3	2	3	3	2	2	1	-	3	-	-	2	3	3	2
		CO14100	2.0	2.0	2.0	2.67	2.0	2.0	1.67	2.0	2.67	3.0	-	2.33	3.0	2.0	1.67

Year II

Semester IV

SEMESTER IV

CSE11108	Database Management Systems	L	T	P	C
Version 1.0	Contact Hours – 45	3	0	0	3
Pre-requisite/Exposure	Set Theory, Knowledge of programming language.				
Co-requisite	NIL				

Course Objectives:

- To understand database concepts, applications, data models, schemas and instances.
- To implement the relational database design and data modelling using entity-relationship (ER) model.
- To demonstrate the use of constraints and relational algebra operations and Normalization process
- To learn the new emerging Technologies and Applications in database.

Course Outcomes:

On the completion of this course the student will be able to

- **Describe** the characteristics of database and the architecture of Database system.
- **Model** the elements used in Entity- Relationship diagram.
- **Summarize** relational model concept and illustrate the relational constraints.
- **Build** Structured Query Language (SQL) and apply to query a database and **Define** normalization for relational databases.
- **Develop** some Standalone (Example)/ Mobile/ Web Application DB on real world case studies.

Course Description:

Databases form the backbone of all applications today – tightly or loosely coupled, intranet or internet based, financial, social, administrative, and so on. Database Management Systems (DBMS) based on relational and other models have long formed the basis for such databases. Consequently, Oracle, Microsoft SQL Server, Sybase etc. have emerged as leading commercial systems while MySQL, PostgreSQL etc. lead in open source and free domain. While DBMS's differ in the details, they share a common set of models, design paradigms and a Structured Query Language (SQL). In this background the course examines data structures, file organizations, concepts and principles of DBMS's, data analysis, database design, data modeling, database management, data & query optimization, and database implementation. More specifically, the course introduces relational data models; entity-relationship modeling, SQL, data normalization, and database design. Further it introduces query coding practices using MySQL (or any other open system) through various assignments. Design of simple multi-tier client / server architectures based and Webbased database applications is also introduced.

Course Content:

Unit-I **9 Lecture Hours**

Overview of database management systems and the relational mode:

Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML). Data models: Entity-relationship model, network model, relational and object-oriented data models, integrity constraints, data manipulation operations. ER models: Entity Set, Relation Ship Set, Cardinality Properties, Type of Entities, Type of Keys, Aggregation, Specialization and Generalization.

Unit-II **9 Lecture Hours**

Database design: E-R diagrams, constraints, normal forms

Relational algebra, Fundamental Operations, Additional Operations. Select, Project, Cartesian Product, UNION, Set difference, Rename. Types of joining operations, Division, Intersection, Aggregate. Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server.

Unit-III **9 Lecture Hours**

SQL: data definition, data manipulation, queries, views, constraints, triggers:

Relational database design: Integrity Constraint, Domain Constrain, Referential Integrity, Functional Dependencies, Closure of Set, Cover and Canonical Cover, Types of Anomalies, Armstrong's axioms, Extended Armstrong's axioms, Assertions and Demons. Data Base Decomposition: Domain and data dependency, Normal forms: 1NF, 2 NF, 3 NF, BCNF, Dependency preservation, Lossless design.

Unit-IV **9 Lecture Hours**

Storage and indexing: B-trees, hashing:

Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms. Storage strategies: Indices, B-trees, B+-trees, hashing, File System, Disk Organization, Physical Storage, Buffer management.

Unit-V **9 Lecture Hours**

Case Studies : Standalone (Example)/ Mobile/ Web Application DB:

Transaction processing: Failure, Recovery from Failure, Different States of Transaction, Transaction Isolation, ACID property, Serializability of scheduling, Multi-version and optimistic Concurrency Control schemes. Concurrency control: Locking and timestamp-based schedulers, 2-Phase Locking Protocol, Dead Lock, Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection. Advanced topics: Distributed databases, Data warehousing and data mining.

Text Books:

"Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill

2. "Principles of Database and Knowledge – Base Systems", Vol 1 by J. D. Ullman, Computer Science Press.

Reference Books:

"Fundamentals of Database Systems", 5th Edition by R. Elmasri and S. Navathe, Pearson Education

"Foundations of Databases", Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11108	Database Management Systems	CO11108.1	3	3	2	2	1	3	2	-	2	-	-	2	1	3	1
		CO11108.2	3	2	3	2	1	2	2	-	2	-	-	1	1	2	1
		CO11108.3	3	2	3	3	2	3	2	-	3	-	-	1	3	2	1
		CO11108.4	1	2	2	2	2	3	2	-	2	-	-	3	2	3	2
		CO11108.5	2	2	2	1	2	3	2	-	2	-	-	3	2	2	3
		CO11108	2.4	2.2	2.4	2.0	1.6	2.8	2.0	-	2.2	-	-	2.0	1.8	2.4	1.6

1 = Weakly Mapped   2 = Moderately Mapped 3 = Strongly Mapped

CSE11109	**Object Oriented Programming**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Knowledge of procedural programming**				
Co-requisite	**NIL**				

Course Objectives:

Students will be motivated to solve the problems in engineering using the concepts of object-oriented programming.

Course Outcomes:

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

CO1. **Interpret** fundamentals of object-oriented programming in Java, including defining Classes, invoking methods, using class libraries, etc.

CO2. **Construct** programming solutions with exception handling and multi-threading concept

CO3. Develop programming solutions using database connection

CO4. . **Solve** GUI program with proper event handling techniques

CO5. **Develop** programming solutions to real world problems effectively.

Course Description:

This course investigates object-oriented methods including object-oriented programming methodologies and techniques. Current methodology is emphasized. The use of object-oriented features such as encapsulation, information hiding, inheritance and polymorphism is reinforced by class assignments and programming exercises. The importance of multi-threading and exception handling is introduced in this course.

Course Content:

Unit-I **09 Lecture Hours**

OOP Concepts - Data Abstraction, Encapsulation, Inheritance, Benefits of Inheritance, Polymorphism, Classes and Objects, Procedural and OOP Paradigms. Introduction To Java, Data Types, Variables & Constants, Scope & Life Time Of Variables, Precedence Of Operator, Expressions, Type Casting, Enumerated Types, Block Scope, Control Flow, Conditional Statements, Loops, Break & Continue Statements, Arrays, Console Input/Output, Formatting Output, Constructors Methods, Parameter Passing, Static Fields & Methods, Access Control, "This" Reference, Method Overloading, Recursion, Garbage Collection, Building Strings, String Class.

Unit-II **09 Lecture Hours**

Exception Handling - Dealing With Errors, Advantages Of Exception Handling, The Classification - Exception Hierarchy, Checked And Unchecked Exceptions, Try, Catch, Throw, Throws And Finally, Exceptions-Throwing, Exception Specification, Built In Exceptions, Creating Exception Sub Classes.

Multithreading - Difference Between Multiple Processes And Multiple Threads, Thread States, Creating And Interrupting Threads, Thread Priorities, Synchronizing Threads, Inter-Thread Communication, Procedure Consumer Pattern.

Unit-III **09 Lecture Hours**

Collection Framework - Introduction, Generics and Common Use Of Collection Classes, Array List, Vector, Hash Table, Stack, Enumeration, Iterator, String Tokenizer, Random, Scanner, Calendars And Properties.

Files - Streams - Byte Streams, Character Streams, Text Input/Output, Binary Input/Output, Random Access of File Operations, File Management.

Connecting To Database – JDBC / ODBC Type 1 To 4 Drivers, Connection And Handling Databases With JDBC.

Unit-IV **09 Lecture Hours**

GUI Programming - The AWT Class Hierarchy, Introduction To Swing, Swing Vs, AWT, Hierarchy Of Swing Components, Containers - Jframe, Japplet, Jdialog, Jpanel, Overview Of Swing Components: Jbutton, Jlabel, Jtextfield, Jtextarea, Swing Applications, Layout Management - Types - Border, Grid And Flow

Event Handling - Events, Sources, Classes, Listeners, Event Sources And Listeners, Delegation Event Model, Examples. Handling Mouse Events, Adapter Classes.

Applets - Inheritance Hierarchy For Applets, Differences Between Applets And Applications, Life Cycle, Passing Parameters To Applets, Applet Security Issues.

Unit-V **09 Lecture Hours**

Application Development: Design of real life GUI applications using Swing/AWT/JDBC for Employee management system, Hotel management system, Hospital management system etc.

Text Books:

Java Fundamentals - A Comprehensive Introduction, Illustrated Edition ByDaleskrien, Herbert Schildt, Mcgraw-Hill Education.

Reference Books:

Java For Programmers, 2nd Edition By Paul Deitel And Harvey Deitel, Pearson Education.

Thinking In Java, Low Price Edition By Bruce Eckel, Pearson Education

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11109	Object Oriented Programming	CO11109.1	3	1	2	1	2	3	1	-	3	-	-	3	1	2	2
		CO11109.2	2	3	2	3	1	2	3	-	3	-	-	3	3	2	1
		CO11109.3	2	3	3	2	2	3	3	-	1	-	-	3	1	1	1
		CO11109.4	3	1	3	3	3	1	1	-	1	-	-	3	2	3	3
		CO11109.5	3	3	3	1	2	1	1	-	2	-	-	3	3	3	3
		CO11109	2.6	2.2	2.6	2.0	2.0	2.0	1.8	-	2.0	-	-	3.0	2.0	2.2	2.0

1 = Weakly Mapped
2 = Moderately Mapped
3 = Strongly Mapped

CSE11110	**Design and Analysis of Algorithms**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Discrete Mathematics**				
Co-requisite	**Concepts on Programming, Logical Ability, Problem Solving**				

Course Objectives:

- To introduce problem solving approach through design.
- To develop students to analyse the existing algorithms and approach for improvement.
- To introduce the students a perspective to different design and analysis approach for algorithm(s) to solve a problem.
- To develop students to select optimal solution to a problem by choosing the most appropriate algorithmic method.

Course Outcomes:

On the completion of this course the student will be able to

- **Understand** the basics about algorithms and learn how to analyse and design algorithms
- **Choose** brute force, divide and conquer, dynamic programming and greedy techniques methods to solve computing problems
- **Understand** the approach for solving problems using iterative method.
- **Describe** the solution of complex problems using backtracking, branch and bound techniques.
- **Classify** the different Computability classes of P, NP, NP-complete and NP-hard.

Course Description:

Algorithmic study is a core part of Computer Science. This study caters to all possible applicable areas of Computer Science. This study includes observation, design, analysis and conclusion. Various types of algorithms have different notion of implementation according to their cost (in terms their time and space complexity). This study also includes refinement of one algorithm as per the applicability to real problems. Categorization of algorithms according to different method of design also includes in this course. It also compares the same algorithm using different algorithm design methods. For example, Knapsack problem can be solved in Greedy approach and Dynamic approach, both are optimization method. This course enables the students to think analytically while applying, designing an algorithm to solve a specific problem.

Course Content:

Unit-I **09 Lecture Hours**

Introduction:

Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behaviour; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.

Algorithm Design Paradigms.

Unit-II **09 Lecture Hours**

Sorting Algorithms & Data Structures:

Selection sort, bubble sort, insertion sort, Sorting in linear time, count sort, Linear search,

Divide & Conquer:

Quick sort, worst and average case complexity, Merge sort, Matrix multiplication

Binary search, Binary search tree, Strassen's algorithm for matrix multiplication, The substitution method for solving recurrences, The recursion-tree method for solving recurrences, The master method for solving recurrences.

Unit-III **09 Lecture Hours**

Greedy algorithms:

General Characteristics of greedy algorithms, Problem solving using Greedy Algorithm-

Activity selection problem, Minimum Spanning trees (Kruskal's algorithm, Prim's algorithm), Graphs: Shortest paths, The Knapsack Problem

Dynamic programming:

Introduction, The Principle of Optimality, Problem Solving using Dynamic Programming-

Making Change Problem, Assembly Line Scheduling, Knapsack problem, Matrix chain multiplication, Longest Common Subsequence Dynamic Programming using Memoization.

Unit-IV **09 Lecture Hours**

Graph Algorithms :

Representations of graphs, Breadth-first search, Depth-first search, Topological sort, Strongly connected components, Minimum Spanning Trees, Growing a minimum-spanning tree, The algorithms of Kruskal and Prim, Single-Source Shortest Paths, Bellman-Ford algorithm, Single-source shortest paths in directed acyclic graphs, Dijkstra's algorithm, Difference constraints and shortest paths, Proofs of shortest-paths properties, All-Pairs Shortest Paths, Shortest paths and matrix multiplication, The Floyd-Warshall algorithm, Johnson's algorithm for sparse graphs, Maximum Flow, Flow-networks, The Ford-Fulkerson method,

Branch & Bound & Backtracking

Unit-V **09 Lecture Hours**

String Matching

The naive string-matching algorithm, The Rabin-Karp algorithm, String matching with finite automata, The Knuth-Morris-Pratt algorithm

Approximation Algorithms:

The vertex-cover problem, The traveling-salesman problem, The set-covering problem, Randomization and linear programming

NP-Completeness:

Polynomial time, Polynomial-time verification, NP-completeness and reducibility,

NP-completeness proofs , NP-complete problems.

Text Books:

Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest And Clifford Stein, MIT Press/ Mcgraw-Hill.

Fundamentals of Algorithms – E. Horowitz Et Al.
Algorithm Design, 1ST Edition, Jon Kleinberg and Évatardos, Pearson.
Book 3 – Author – Publisher

Reference Books:

Algorithm Design: Foundations, Analysis, And Internet Examples, Second Edition, Michael T Goodrich And Roberto Tamassia, Wiley.
Algorithms -- A Creative Approach, 3RD Edition, Udimanber, Addison-Wesley, Reading, MA.

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11110	Design and Analysis of Algorithms	CO11110.1	3	3	2	3	2	2	2	-	3	-	-	2	1	2	3
		CO11110.2	3	1	2	3	3	1	1	-	3	-	-	3	2	3	2
		CO11110.3	3	3	2	2	1	3	1	-	3	-	-	1	3	1	3
		CO11110.4	2	1	3	2	1	2	1	-	3	-	-	3	3	3	2
		CO11110.5	3	1	2	2	2	3	3	-	1	-	-	3	3	3	1
		CO11110	2.8	1.8	2.2	2.4	1.8	2.2	1.6	-	2.6	-	-	2.4	2.4	2.4	2.2

1 = Weakly Mapped

2 = Moderately Mapped

3 = Strongly Mapped

CSE11111	Formal Language and Automata Theory	L	T	P	C
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**NIL**				
Co-requisite	**NIL**				

Course Objectives:

- Introduce concepts in automata theory and theory of computation
- Identify different formal language classes and their relationships
- Design grammars and recognizers for different formal languages
- Prove or disprove theorems in automata theory using its properties
- Determine the decidability and intract
- ability of computational problems

Course Outcomes:

On the completion of this course the student will be able to

- Define the basic concepts in formal language theory, grammars, automata theory, computability theory, and complexity theory.
- Demonstrate abstract models of computing, including deterministic (DFA), non-deterministic (NFA), Push Down Automata (PDA) and Turing (TM) machine models and their power to recognize the languages
- Prove and disprove theorems establishing key properties of formal languages and automata.
- Acquire a fundamental understanding of core concepts relating to the theory of computation and computational models including (but not limited to) decidability and Intractability.
- Solve fundamental problems related to Computational Model.

Course Description:

This course will provide a foundation to the "Theory of Computation". The student will realize that the sometimes chaotic technology oriented world of computers has a very elegant mathematical basis to it. This basis is deeply rooted in mathematics developed before the days of modern computers. Our study will lead to some interesting implications concerning the theoretical limits of computing. On the practical side, this course is a background for a course on compilers. Topics covered in this course include: mathematical prerequisites, finite state machines (automata), concept of a language and grammars, deterministic and non-deterministic accepters, regular expressions and languages, context-free languages, normal/canonical forms, pushdown automata, Turing machines, context sensitive languages, recursive and recursively enumerable languages. Each of the language classes has two points of view: a class of automata defining the language, and a class of grammars defining the language. This dual approach to defining languages, will finally lead to the Chomsky hierarchy of languages. We shall observe that the Turing Machine not only serves to define a language class, but also a mathematical model for computation itself and defines the theoretical limits of computation.

Course Content:

Unit-I **4 Lecture Hours**

Mathematical Preliminaries:

Set Theory, Describing a Set, Empty Set, Identity and Cardinality, Subset, Power Sets, Operations on Sets: Union, Intersection, Set Theoretic Equalities, Sequence versus Set, Ordered Pairs, Cartesian Product,Relations, Binary Relation, Domain and Range of Relation, Operations on Relations, Properties of Relations, Functions, Types of Functions, Alphabet, String and Language, Operations on Language, Grammars, Types of Grammars–Chomsky Hierarchy, Graphs and Trees, Directed Graph, Undirected Graph, Trees, Lemma, Theorem Proving, Proof by Induction Proof by Contradiction, Proof by Example.

Unit-II **16 Lecture Hours**

Finite Automata:

Finite-state Machine, Finite-Automaton Model, Properties of Transition Function ‘c’, Transition Diagram, Transition Table, Language Acceptance, Two Types of Finite Automata, Deterministic Finite Automata (DFA) Non-deterministic Finite Automaton, Acceptance of NFA, Equivalence of DFAs and NFAs, Converting NFA to DFA, Subset Construction, NFA with Epsilon-(ε) Transitions, Epsilon Closure (e-closure), Eliminating e-Transitions, Converting NFA with ε-Transition to NFA, without ε-Transition, Converting NFA with ε-Transition to DFA, Comparison Method for Testing, Equivalence of Two FA, Reduction of Number of States in FA, Indistinguishable States, Equivalent Classes, Minimization of DFA, Minimization of DFA Using Myhill Nerode Theorem, Finite Automata with Output, Moore Machine, Mealy Machine, Equivalence Between Moore and Mealy Machines, Interconversions Between Machines, Applications of Finite Automata with Output, The Full-adder, The String Sequence Detector.

Regular Languages and Regular Grammar:

Regular language, Regular expressions, Deterministic finite automata (DFA) and equivalence with regular expressions, NFA and equivalence with DFA, Regular grammars and equivalence with finite automata, Properties of regular languages, Pumping lemma for regular languages, Problem solving using pumping lemma.

Unit-III **15 Lecture Hours**

Pushdown Automata & Context Free Languages:

Graphical Representation of PDA, Instantaneous Description of PDA, Language Acceptance by PDA, Equivalence of Acceptance of Final State and Empty Stack, Types of PDAs, Deterministic PDA, Closure Properties of DCFL, Decision Properties of DCFLs, DPDA and Regular Languages, DPDA and Ambiguous Grammar, Equivalence of PDA’s and CFG’s, Nondeterministic pushdown automata (NPDA), NPDA and equivalence with CFG, Constructing PDA for Given CFG, Constructing CFG for the Given PDA, Two-stack PDA, Applications of PDA, PDA as a Parser, Top-down Parser Using the PDA, Pumping lemma for context-free languages.

Context Free Grammar:

Context-free grammars (CFG), Leftmost and Rightmost Derivations, Derivation Tree, Equivalence of Parse Trees and Derivations, Ambiguous Grammar, Removing Ambiguity, Inherent Ambiguity, Simplification of Grammars, Elimination of Useless Symbols, Elimination of e-Productions, Eliminating Unit Productions, Chomsky normal forms, Greibach normal forms

Unit-IV **10 Lecture Hours**

Context Sensitive Grammar and Languages:

Context-sensitive grammars (CSG), Context-sensitive Languages, Linear bounded automata, Linear bounded automata and equivalence with CSG, Properties of Context-sensitive grammars (CSG) and Languages, Properties of Linear bounded automata.

Turing Machine :

Turing Assumptions, Instantaneous Description, Turing Machine as Language Accepter, Turing Machine as a Computational Machine, Techniques for Turing Machine Construction, Storage in Finite Control, Multi-track Tape, Checking off Symbols, Subroutines, Shifting Over, Types of Turing Machines, Non-deterministic Turing Machines, Turing Machines with Two-dimensional, Tapes, Turing Machines with Multiple Tapes, Turing Machines with Multiple Heads, Turing Machines with Infinite Tape, Church's Thesis, Turing Machines as Enumerators, Universal Turing Machine, Counter Machine, Recursive and Recursively Enumerable Languages

Unrestricted grammars and equivalence with Turing machines, Church-Turing thesis, universal Turing machine, Rice's theorem, undecidable problems about languages.

Unit-V **10 Lecture Hours**

Decidability:

Decidable Languages, Decidable problems concerning regular languages, Decidable problems concerning context-free languages, Undecidability, The diagonalization method, An undecidable language

A Turing-unrecognizable language

Reducibility:

Undecidable Problems from Language Theory, Reductions via computation histories, Simple Undecidable Problem, Mapping Reducibility , Computable functions, Formal definition of mapping reducibility

Time Complexity:

Measuring Complexity, Big-O and small-o notation, Analyzing algorithms, Complexity relationships among models, The Class P, Polynomial time, Examples of problems in P, The Class NP, Examples of problems in NP,

P versus NP, NP-completeness, Polynomial time reducibility, Definition of NP-completeness, The Cook–Levin Theorem

Space Complexity:

Savitch's Theorem, The Class PSPACE, PSPACE-completeness

Text Books:

Introduction to Automata Theory, Languages, and Computation, 3rd Edition, John E. Hopcroft Rajeev Motwani and Jeffrey D. Ullman, Pearson Education.
Michael Sipser, Introduction to the Theory of Computation, PWS Publishing
An Introduction To Formal Languages And Automata, Peter Linz

Reference Books:

Harry R. Lewis and Christos H. Papadimitriou, Elements of the Theory of Computation,Pearson Education Asia.
Dexter C. Kozen, Automata and Computability, Undergraduate Texts in Computer Science, Springer.

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11111	Formal Language and Automata Theory	CO11111.1	3	3	2	3	1	1	1	-	1	-	-	3	1	2	3
		CO11111.2	3	3	2	2	3	1	2	-	2	-	-	3	3	1	2
		CO11111.3	2	1	2	2	3	3	3	-	2	-	-	1	2	2	1
		CO11111.4	3	2	3	3	3	2	3	-	3	-	-	3	2	1	3
		CO11111.5	2	3	3	3	2	2	1	-	2	-	-	1	3	3	3
		CO11111	2.6	2.4	2.4	2.6	2.4	1.8	2.0	-	2.0	-	-	2.2	2.2	1.8	2.4

1 = Weakly Mapped
2 = Moderately Mapped
3 = Strongly Mapped

CSE11112	**Introduction to Artificial Intelligence**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Fundamentals of computer science, Operating system**				
Co-requisite	**NIL**				

Course Objectives:

- To provide the most fundamental knowledge of AI.
- To make a computer that can learn, plan, and solve problems autonomously.
- To give the students a perspective on the main research topics in AI i.e. problem solving, reasoning, planning, etc.
- To enable students to acquire knowledge on some basic search algorithms for problem solving; knowledge representation and reasoning; pattern recognition; fuzzy logic; and neural networks.

Course Outcomes:

On the completion of this course the student will be able to

- **Define** Artificial Intelligence and its approach.
- **Describe** propositional logic and inference engine.
- **Execute** Planning with state-space search.
- **Construct** Bayesian networks and other temporal models.
- **Explain** the types of Learning.

Course Description:

Artificial intelligence (AI) is a research field that studies how to realize the intelligent human behaviors on a computer. The ultimate goal of AI is to make a computer that can learn, plan, and solve problems autonomously. The main research topics in AI include: problem solving, reasoning, planning, natural language understanding, computer vision, automatic programming, machine learning, and so on. Of course, these topics are closely related with each other. For example, the knowledge acquired through learning can be used both for problem solving and for reasoning. In fact, the skill for problem solving itself should be acquired through learning. Also, methods for problem solving are useful both for reasoning and planning. Further, both natural language understanding and computer vision can be solved using methods developed in the field of pattern recognition. In this course, we will study the most fundamental knowledge for understanding AI. We will introduce some basic search algorithms for problem solving; knowledge representation and reasoning; pattern recognition; fuzzy logic; and neural networks

Course Content:

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Unit-I **10 Lecture Hours**

Introduction:
Introduction, Agents, Problem formulation, Forward and backward chaining, Unification, Resolution.

Unit-II **8 Lecture Hours**

Search in State Space and Planning:
Uninformed search strategies, Heuristics, Informed search strategies, Satisfying constraints. Planning with state-space search, Partial-order planning, planning graphs, Planning and acting in the real world, Forward and backward chaining, Unification, Resolution.

Unit-III **9 Lecture Hours**

Knowledge Representation & Reasoning:

Introduction & Overview, Logical agents, Propositional logic, Inference rules, First-order logic, Inferences in first order logic, Ontology Engineering, knowledge representation

Unit-IV **9 Lecture Hours**

Uncertainty

Quantifying Uncertainty, Probabilistic Reasoning, Probabilistic Reasoning over Time ,Probabilistic Programming, Making Simple Decisions, Making Complex Decisions ,Multiagent Decision Making

Unit-V **9 Lecture Hours**

Various wings of AI:

Introduction to various wings of AI –Neurophysiology, cognitive science, pattern recognition, machine learning, machine vision, linguistics, data science, robotics, bioinformatics, speech processing, generative systems.

Text Books:

1.Artificial Intelligence – A Modern Approach, Second Edition, S. Russel and P. Norvig Pearson Education, 2003.
2.Machine Learning, 1st Edition, Tom M. Mitchell, McGraw-Hill Series. In Computer Science

3.Neural Networks and Learning Machines, 3rd Edition, Simon O. Haykin, Prentice Hall

4.Introduction to Machine Learning, 2nd Edition, Ethem Alpaydın, The MIT Press.

Reference Books:

1.Computational Intelligence: a logical approach", David Poole, Alan Mack worth, Randy Goebel, First edition; Oxford University Press, 2004 2.Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, G. Luger, Pearson Education, 2002. 3.Minsky, Marvin. "Society of Mind: a response to four reviews." Artificial Intelligence 48.3 (1991): 371-396.

Components	Mid Term	Class Assessment	End Term
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11112	Introduction to Artificial Intelligence	CO11112.1	3	3	3	3	1	3	2	-	2	-	-	3	2	2	1
		CO11112.2	3	3	3	3	3	2	2	-	1	-	-	1	3	3	2
		CO11112.3	2	2	3	3	3	3	3	-	1	-	-	2	2	1	2
		CO11112.4	3	2	2	3	2	2	3	-	3	-	-	1	3	1	1
		CO11112.5	3	1	3	3	2	3	1	-	3	-	-	3	3	2	1
		CO11112	2.8	2.2	2.8	3.0	2.2	2.6	2.2	-	2.0	-	-	2.0	2.6	1.8	1.4

1 = Weakly Mapped

2 = Moderately Mapped

3 = Strongly Mapped

PSG11021	Human Values and Professional Ethics	L	T	P	C
Version 1.0	Contact Hours -45	3	0	0	3
Pre-requisites/Exposure	Basic human ethics				
Co-requisites	--				

Course Objectives:

- To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Value based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behaviour and mutually enriching interaction with Nature.

Course Outcomes:

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

CO1. **Explain** the morals, values, ethics, and the law and to explore how they impact professional practice;

- **Develop** an increased personal understanding of issues related to ethics.
- **Develop** an increased personal understanding of issues related the law
- **Analyze** one's own ethical decision-making processes.
- **Plan** guidelines for enhancing one's ability to generate ethical behavior and solutions to conflicts arising in the practice.

Catalog Description:

This course offers an introduction to graph theory, with an emphasis on applications and modelling. Graph theory is a study of graphs, trees and networks. Topics that will be discussed include Euler formula, Hamilton paths, planar graphs and coloring problem; the use of trees in sorting and prefix codes; useful algorithms on networks such as shortest path algorithm, minimal spanning tree algorithm and min-flow max-cut algorithm.

Course Content:

Unit I: 9 lecture hours

Ethics, morals and values: The meaning of ethics, morals and values, The relevance of ethics, morals and values in the promotion of scientific temper, Theories of right action, Kohlberg's and Gilligan's theory of moral development, Ethical theories and their applications.

Unit II: 9 lecture hours

Ethics in Engineering Practice and Research: Overview of engineering ethics, Rights and obligations in engineering, The NPSE, IEEE and ECI codes, Violation of codes and their consequences, Conflicts of interest, Whistle blowing, Whistle blowing cases.

Unit III: 9 lecture hours

Sustainable Engineering and Sustainable Development: Meaning of sustainable engineering, Principles of sustainable engineering, Safety and risk assessment, Sustainable development, Sustainable engineering v. engineering negligence.

Unit IV: 9 lecture hours

Engineering Negligence: The elements of engineering negligence, The standard duty of care, Liability in negligence cases, Defenses Negligence Cases (Engineering, med ical and others).

Unit V: 9 lecture hours

Rights and obligations of Engineers under Various Indian Laws: The Indian adjuratory system, Constitutional laws governing engineering professionals, Contractual obligations of engineers Environment protection laws, Arbitration and conciliation laws, Intellectual property laws, Information technology laws.

Text Books:

1.AroraVibha, AroraKunwar, Laws for Engineers, Central Law Publications, 1st Edition, 2017.

2.Fledderman Charles B., Engineering Ethics, Pearson Education Inc., 4th Edition, 2012

3.Govindarajan M., Natarajan S., Senthilkumar V. S., Engineering Ethics Includes Human Values, PHI Learning Private Limited, 1st Edition, 2010

Reference Books:

1.Govindarajan M., Natarajan S., Senthilkumar V. S., Professional Ethics and Human Values, PHI Learning Private Limited, 1st Edition, 2017.

2.Harris Charles E., Jr., Pritchard Michael S., Rabins Michael J., Engineering Ethics, Wadsworth Cengage Learning, 4th Edition, 2009

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Class Assessment	Mid Term	End Term
Weightage (%)	30	20	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
PSG11021	Human Values and Professional Ethics	CO11021.1	3	2	3	2	2	1	3	2	2	-	-	3	3	3	3
		CO11021.2	1	2	3	3	1	2	2	3	2	-	-	3	1	1	2
		CO11021.3	2	2	3	1	1	2	2	-	1	-	-	3	1	3	1
		CO11021.4	2	3	3	1	1	2	3	-	3	-	2	2	3	2	1
		CO11021.5	2	2	3	2	2	1	1	-	1	-	-	1	3	2	1
		CO11021	2.0	2.2	3.0	1.8	1.4	1.6	2.2	2.5	1.8	-	2.0	2.4	2.2	2.2	1.6

1=weakly mapped

2= moderately mapped

3=strongly mapped

CSE12114	**Object Oriented Programming Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 30**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure	**Knowledge of programming basics**				
Co-requisite	**NIL**				

Course Objectives:

To understand how to design, implement, test, debug, and document programs that use basic data types and computation, simple I/O, conditional and control structures, string handling, functions and object oriented approaches.

Course Outcomes:

On the completion of this course the student will be able to

CO1. **Define** classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem.
CO2. **Illustrate** object-oriented modelling techniques like classes and Instances modelling techniques
CO3. **Interpret** fundamentals of object-oriented programming in Java, including defining Classes, invoking methods, using class libraries, etc.
CO4. **Construct** programming solutions with exception handling and multi-threading concept
CO5. **Solve** GUI program with proper event handling techniques.

Course Description:

This course investigates object-oriented methods including object-oriented programming methodologies and techniques. Current methodology is emphasized. The use of object-oriented features such as encapsulation, information hiding, inheritance and polymorphism is reinforced by class assignments and programming exercises. The importance of multi-threading and exception handling is introduced in this course.

Course Content:

Unit-I **09 Lecture Hours**

Write a Java program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle, and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.

Write a Java program to illustrate the parameterized constructor.

Write a Java program to add two numbers with int and float types using method overloading.

Unit-II **09 Lecture Hours**

Write a Java program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num 2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box

Unit-III **09 Lecture Hours**

Write a Java program to list all the files in a directory including the files present in all its subdirectories.

Write a Java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab (\t). It takes a name or phone number as input and prints the corresponding other value from the hash table (hint: use hash tables).

Unit-IV **09 Lecture Hours**

Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with “Stop” or “Ready” or “Go” should appear above the buttons in selected color. Initially, there is no message shown.

Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using Labels in Grid Layout.

a) Develop an applet in Java that displays a simple message.

b) Develop an applet in Java that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named “Compute” is clicked.

Unit-V **09 Lecture Hours**

Write a Java program that simulates a Banking GUI application with facilities of deposit, withdraw and check balance in an account.

Write a Java program that implements Quick sort algorithm for sorting a list of names in ascending order

Write a Java program that implements Bubble sort algorithm for sorting in descending order and also shows the number of interchanges occurred for the given set of integers.

Text Books:

Java Fundamentals - A Comprehensive Introduction, Illustrated Edition ByDaleskrien, Herbert Schildt, Mcgraw-Hill Education.

Reference Books:

Java For Programmers, 2nd Edition By Paul Deitel And Harvey Deitel, Pearson Education.

Thinking In Java, Low Price Edition By Bruce Eckel, Pearson Education

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination

Examination Scheme:

Components	Internal	End Term
Weightage (%)	50	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12114	Object Oriented Programming Lab	CO12114.1	3	3	3	1	2	3	2	-	1	-	-	2	3	1	3
		CO12114.2	3	2	2	1	2	2	1	-	2	-	-	1	3	1	3
		CO12114.3	2	2	2	2	1	2	1	-	3	-	-	1	1	1	1
		CO12114.4	3	3	3	1	2	1	1	-	3	-	-	1	3	2	3
		CO12114.5	2	2	3	3	1	2	3	-	2	-	-	2	3	1	2
		CO12114	2.6	2.4	2.6	1.6	1.6	2.0	1.6	-	2.2	-	-	1.4	2.6	1.2	2.4

1 = Weakly Mapped

2 = Moderately Mapped

3 = Strongly Mapped

CSE11175	Parallel Processing	L	T	P	C
Version 1.0	Contact Hours – 45 Hours	3	0	0	3
Pre-requisite/Exposure	Programming in C, Data Structures, and Computer Architecture				
Co-requisite	NIL				

Course Objectives:

- To familiarize the issues in parallel computing.
- To describe distributed memory programming using MPI.
- To understand shared memory paradigm with Pthreads and with OpenMP.
- To learn the GPU based parallel programming using OpenCL

Course Outcomes:

On the completion of this course the student will be able to

- Understand the basics of Parallel Processing.
- Identify issues in parallel programming.
- Develop distributed memory programs using MPI framework.
- Design and develop shared memory parallel programs using Pthreads and using OpenMP.
- Implement Graphical Processing OpenCL programs.

Course Description:

In a parallel computation, multiple processors work together to solve a given problem. These are exciting times in parallel computing. The largest parallel machine has over a hundred thousand processors, and it is believed that machines with over ten thousand processors will be commonly available by the end of the decade. Furthermore, with most chip manufacturers moving toward multicore processors, most machines will soon be parallel ones. It is, therefore, essential to learn to use parallel machines effectively. While parallel machines provide enormous raw computational power, it is often not easy to make effective use of all this power. The problems encountered in making effective use of a large number of machines are similar to those encountered in making a group of people work together. (i) People may spend much of their time talking to each other, instead of doing useful work. Communication between processors is quite expensive, compared with the CPU speed. So we need to pay attention to minimizing the amount of communication; otherwise much of the time will be spent on inter-processor communication, rather than on useful work. (ii) In a group, a few people may do much of the work, while the others relax. Similarly, in a computation, the work load on different processors may differ. In order to make effective use of the parallel machine, we want to keep the work load balanced on all processors. (iii) It may be difficult to decompose a problem so that people can work on different parts simultaneously. For example, consider someone who want to have dinner cooked, eat it, and then have the dishes washed. It is not easy to speed up this process by hiring someone to cook, and another person to wash the dishes, because the three tasks are sequential; the food needs to be cooked before it is eaten, and the food needs to be eaten before the dishes are washed. Similar problems occur in parallel computations too, and sequential parts of the computation can reduce the effectiveness of parallelization substantially. This course will describe different techniques used to solve the above problems, in order to develop efficient parallel algorithms for a variety of problems. We will also pay much attention to practical aspects of implementing parallel code that actually yields good performance on real parallel machines.

Course Content:

Unit-I **09 Lecture Hours**

Foundations Of Parallel Programming: Motivation for parallel programming – Need-Concurrency in computing – Basics of processes, multitasking and threads – cache – cache mappings – caches and programs – virtual memory – Instruction level parallelism – hardware multi-threading – Parallel Hardware-SIMD – MIMD – Interconnection networks – cache coherence –Issues in shared memory model and distributed memory model –Parallel Software- Caveats- coordinating processes/ threads- hybrid model – shared memory model and distributed memory model - I/O – performance of parallel programs-– parallel program design.

Unit-II **09 Lecture Hours**

Distributed Memory Programming with MPI: Basic MPI programming – MPI_Init and MPI_Finalize – MPI communicators – SPMD- programs– MPI_Send and MPI_Recv – message matching – MPI- I/O – parallel I/O – collective communication – Tree-structured communication -MPI_Reduce – MPI_Allreduce, broadcast, scatter, gather, allgather – MPI derived types – dynamic process management – performance evaluation of MPI programs- A Parallel Sorting Algorithm.

Unit-III **09 Lecture Hours**

Shared Memory Paradigm With Pthreads: Basics of threads, Pthreads – thread synchronization – critical sections – busy waiting – mutex – semaphores – barriers and condition variables – read write locks with examples - Caches, cache coherence and false sharing – Thread safety-Pthreads case study.

Unit-IV **09 Lecture Hours**

Shared Memory Paradigm: OpenMP: Basics OpenMP – Trapezoidal Rule-scope of variables – reduction clause – parallel for directive – loops in OpenMP – scheduling loops –Producer Consumer problem – cache issues – threads safety in OpenMP – Two- body solvers- Tree Search .

Unit-V **09 Lecture Hours**

Graphical Processing Paradigms: OpenCL and Introduction to CUDA: Introduction to OpenCL – Example- OpenCL Platforms- Devices-Contexts - OpenCL programming – Built-In Functions-Programs Object and Kernel Object – Memory Objects - Buffers and Images – Event model – Command-Queue - Event Object - case study. Introduction to CUDA programming.

Text Books:

OpenCL programming guide – A. Munshi, B. Gaster, T. G. Mattson, J. Fung, and D. Ginsburg – Addison Wesley
Parallel programming in C with MPI and OpenMP – M. J. Quinn – Tata McGraw Hill

Reference Books:

An introduction to parallel programming – Peter S. Pacheco – Morgan Kaufmann
CUDA application design and development – Rob Farber – Morgan Haufmann
Using MPI: Portable parallel programming with the message passing interface – W. Gropp, E. Lusk, and A. Skjellum – MIT Press

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11175	Parallel Processing	CO11175.1	3	1	3	3	3	1	3	-	1	-	-	1	1	3	1
		CO11175.2	2	2	2	3	2	2	1	-	1	-	-	2	2	1	1
		CO11175.3	2	3	2	2	3	1	3	-	3	-	-	3	2	3	1
		CO11175.4	2	2	2	1	3	3	2	-	3	-	-	2	3	3	1
		CO11175.5	3	3	1	1	1	1	2	-	3	-	-	2	3	1	1
		CO11175	2.4	2.2	2.0	2.0	2.4	1.6	2.2	-	2.2	-	-	2.0	2.2	2.2	1.0

CSE12176	**Parallel Processing Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 30**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure	**Programming in C, Data Structures, and Computer Architecture**				
Co-requisite	**NIL**				

Course Objectives:

- To familiarize the issues in parallel computing.

- To describe distributed memory programming using MPI.
- To understand shared memory paradigm with Pthreads and with OpenMP.
- To learn the GPU based parallel programming using OpenCL

Course Outcomes:

On the completion of this course the student will be able to

- Understand the basics of Parallel Processing.
- Identify issues in parallel programming.
- Develop distributed memory programs using MPI framework.
- Design and develop shared memory parallel programs using Pthreads and using OpenMP.
- Implement Graphical Processing OpenCL programs.

Course Description:

In a parallel computation, multiple processors work together to solve a given problem. These are exciting times in parallel computing. The largest parallel machine has over a hundred thousand processors, and it is believed that machines with over ten thousand processors will be commonly available by the end of the decade. Furthermore, with most chip manufacturers moving toward multicore processors, most machines will soon be parallel ones. It is, therefore, essential to learn to use parallel machines effectively. While parallel machines provide enormous raw computational power, it is often not easy to make effective use of all this power. The problems encountered in making effective use of a large number of machines are similar to those encountered in making a group of people work together. (i) People may spend much of their time talking to each other, instead of doing useful work. Communication between processors is quite expensive, compared with the CPU speed. So we need to pay attention to minimizing the amount of communication; otherwise much of the time will be spent on inter-processor communication, rather than on useful work. (ii) In a group, a few people may do much of the work, while the others relax. Similarly, in a computation, the work load on different processors may differ. In order to make effective use of the parallel machine, we want to keep the work load balanced on all processors. (iii) It may be difficult to decompose a problem so that people can work on different parts simultaneously. For example, consider someone who want to have dinner cooked, eat it, and then have the dishes washed. It is not easy to speed up this process by hiring someone to cook, and another person to wash the dishes, because the three tasks are sequential; the food needs to be cooked before it is eaten, and the food needs to be eaten before the dishes are washed. Similar problems occur in parallel computations too, and sequential parts of the computation can reduce the effectiveness of parallelization substantially. This course will describe different techniques used to solve the above problems, in order to develop efficient parallel algorithms for a variety of problems. We will also pay much attention to practical aspects of implementing parallel code that actually yields good performance on real parallel machines.

Course Content:

- first parallel construct in OpenMP that creates a parallel region in a C++ code.
- write a SPMD (Single Instruction Multiple Data) parallel program in OpenMP
- create a parallel program using OpenMP to calculate PI
- create an OpenMP program to calculate themandelbrot set
- A prime pair or twin prime is a prime number that has a prime gap of two, in other words, the difference between the two prime numbers are two, for example the twin prime pair (41, 43). You need to write an OpenMP program to find the total number of prime pairs between 2 and 50,000,000. Your grade will be not only determined by the correctness of the total number, but also depends on your program performance. Your program should print the number of prime pairs and the total execution time of your program. Report the speedup of your program using 1, 2, 4, and 8 threads respectively.
- implement Parallel Programming in Java by using Fork/Join Framework
- implement Parallel Stream in Java
- Read and Monitor GPU status using CUDA API
- Allocated and Deallocate from GPU Memory using CUDA API
- Multiply two large matrix using CUDA API.
- Distributed Memory Environments / Cluster Programming -
  Basics of MPI (Message Passing Interface)
  - To learn Communication between MPI processes
  - To get familiarized with advance communication between MPI processes
  - Study of MPI collective operations using 'Synchronization'
  - Study of MPI collective operations using 'Data Movement'
  - Study of MPI collective operations using 'Collective Computation'
  - To understand MPI Non-Blocking operation
- Shared Memory Environments / SMP Programming
  Basics of OpenMP API (Open Multi-Processor API)
  - To get familiarized with OpenMP Directives 55
  - Sharing of work among threads using Loop Construct in OpenMP
  - Clauses in Loop Construct
  - Sharing of work among threads in an OpenMP program using 'Sections Construct'
  - Sharing of work among threads in an OpenMP program using 'Single Construct'
  - Use of Environment Variables in OpenMP API

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12	Parallel	CO1217	2	2	2	2	3	1	1	-	1	-	-	2	1	2	1

176	Processing Lab	6.1															
		CO12176.2	2	2	1	3	1	2	2	-	2	-	-	2	2	2	1
		CO12176.3	3	2	3	2	2	3	3	-	3	-	-	3	2	2	3
		CO12176.4	3	3	2	1	1	1	1	-	2	-	-	3	2	3	2
		CO12176.5	3	1	1	1	1	1	3	-	3	-	-	2	2	3	2
		CO12176	2.6	2.0	1.8	1.8	1.6	1.6	2.0	-	2.2	-	-	2.4	1.8	2.4	1.8

SEMESTER V

CSE11115	Computer Networks	L	T	P	C
Version 1.0	**Contact hour-45**	**3**	**0**	**0**	**3**
Pre-requisites/Exposure	**Computer Fundamentals**				
Co-requisites	--				

Year III
Semester V

Course Objectives:

- To give a brief overview of fundamentals of computer network
- To conceptualize understanding in transmission media and data communication.
- To propagate a functional overview of addressing techniques and protocols
- To analyse file transfer protocols, and concepts of secured data communication technique

Course Outcomes:

On the completion of this course the student will be able to

- Explain key networking concepts, principles, design issues and techniques at all protocol layers.
- Contrast between different types of networks (e.g., wide area networks vs. local area networks, wired vs. wireless) in terms of their characteristics and protocols used.
- Describe different types of networked applications and what underlying network protocols are needed to meet their diverse requirements.
- Distinguish between control and data planes in computer networks, and their corresponding architectures in real-world networks (including the Internet).
- Illustrate reliable transport protocols and networked system architectures via implementation using Socket APIs, measurement and analysis.

Course Description:

In this course, students will study architectures, protocols, and layers in computer networks and develop client-server applications. Topics include the OSI and TCP/IP models, transmission fundamentals, flow and error control, switching and routing, network and transport layer protocols, local and wide-area networks, wireless networks, client-server models, and network security. Students will extend course topics via programming assignments, library assignments and other requirements.

Course Content:

Unit-I **9 Lecture Hours**

Unit Heading: Idea Of Networking

What Is the Internet?, Network Edge, Network Core, Delay, Loss, and Throughput in Packet-Switched Networks, Protocol Layers and Their Service Models, Networks Under Attack. Principles of Network Applications, Web and HTTP, Electronic mail in Internet, DNS—The Internet's Directory Service, Peer-to-Peer Applications. LAN Topology, Encoding Technique, Transmission Mode, layers of networking

Unit-II **9 Lecture Hours**

Unit Heading: Datalink layer Concept

Design issues, error detection and correction, elementary data link protocols, sliding window protocols, example data link protocols - HDLC, the data link layer in the internet. THE MEDIUM ACCESS SUBLAYER: Channel allocations problem, multiple access protocols, Ethernet, Data Link Layer switching, Wireless LAN, Broadband Wireless, Bluetooth

Unit-III **9 Lecture Hours**

Unit Heading: Network and Transport layer

Network layer design issues, routing algorithms, Congestion control algorithms, Internetworking, the network layer in the internet (IPv4 and IPv6), Quality of Service.

Transport service, elements of transport protocol, Simple Transport Protocol, Internet transport layer protocols: UDP and TCP. Addressing Mode Class A,B,C,D

Unit-IV **9 Lecture Hours**

Unit Heading: Socket Over view

Client server Model.What is socket.TCP socket over view, Socket options – getsocket and setsocket functions – generic socket options – IP socket options – ICMP socket options – TCP socket options – Elementary UDP sockets – UDP echo Server – UDP echo Client – Multiplexing TCP and UDP sockets – Domain name system – gethostbyname function – Ipv6 support in DNS – gethostbyadr function – getservbyname and getservbyport functions

Unit-V **9 Lecture Hours**

Unit Heading: Application Layer

Domain name system, electronic mail, World Wide Web: architectural overview, dynamic web document and http. APPLICATION LAYER PROTOCOLS: Simple Network Management Protocol, File Transfer Protocol, Simple Mail Transfer Protocol, Telnet.Socket Programming,Network security,Leaky Bucket application,WSN concept and realtime application case study.

Text Books:

. Computer Networking -Top Down Approach- James F. Kurose and Keith W. Ross-- Pearson 2013, sixth Edition
Data Communications and Networking- Behrouz A. Forouzan-McGraw-Hill 2007, fourth Edition.

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11115	Computer Networks	CO11115.1	2	2	3	3	2	3	2	-	1	-	-	2	1	3	2
		CO11115.2	3	3	2	2	1	3	2	-	3	3	3	3	1	3	3
		CO11115.3	2	3	2	3	2	2	1	-	1	-	-	3	1	3	3
		CO11115.4	2	1	2	1	3	2	1	-	3	3	2	2	3	2	2
		CO11115.5	1	2	3	2	2	3	2	-	2	2	3	3	1	1	1
		CO11115	2.0	2.2	2.4	2.2	2.0	2.6	1.6	-	2.0	2.67	2.67	2.6	1.4	2.4	2.2

1 = Weakly Mapped
2 = Moderately Mapped
3 = Strongly Mapped

CSE11116	**Computer Organization and Architecture**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45 Hours**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Digital Logic**				
Co-requisite	**NIL**				

Course Objectives:

To study the basic organization and architecture of digital computers (CPU, memory, I/O, software). Discussions will include digital logic and microprogramming. Such knowledge leads to better understanding and utilization of digital computers, and can be used in the design and application of computer systems or as foundation for more advanced computer-related studies.

Course Outcomes:

On the completion of this course the student will be able to

- Define functional block of a computer and relate data representation
- Explain and understand memory hierarchy design, memory access time formula, performance improvement techniques, and trade-offs.
- Analyze the concepts of memory utilization in a computer system.
- Analyze the concepts of memory utilization in a computer system.
- Define the implementation of parallel processors and Analyze the synchronization techniques

Course Description:

The architecture of computer systems and associated software. Topics include addressing modes, interrupt systems, input/output systems, external memory systems, assemblers, loaders, multiprogramming, performance evaluation, and data security.

This task is challenging for several reasons. First, there is a tremendous variety of products that can rightly claim the name of computer, from single-chip microprocessors costing a few dollars to supercomputers costing tens of millions of dollars. Variety is exhibited not only in cost, but also in size, performance, and application. Second, the rapid pace of change that has always characterized computer technology continues with no letup. These changes cover all aspects of computer technology, from the underlying integrated circuit technology used to construct computer components, to the increasing use of parallel organization concepts in combining those components. In spite of the variety and pace of change in the computer field, certain fundamental concepts apply consistently throughout. The application of these concepts depends on the current state of the technology and the price/performance objectives of the designer. The intent of this paper is to provide a thorough discussion of the fundamentals of computer organization and architecture and to relate these to contemporary design issues.The subtitle suggests the theme and the approach taken in this book. It has always been important to design computer systems to achieve high performance, but never has this requirement been stronger or more difficult to satisfy than today. All of the basic performance characteristics of computer systems, including processor speed, memory speed, memory capacity, and interconnection data rates, are increasing rapidly. Moreover, they are increasing at different rates. This makes it difficult to design a balanced system that maximizes the performance and utilization of all elements.

Course Content:

Unit-I **8 Lecture Hours**

Introduction:

Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer. Processor organization, general registers organization, stack organization and addressing modes.

Unit-II **10 Lecture Hours**

Computer Arithmetic :

Look ahead carries adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design. IEEE Standard for Floating Point Numbers

Control Unit:

Instruction types, formats, instruction cycles and sub cycles (fetch and execute etc), micro operations, execution of a complete instruction. Program Control, Reduced Instruction Set Computer, Pipelining. Hardwire and micro programmed control: micro programme sequencing, concept of horizontal and vertical microprogramming.

RISC Scalar Procesors, CISC Scalar Process, Super Scalar and Vector Procesor and its Instruction Set Architecture.

Unit-III **12 Lecture Hours**

Memory:

Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories. Cache memories: concept and design issues & performance, address mapping and replacement Auxiliary memories: magnetic disk, magnetic tape and optical disks Virtual memory Technology, Virtual Meory Models, TLB, Paging, Segmentaion & its concept of implementation, Shared Memory Organization, Interleaved Memory Organization, Cache Memory Optimization

Input / Output:

Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors. Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.

Unit-IV **10 Lecture Hours**

Pipeline and Superscalar:

Linear Pipeline, Non- Linear Pipeline, Instruction Pipeline Design, Arithmetic Pipeline Design, Super Scalar & Superpipeline Design

Paralle Computing Models: PRAM & VLSI models, Shared & Distributed memory multi Computers, Vector Super Computers & SIMD Super Computers

Unit-V **5 Lecture Hours**

Motivation: why parallel computing, Fundamentals of parallel computing, PCA components & systems, PCA architectures: Flynn's taxonomy, based on memory organization, Parallel programming models

ARM Architectures, x86 Architectures, Other Sample Architectures.

Text Books:

Computer Organization 1.and Design: The Hardware/Software Interface, 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
Computer Organization and Embedded Systems, 6th Edition by Carl Hamacher, McGraw Hill Higher Education.

Reference Books:

Computer Architecture and Organization, 3rd Edition by John P. Hayes, WCB/McGraw-Hill
Computer Organization and Architecture: Designing for Performance, 10th Edition by William Stallings, Pearson Education.
.Computer System Design and Architecture, 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11116	Computer Organization and Architecture	CO11116.1	2	3	3	3	2	2	1	-	1	-	-	2	3	1	3
		CO11116.2	3	2	3	3	1	3	1	-	3	-	-	3	2	2	1
		CO11116.3	2	2	3	2	1	1	1	-	2	-	-	1	3	2	1
		CO11116.4	2	3	3	2	3	2	2	-	3	-	-	2	3	3	3

		CO11116.5	3	3	3	3	1	3	1	-	2	-	-	2	3	3	3
		CO111116	2.4	2.6	3.0	2.6	1.6	2.2	1.2	-	2.2	-	-	2.0	2.8	2.2	2.2

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3 = Strongly Mapped

Course Objectives:

CSE11117	Software Engineering	L	T	P	C
Version 1.0	Contact Hours -45	3	0	0	3
Pre-requisites/Exposure	Software/Hardware evolution at basic level				
Co-requisites	--				

1. To help the student to acquire knowledge of software evolution process.
2. To enable students modelling software project with appropriate metric and precision at workplace.
3. To give the students a perspective to software design process variables by exposing them to software specification document; and also, to enrich their software testing ability.
4. To enable students, acquire testing and quality assessment of model required for their profession.

Course Outcomes:

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

CO1.**Interpret** the impact of software engineering.

CO2.**Communicate** with proper software model paradigm to pupils.

CO3. **Enhancement** of software metric engineering application in industry.

CO4. **Effectively** analyse testing and maintenance of software project.

CO5. **Illustrate** software metric analysis for an effective model.

Catalog Description:

There is a growing need for talented software developers across every industry. As technology advances, the ability to build quality software while considering design, development, security, and maintenance is sought after amongst all kinds of companies, from finance and banking to healthcare and national security.

Software Engineering applies the knowledge and theoretical understanding gained through computer science to building high-quality software products. As a maturing discipline, software is becoming more and more important in our everyday lives. Our software development and engineering professional program is Pace University's response to the tremendous growth of the software development industry.

Course Content:

Unit I: 9 lecture hours

Software - Evolving role of it, a crisis on the Horizon and its Myths, Software process models: linear sequential model, prototyping model, RAD model, Evolutionary model, Formal methods model, Component based development, fourth generation techniques, Software development and requirement analysis using Agile, Scrum framework.

Unit II: 10 lecture hours

Management spectrum, people, problem, process, project and few Critical approach,

Software Process and project metrics: Measure, Metrics and Indicators, Process and Project Domain related metrics, Software Measurement, Reconciling of Different, Metrics Approaches, Software quality metrics, Validation management, **Software project planning:** Observations on estimation, Objectives of Project planning.

Unit III: 8 lecture hours

Resources: Software project estimation, Empirical models for estimation, Automated estimation tools, Risk management and Software risks: Identification, Risk projection, safety risks and hazards; RMMM plans, Risk management

Unit IV: 9 lecture hours

Project scheduling and tracking: Definition of task set and task network, Scheduling, earned value analysis, Tracking of Errors, Project planning, **Software quality assurance:** Concepts of Software Quality, Quality movement, Review of software quality assurance, Software reliability, Software quality metrics (MTTF, MTTR, MTBF ETC.)

Unit V: 9 lecture hours

Software configuration management: Object identification in software configuration, Configuring audit-SCM standards, **Analysis concepts and principles:** Requirement analysis, Software prototyping, Specification Review Analysis modeling, Data modeling, Functional modeling, Behavioral modeling, **Software design, Software testing techniques:** White box and black box testing, Software testing strategies - Unit testing, Integrating testing, System testing.

Text Books:

1. Software Engineering: A practitioner's approach, 8th Edition, Roger S. Pressman, McGraw Hill
2. An integrated approach to Software Engineering, Springer/Narosa Edition, Pankaj Jalote.

Reference Books:

- Fundamentals of Software Engineering, 4th Edition, Rajib Mall, Prentice Hall, India.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Mid term	Continuous Assessment	End Term
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11117	Software Engineering	CO11117.1	2	3	3	2	2	3	2	-	1	3	2	1	1	1	3
		CO11117.2	2	2	3	1	2	1	2	-	1	-	-	3	2	1	1
		CO11117.3	3	1	2	3	3	3	3	-	1	-	-	2	2	3	2
		CO11117.4	3	3	2	3	2	2	1	2	2	-	-	3	3	3	2
		CO11117.5	3	1	3	1	3	2	2	2	3	-	-	3	1	3	2
		CO11117	2.6	2.0	2.6	2.0	2.4	2.2	2.0	2.0	1.6	3.0	2.0	2.4	1.8	2.2	2.0

1=weakly mapped

2= moderately mapped

3=strongly mapped

CSE11167	Competitive Programming	L	T	P	C
Version 1.0	Contact Hours -45	3	0	0	3
Prerequisites/Exposure	Basics of data structure, algorithm				
Co-requisites	Programming Concepts				

Course Objectives:

- To introduce problem solving approach through programming.
- To develop students to analyse the existing algorithms and approach for improvement.
- To introduce the students a perspective to different design and analysis approach for algorithm(s) to solve a problem.
- To develop students to select optimal solution to a problem by choosing the most appropriate algorithmic method.

Course Outcomes

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

- **Implement** the basics about arrays and learn how to analyse and design greedy methods.
- **Identify** different data structure techniques methods to solve computing problems
- **Choose** divide and conquer, dynamic programming methods to solve real life problems
- **Understand** the approach for solving problems using graphs.
- **Implement** different number theory and combinatorics related problems.

Course Description:

The focus of the course is the development and implementation of advanced algorithms, as well as the skills required for programming competitions. The students will learn to select appropriate algorithms for a given problem, integrate multiple algorithms for solving a complex problem, design new algorithms, and implement them. They will also learn skills required for participation in programming contests, which include evaluation of problem difficulty, solving problems in teams, and work under time pressure.

Course Content:

Module-I: [8 Lecture Hours]

Basics Of Array, String, Greedy and Bit Manipulation: Single and Multidimensional Arrays, Representation of Arrays - Row Major Order, and Column Major Order, Application of arrays – searching and sorting, Declaration of a String, Initialization of a String, Various String Handling Functions with example, greedy algorithms, Bit operators

Module-II: [11 Lecture Hours]

Basic Data Structures and Algorithms: Linked Lists: Implementation and basic operations. Stacks and Queues: Concepts and applications. Trees. Hashing and Hash tables: Introduction and applications. Bubble Sort, Selection Sort, Insertion Sort. Merge Sort, Quick Sort, Counting Sort. Binary Search, Ternary Search.

Module -III: [11 Lecture Hours]

Dynamic Programming and Divide and Conquer: Introduction to Dynamic Programming (DP). Memoization and tabulation techniques. Problems involving DP (e.g., Fibonacci sequence, knapsack problem). Introduction to Divide and Conquer. Problems involving the Divide and Conquer approach.

Module -IV: [9 Lecture Hours]

Graph Algorithms: Graph Representation (Adjacency Matrix, Adjacency List). Depth-First Search (DFS) and Breadth-First Search (BFS). Shortest Path Algorithms (Dijkstra's, Bellman-Ford, Floyd-Warshall). Minimum Spanning Tree (Prim's and Kruskal's algorithms).

Module -V: **[6 Lecture Hours]**

Number Theory and Combinatorics: Prime numbers and primality testing. Sieve of Eratosthenes. Modular arithmetic and its applications. Permutations and Combinations. Heaps and Priority Queues. Disjoint Set Union (Union-Find) Data Structure. Segment Trees and Fenwick Trees (Binary Indexed Trees).

Text Books:

- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms, first or second edition, McGraw Hill.
- "Programming Challenges" by Steven S. Skiena and Miguel A. Revilla:

Reference Books:

- "Competitive Programming" by Steven Halim and Felix Halim

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	**Internal Assessment**	**Mid Semester Examination**	**End Semester Examination**
Weightage (%)	**30**	**20**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11167	Competitive Programming	CO11167.1	3	3	3	1	3	2	1	-	3	-	-	1	3	1	2
		CO11167.2	2	3	1	2	2	3	3	-	1	-	-	2	1	1	2
		CO11167.3	2	1	1	3	3	2	3	-	2	-	-	2	2	3	3
		CO11167.4	2	3	1	2	2	2	3	-	2	-	-	3	1	2	3
		CO11167.5	2	3	3	3	3	3	1	-	3	-	-	3	2	3	1
		CO11167	2.2	2.6	1.8	2.2	2.6	2.4	2.2	-	2.2	-	-	2.2	1.8	2.0	2.2

1=weakly mapped

2= moderately mapped

3=strongly mapped

CSE11118	**Introduction to Python**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**10+2 Level Mathematics, Knowledge of Basics of Computer**				
Co-requisite	**NIL**				

Course Objectives:

To understand the concept of programming using python
To apply numerical computations using numpy
To apply scientific computations using scipy
To visualize trends in data using matplotlib
To perform machine learning operations using sklearn

Course Outcomes:

On the completion of this course the student will be able to

CO1 :	Understand the basic concepts of python
CO2 :	Understand database management using python
CO3 :	Apply numerical computation with python
CO4 :	Compare scientific computation methods with python
CO5 :	Visualize trends in the data with python

Course Description:

Data is the new Oil. This statement shows how every modern IT system is driven by capturing, storing and analysing data for various needs. Be it about making decision for business, forecasting weather, studying protein structures in biology or designing a marketing campaign. All of these scenarios involve a multidisciplinary approach of using mathematical models, statistics, graphs, databases and of course the business or scientific logic behind the data analysis. So we need a programming language which can cater to all these diverse needs of data science. Python shines bright as one such language as it has numerous libraries and built in features which makes it easy to tackle the needs of Data science. In this course we will cover these the various techniques used in data science using the Python programming language.

Course Content:

Unit I: **9 lecture hours**

Introduction to Python : Datatypes, expressions, statements, conditions, loops, classes, objects, functions, data structures, I/O, packages.

Unit II: **9 lecture hours**

Data Handling with Pandas: DataFrames, Series, loading and saving, alignment, missing data, reshaping, pivoting, slicing, indexing, subsetting, insertion/deletion, merge and join, time series.

Unit III: **9 lecture hours**

Numerical computation: ndarrays, datatypes, mathematical and logical operations, linear algebra, fourier transforms, random, searching, sorting, import and export data.

Unit IV **9 lecture hours**

Scientific computations: Physical and mathematical constants, Fourier transform, Integration routines, Interpolation, Data input and output, Linear algebra routines, Optimization, Signal processing, Sparse matrices, Spatial data structures and algorithms, Any special mathematical functions, Statistics

Unit V **9 lecture hours**

Data visualization: Chart properties, styling, box plots, heatmaps, scatterplots, bubble charts, 3d charts, time series, geographical data, graph data.

Text Books:

1. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython - Wes McKinney – O'Reilly

2. Machine Learning with Python Cookbook: Practical Solutions from Preprocessing to Deep Learning – Chris Albon- O'reilly

Reference Books:

1. Introduction to Machine Learning with Python: A Guide for Data Scientists by Andreas C. Müller, Sarah Guido- O'Reilly

2. Learning Python: Powerful Object-Oriented Programming, Mark Lutz- O'Reilly

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination

Examination Scheme:

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11118	Introduction to Python	CO111118.1	3	1	2	2	3	2	2	-	2	-	-	1	3	3	3
		CO111118.2	3	3	2	2	1	2	3	-	2	-	-	3	3	1	3
		CO111118.3	2	3	3	3	2	1	3	-	1	-	-	1	3	1	3
		CO111118.4	3	2	2	3	2	2	3	-	2	-	-	2	2	1	2
		CO111118.5	2	1	3	3	2	2	1	-	3	-	-	2	1	1	3
		CO111118	2.6	2.0	2.4	2.6	2.0	1.8	2.4	-	2.0	-	-	1.8	2.4	1.4	2.8

1 = Weakly Mapped

2 = Moderately Mapped

3 = Strongly Mapped

CSE11119	**Optimization and Game Theory**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**---**				
Co-requisite	**NIL**				

Course Objectives:

- Formulate an equilibrium-finding problem of certain games as a CP/VI or an MPEC
- Rigorously analyze the existence and uniqueness of solutions to CPs, VIs and MPECs, and hence able to prove the existence and uniqueness of Nash equilibrium to certain games
- Understand and utilize various algorithms to solve CPs, VIs and MPECs
- Understand the basic formulation and theories of optimization under uncertainty
- Understand the basic concepts of games with uncertainty

Course Outcomes:

On the completion of this course the student will be able to

CO1	Explain basic concepts of linear algebra, real analysis and nonlinear programming
CO2	Understand Game theory and linear complementarity problems
CO3	Formulate nonlinear complementarity problems and variational inequalities
CO4	Solve mathematical problems with equilibrium concepts
CO5	Decide under uncertainty and competition

Course Description:

This course will serve as an advanced graduate-level course to provide students both solid theoretical foundations of optimization in general, and knowledge of the state-of-the-art development the area of complementarity problems (CPs), (finite-dimensional) variational inequalities (VIs), mathematical problems with equilibrium constraints (MPECs) and their applications in game theory. Building upon such knowledge, the course will also provide an introduction, not a comprehensive treatment, of decision-making under uncertainties and competition. While the course will focus on the theoretical aspects of the subjects, it will as well introduce students to modeling languages, such as AMPL and GAMS, and the complementarity-problem solver PATH, through NEOS Online Optimization Server.

Course Content:

Unit-I **10 Lecture Hours**

Background – linear algebra, real analysis and nonlinear programming

Linear algebra Vectors, matrices, norms, Eigenvalues, eigenvectors and singular-value decomposition, Semidefinite and definite matrices

Real analysis Limits, continuity, Functions of several variables, differentiability, Contraction mappings, fixed point theorems

Convex analysis Convex sets, convex hulls, Separation and support of sets, Convex functions, differentiability and sub gradients, Generalizations of convex functions,

Nonlinear programming

Unconstrained optimization: optimality conditions, algorithms

Constrained optimization: Tangent cones, Constrained qualifications, Optimality

Lagrange multipliers and duality NLP algorithms: penalty approach, SQP, interior point methods

Unit-II **10 Lecture Hours**

Game theory and linear complementarity problems

- Game Theory Non-cooperative games: normal-form representation, the concept of Nash equilibrium, Proof of Nash equilibrium through fixed-point theorem

- LCP : Reformulation of games to CPs, Solution existence of LCPs, Lemke's Method

Unit-III **15 Lecture Hours**

Nonlinear complementarity problems and variational inequalities

- Problem definitions and application areas

– Solution analysis

– Algorithms for CPs

– Algorithms for VIs

Unit-IV **10 Lecture Hours**

Mathematical problems with equilibrium constraints

- Extensive-form games and Stackelberg games

- MPECs : Formulation, Solution existence, constraint qualifications, and optimality conditions, Algorithms for MPECs

Unit-V **5 Lecture Hours**

Decision-making under uncertainty and competition

- Decision theory under uncertainty

- Optimization under uncertainty - Formulation, solution concepts and analysis , Sample average approximation

- Game theory under uncertainty - Information and equilibrium concepts, Algorithms

Text Books:

Computer Organization 1.and Design: The Hardware/Software Interface, 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.

Computer Organization and Embedded Systems, 6th Edition by Carl Hamacher, McGraw Hill Higher Education.

Reference Books:

Computer Architecture and Organization, 3rd Edition by John P. Hayes, WCB/McGraw-Hill

Computer Organization and Architecture: Designing for Performance, 10th Edition by William Stallings, Pearson Education.

.Computer System Design and Architecture, 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11119	Optimization and Game Theory	CO11119.1	3	3	3	3	3	3	1	-	1	-	-	3	3	3	3
		CO11119.2	3	3	2	3	2	3	3	-	1	-	-	2	1	1	2
		CO11119.3	2	3	2	3	3	1	3	-	3	-	-	1	3	1	3
		CO11119.4	2	2	3	2	1	1	3	-	3	-	-	1	3	2	3
		CO11119.5	2	3	3	2	3	3	3	-	2	-	-	2	1	3	1
		CO11119	2.4	2.8	2.6	2.6	2.4	2.2	2.6	-	2.0	-	-	1.8	2.2	2.0	2.4

1 = Weakly Mapped
2 = Moderately Mapped
3 = Strongly Mapped

CSE11120	**Introduction to Data Science**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**---**				
Co-requisite	**NIL**				

Course Objectives:

This course will provide a foundation in the area of data science based on data curation and statistical analysis.

Course Outcomes:

On the completion of this course the student will be able to

- Define Understand the limitations of data sets based on their contents and provenance
- Understand data organization, management, preservation, and reuse

Knowledge of what statistical analysis techniques to choose, given particular demands of inference and available data

- Explain of general linear models and cluster analysis methods for statistical analysis
- Demonstrate Skills and knowledge in preparing data for analysis, including cleaning data, manipulating data, and dealing with missing data
- Show Skills in actually analyzing data using open source data analysis tool

Course Description:

The primary goal of this course is for students to learn data analysis concepts and techniques that facilitate making decisions from a rich data set. Students will investigate data concepts, metadata creation and interpretation, general linear method, cluster analysis, and basics of information visualization. At the beginning, this course will introduce

fundamentals about data and data standards and methods for organizing, curating, and preserving data for reuse. Then, we will focus on the inferential statistics: drawing conclusions and making decisions from data. This course will help students understand how to use data analysis tools, and especially, provide an opportunity to utilize an open source data analysis tool, R, for data manipulation, analysis, and visualization. Finally, in this course we will discuss diverse issues around data including technologies, behaviors, organizations, policies, and society.

Course Content:

Unit-I **5 Lecture Hours**

Definition of Data Science, Essential Concepts of Data, Data Problems and Solutions

10 Lecture Hours

Unit-II

Data Modelling and Relationship, Data Structure and Variables.

10 Lecture Hours

Unit-III

Descriptive Statistics, Sampling Distributions, Big Data and Statistics

10 Lecture Hours

Unit-IV

Linear Regression, Cluster Analysis, Similarity Metrics, Dimensionality Reduction

10 Lecture Hours

Unit-V

Text Analysis(Unstructured Data), Relevant Issues in Data Science

Text Books:

Jeffrey M. Stanton (2013). Introduction to Data Science.

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11120	Introduction to Data Science	CO11120.1	2	2	3	3	2	2	3	-	2	-	-	3	1	3	3
		CO11120.2	2	2	3	2	2	3	1	-	1	-	-	3	2	1	3
		CO11120.3	2	2	2	2	2	3	1	-	3	-	-	2	2	3	3
		CO11120.4	3	3	3	2	1	3	3	-	1	-	-	3	2	1	1
		CO11120.5	2	3	2	3	1	2	2	-	3	-	-	3	2	3	3
		CO11120	2.2	2.4	2.6	2.4	1.6	2.6	2.0	-	2.0	-	-	2.8	1.8	2.2	2.6

1 = Weakly Mapped

2 = Moderately Mapped

3 = Strongly Mapped

CSE11121	**Distributed Systems and Cloud**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Knowledge of programming, computer systems architectures, networks and operation systems**				
Co-requisite	**NIL**				

Course Objectives:

- To explain the evolving computer model called cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.
- Apply distributed computational model and understand the need for cloud computing.

Course Outcomes:

On the completion of this course the student will be able to

- Explain distributed system models and cloud service & deployment models.
- Analyse the need for virtualization in a cloud environment and apply it in compute, memory and storage levels.
- Explain distributed computation model on large datasets using parallel and distributed programming approaches over cloud platforms.
- Analyse the security issues on SPI infrastructure and explain the need for Homomorphic encryption.
- Explain the role of trust and energy efficiency in cloud.

Course Description:

It serves as one of the important courses in terms of having an understanding about the basic concepts about distributed systems, their types or categories with some concepts about basic networking and various different directions in which it is useful and applicable. The outcome of the course implicitly and explicitly affects the abilities of students to have a good understanding of the upcoming other related courses. This course also gives students an insight into the basics of cloud computing along with virtualization, cloud computing is one of the fastest growing domain from a while now. It will provide the students basic understanding about cloud and virtualization along with it how one can migrate over it.

Course Content:

Unit-I **09 Lecture Hours**

Distributed System Models & Enabling technology: Scalable computing over the internet, Technologies for network based system, System models for distributed & cloud, Software environments for distributed & Cloud.

Time and Global States: Introduction, Clocks events and process states, synchronizing physical clocks, Logical clocks, Global states

Introduction to Cloud Computing: Cloud Computing in a Nutshell System Model for Distributed and Cloud Computing, Roots of Cloud Computing, Grid and Cloud, Layers and Types of Clouds, Desired Features of a Cloud, Basic Principles, of Cloud Computing, Challenges and Risks, Service Models.

Unit-II **09 Lecture Hours**

Virtual Machines and Virtualization of Cluster and Data Centres: Levels of Virtualization, Virtualization structures/Tools and Mechanism, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resources Management, Virtualization Data-Centre Automation.

Unit-III **09 Lecture Hours**

Service Oriented Architecture for Distributed Computing: Services & SOA, Message Oriented Middleware, Workflow in SOA.

Cloud Programming & Software Environments: Features of Cloud & Grid, Parallel & Distributed programming paradigms, Programming support of Google Cloud, Amazon AWS & Azure. Case Studies: OpenStack & Aneka.

Unit-IV **09 Lecture Hours**

Cloud Security, Data Security in the Cloud: An Introduction to the Idea of Data Security, The Current State of Data Security in the Cloud

CryptDb: Onion Encryption layers- DET, RND, OPE, JOIN, SEARCH, HOM, and Homomorphism Encryption, FPE.

Unit-V **09 Lecture Hours**

Trust Management & Green Cloud: Trust, Reputation and Security Management in P2P Systems, Load

Balancing-HAProxy, Container based Virtualization-Docker, Green Cloud - Energy Consumption Models and Energy-aware Data Centres and Clouds.

Text Books:

Cloud Computing: Principles and Paradigms – Rajkumar Buyya, James Broberg and Andrzej M. Goscinski – Wiley
Distributed and Cloud Computing – Kai Hwang, Geoffery C. Fox, Jack J. Dongarra – Elsevier

Reference Books:

Cloud Computing : A Practical Approach – Anthony T.Velte, Toby J.Velte, Robert Elsenpeter – Tata McGraw Hill
Enterprise Cloud Computing – Gautam Shroff – Cambridge University Press
Cloud Computing: Implementation, Management and Security – John W. Rittinghouse, James F. Ransome – CRC Press
Cloud Application Architectures: Building Applications and Infrastructure in the Cloud – George Reese – O'Reilly

Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance– Tim Mather, Subra Kumaraswamy, Shahed Latif – O'Reilly

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11121	Distributed Systems and Cloud	CO11121.1	2	3	2	1	3	3	2	-	3	-	-	1	1	3	1
		CO11121.2	3	2	1	1	3	2	3	-	2	-	-	2	3	2	2
		CO11121.3	2	1	2	3	1	2	3	-	2	-	3	1	2	3	3
		CO11121.4	1	1	3	3	2	1	3	-	1	-	-	2	1	1	3
		CO11121.5	3	3	1	3	1	3	2	-	3	-	3	3	1	3	2
		CO11121	2.2	2.0	1.8	2.2	2.0	2.2	2.6	-	2.2	-	3.0	1.8	1.6	2.4	2.2

1 = Weakly Mapped
2 = Moderately Mapped
3 = Strongly Mapped

CSE11122	**Introduction to Cyber Security**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Computer Network**				
Co-requisite	**NIL**				

Course Objectives:

- To understand basics of Cyber Security.
- To be able to secure a message over insecure channel by various means.
- To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
- To understand various protocols for cyber security to protect against the threats in the cyber space.

Course Outcomes:

On the completion of this course the student will be able to

- **Define** the basics of Cyber security and types of existing malware.
- **Understand** and identify the cyber security breaches and cyber attacks.
- **Explain** the preventive measures for cyber fraud

CO4. **Examine** the basics concept of Social Network Security and Web Security.

CO5. **Appraise** the recent threats and attacks against the technical world and design some effective prevention scheme.

Course Description:

Effective network communication is an integral part of technical life. Cyber Security and Cryptography is a process of securing the data communication, all the algorithms, messages etc. In this course you will learn the basics of cyber security and how to prevent and detect any sort of cyber attacks. The course begins with a detailed discussion of different types of malware, cyber security breaches and cyber attacks. Throughout the course participants will be exposed to many exciting open problems in the field and work on fun (optional) programming projects. In the course cyber security we will cover more advanced security tasks such as zero-day vulnerability, privacy mechanisms, and other forms of defence against hackers.

Course Content:

Unit-I **09 Lecture Hours**

Cyber security fundamentals:

Definition of cyber space, cyber security, importance of cyber security, hacker, related case studies

Types of malware:

Worm, virus, spyware, Trojan, related case studies

Unit-II **09 Lecture Hours**

Cyber security breaches:

Phishing, identity theft, harassment, cyber stalking, related case studies

Types of cyber attacks:

Password attacks, Denial of service attacks, Passive attack, Penetration testing, related case studies

Unit-III **09 Lecture Hours**

Prevention tips:

Design a strong password, Two-step verification, Question validity of web-sites, related case studies

Mobile protection:

No credit card numbers, place lock on phone, don’t save passwords, related case studies

Unit-IV **09 Lecture Hours**

Social network security:

Security measures like not revealing location, keeping birth-date hidden, having private profile, not linking accounts, related case study

Prevention software:

Firewalls, Virtual private network, Anti-virus & anti-spyware, Routine updates, related case study

Unit-V **09 Lecture Hours**

Critical cyber threats:

Critical cyber threats, cyber terrorism, cyber-warfare, cyber-espionage,

Defense against hackers:

Cryptography, digital forensics, intrusion detection, legal recourse, related course study

Text Books:

"Network Security: Private Communication in Public World", Charlie Kaufman, RadiaPerman, Mike Speciner, 2^{nd} Edition, Pearson Education, 2011.

Reference Books:

"Cryptography and Network Security", Atulkahate, TMH, 2003.
"Cyber Security", Nina Godbole, WILEY, 2003.

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination

Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11122	Introduction to Cyber Security	CO11122.1	3	3	2	3	1	2	2	-	1	-	-	2	3	3	2
		CO11122.2	2	2	3	3	2	2	2	-	2	-	-	2	1	1	2
		CO11122.3	2	3	3	1	3	3	2	-	2	-	-	3	3	2	1
		CO11122.4	3	3	2	1	2	1	3	-	1	-	-	3	1	2	2
		CO11122.5	2	3	2	1	2	1	2	-	1	-	-	3	3	1	3
		CO11122	2.4	2.8	2.4	1.8	2.0	1.8	2.2	-	1.4	-	-	2.6	2.2	1.8	2.0

1 = Weakly Mapped
2 = Moderately Mapped
3 = Strongly Mapped

CSE11123	**Full Stack Software Development**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure					
Co-requisite					

Course Objectives:

To enhance software development capability of students

To familiarize students with modern software development technologies

To introduce all components of software development cycles

Course Outcomes:

CO1 :	Understand the concepts of full stack development
CO2 :	Explain the uses of front end libraries and frameworks
CO3 :	Understand principles of backend development
CO4 :	Explore database management solutions
CO5 :	Compare several popular stacks

Course Description:

Course Content:

Unit-I **9 Lecture Hours**

Component of full stack development

Software Requirement specification, Interface Design, Database Design, Logic Design

AGILE software development

Unit-II **9 Lecture Hours**

Front-End Development :

Overview of front-end languages : HTML, CSS, Javascript Overview

Overview of front-end frameworks and Libraries: AngularJS, React.js, Bootstrap, jQuery, SASS

GUI Design principles and challenges

Unit-III **9 Lecture Hours**

Backend Development :

Overview of backend development frameworks : PHP, C++, Java, Python, JavaScript, Node.js, Django, Rails, Laravel

Efficient data handling, API requests, Data security

Unit-IV **9 Lecture Hours**

Database Management :

Overview of database management frameworks: Oracle, MongoDB, MariaDB, SQL

Overview of distributed database management: Hadoop

Database connectivity protocols.

Unit-V **9 Lecture Hours**

Popular Stacks:

MEAN Stack: MongoDB, Express, AngularJS and Node.js.

MERN Stack: MongoDB, Express, ReactJS and Node.js

Django Stack: Django, python and MySQL as Database.

Rails or Ruby on Rails: Uses Ruby, PHP and MySQL.

LAMP Stack: Linux, Apache, MySQL and PHP.
Python Stack: Pandas, Numpy, Matplotlib, Tkinter.

Text Books:

1. Getting MEAN with Mongo, Express, Angular, and Node - Clive Harber and Simon Holmes
2. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node

Reference Books:

1. Django: Web Development with Python

2. Ruby on Rails For Beginners Rails Web Development Programming and Coding Tutorial by Joseph Joyner , Mihails Konoplovs

3. LAMP Stack for Humans - Versluis Jay - AtlanticPublishers

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11123	Full Stack Software Development	CO11123.1	1	3	2	2	2	2	1	-	2	-	2	1	3	2	2
		CO11123.2	1	2	3	2	2	2	3	-	2	-	2	2	2	2	1
		CO11123.3	2	3	2	2	3	3	3	-	2	-	2	2	3	2	2
		CO11123.4	1	3	3	2	2	3	2	-	2	-	2	3	2	3	2
		CO11123.5	1	3	2	2	2	2	1	-	1	-	3	3	1	3	3
		CO11123	1.2	2.8	2.4	2.0	2.2	2.4	2.0	-	1.8	-	2.2	2.2	2.2	2.4	2.0

1 = Weakly Mapped, 2 = Moderately Mapped, 3= Strongly Mapped

CSE11124	**Pattern Recognition and Soft Computing**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**---**				
Co-requisite	**---**				

Course Objectives:

To familiarize concepts of pattern recognition systems

To introduction fuzzy logic and soft computing princples

Course Outcomes:

CO1 :	Discuss components of a pattern recognition system
CO2 :	Explore dimensionality reduction and classification techniques
CO3 :	Validate clustering techniques
CO4 :	Explain concepts of representation learning
CO5 :	Compare Hard and Soft computing methodologies

Course Description:

Pattern recognition is the automated recognition of patterns and regularities in data. It has applications in statistical data analysis, signal processing, image analysis, information retrieval, bioinformatics, data compression, computer graphics and machine learning. Pattern recognition has its origins in statistics and engineering; some modern approaches to pattern recognition include the use of machine learning, due to the increased availability of big data and a new abundance of processing power. Soft computing is a set of algorithms,[1] including neural networks, fuzzy logic, and genetic algorithms.[2] These algorithms are tolerant of imprecision, uncertainty, partial truth and approximation. It is contrasted with hard computing: algorithms which find provably correct and optimal solutions to problems.

Course Content:

Unit-I **9 Lecture Hours**

Introduction

Components of a pattern recognition system, feature selection vs feature extraction, types of learning techniques, descriptive statistics,

Unit-II **9 Lecture Hours**

Dimensionality reduction – PCA, SVD, LDA,

Classification Techniques – K-NN, Decision Trees, Naïve Bayes.

Unit-III **9 Lecture Hours**

Clustering:

Similarity and Dissimilarity Measures, Clustering Techniques: K-Means, Hierarchical Clustering, Cluster Validity Indices: Dunn and DB Index

Unit-IV **9 Lecture Hours**

Representation Learning with Neural Networks : Perceptron, MLP, Backpropagation, Autoencoders, Variational Autoencoders

Unit-V **9 Lecture Hours**

Soft Computing Principles : Hard Logic vs Fuzzy Logic, Membership Functions, Fuzzy Clustering: FCN, EM Algorithms

Text Books:

1. Pattern Recognition in Soft Computing Paradigm Nikhil R. Pal
2. Neuro-fuzzy pattern recognition- Sankar Kumar Pal

Reference Books:

1. Pattern Classification by David G. Stork, Peter E. Hart, and Richard O. Duda

2. Principles of Soft Computing, 2nd Ed (With Cd) Book By S. N. Deepa And S. N. Sivanandam

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Class Assessment	End Term

Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11124	Pattern Recognition and Soft Computing	CO11124.1	2	2	3	2	2	3	3	-	2	-	-	2	3	3	2
		CO11124.2	2	2	2	3	2	3	1	-	1	-	-	2	3	1	3
		CO11124.3	1	3	2	3	2	2	3	-	3	-	-	2	3	3	1
		CO11124.4	3	2	2	2	2	2	2	-	2	-	-	3	1	3	2
		CO11124.5	1	2	3	2	3	3	2	-	2	-	-	3	1	1	3
		CO11124	1.8	2.2	2.4	2.4	2.2	2.6	2.2	-	2.0	-	-	2.4	2.2	2.2	2.2

1 = Weakly Mapped, 2 = Moderately Mapped, 3= Strongly Mapped

CSE11125	**Data Mining and Warehousing**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**DBMS**				
Co-requisite	**NIL**				

Course Objectives:

- Introduce data mining principles and techniques.
- Introduce data mining as a cutting edge business intelligence tool.
- Develop and apply critical thinking, problem solving and decision making skills.
- Introduce the concepts of Data Warehousing, difference between database and data warehousing
- Describe and demonstrate basic data mining algorithms, methods, tools.
- Describe ETL Model and the Star Schema to design a Data Warehouse.

Course Outcomes:

On the completion of this course the student will be able to

- Design a data mart or data warehouse for any organization
- Develop skills to write queries using DMQL
- Extract knowledge using data mining techniques
- Adapt to new data mining tools
- Apply the techniques of Data Mining

Course Description:

Data mining is a class of analytical techniques that examine a large amount of data to discover new and valuable information. This course is designed to introduce the core concepts of data mining, its techniques, implementation, benefits, and outcome expectations from this new technology. It will also identify industry branches which most benefit from DM. Data warehousing involves data pre-processing, data integration, and providing on-line analytical processing (OLAP) tools for the interactive analysis of multidimensional data, which facilitates effective data mining. This course introduces data warehousing and data mining techniques and their software tools. Topics include: data warehousing, association analysis, classification, clustering, numeric prediction, and selected advanced data mining topics.

Course Content:

Unit-I **09 Lecture Hours**

Introduction to Data Mining: Motivation, Importance, Definition of Data Mining, Kind of Data, Data Mining Functionalities, Kinds of Patterns, Classification of Data Mining Systems, Data Mining Task Primitives, Integration of A Data Mining System With A Database or Data Warehouse System, Major Issues In Data Mining, Types of Data Sets and Attribute Values, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity.

Pre-processing: Data Quality, Major Tasks in Data Pre-processing, Data Reduction, Data Transformation and Data Discretization, Data Cleaning and Data Integration.

Unit-II **09 Lecture Hours**

Data Warehousing and On-Line Analytical Processing: Data Warehouse Basic Concepts, Data Warehouse Modelling - Data Cube And OLAP, Data Warehouse Design And Usage, Data Warehouse Implementation, Data Generalization By Attribute-Oriented Induction.

Data Cube Technology: Efficient Methods For Data Cube Computation, Exploration And Discovery In Multidimensional Databases.

Unit-III **09 Lecture Hours**

Mining Frequent Patterns, Associations And Correlations: Basic Concepts, Efficient And Scalable Frequent Item Set Mining Methods, Are All The Pattern Interesting, Pattern Evaluation Methods, Applications Of Frequent Pattern And Associations.

Frequent Pattern And Association Mining: A Road Map, Mining Various Kinds Of association Rules, Constraint-Based Frequent Pattern Mining, Extended Applications Of Frequent Patterns.

Unit-IV **12 Lecture Hours**

Classification: Basic Concepts, Decision Tree Induction, Bayesian Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy: Ensemble Methods, Handling Different Kinds of Cases in Classification, Bayesian Belief Networks, Classification by Neural Networks, Support Vector Machines, Pattern-Based Classification, Lazy Learners (or Learning from Your Neighbours), Other Classification Methods.

Cluster Analysis: Basic Concepts Of Cluster Analysis, Clustering Structures, Major Clustering Approaches, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Model Based Clustering - The Expectation-Maximization Method, Other Clustering Techniques, Clustering High-Dimensional Data, Constraint-Based And User-Guided Cluster Analysis, Link-Based Cluster Analysis, Semi-Supervised Clustering And Classification, Bi-Clustering, Collaborative Clustering.

Outlier Analysis: Why Outlier Analysis, Identifying And Handling Of Outliers, Distribution Based Outlier Detection: A Statistics-Based Approach, Classification-Based Outlier Detection, Clustering-Based Outlier Detection, Deviation-Based Outlier Detection, Isolation-Based Method: From Isolation Tree To Isolation Forest.

Unit-V **06 Lecture Hours**

Term Paper on Data Mining: Pictorial Data Mining, Text Mining, Social Media Mining, Web Mining, And Audio And Video Mining

Text Books:

Data Mining: Concepts and Techniques – Jiawei Han, Micheline Kamber, Jian Pei – Elsevier, United States of America
Data Mining: Introductory and Advanced Topics – H. Dunham – Pearson Education
Data Warehousing in the Real World : A Practical Guide for Building Decision Support Systems – Sam Anahory, Dennis Murray – Pearson Education

Reference Books:

Data Warehousing System – Mallach – McGraw –Hill
Data Warehousing – Amitesh Sinha – Thomson Learning, India
Top Ten Algorithms in Data Mining – Xingdong Wu, Vipin Kumar – CRC Press, UK

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11125	Data Mining and Warehousing	CO11125.1	3	1	3	2	1	1	2	-	1	-	-	3	2	3	3
		CO11125.2	2	3	3	3	3	3	3	-	1	-	-	2	3	2	1
		CO11125.3	2	3	2	3	2	3	1	-	2	-	-	2	1	3	2
		CO11125.4	3	2	2	3	1	1	3	-	2	-	-	3	2	1	2
		CO11125.5	2	1	2	3	2	1	2	-	2	-	-	3	1	1	3
		CO11125	2.4	2.0	2.4	2.8	1.8	1.8	2.2	-	1.6	-	-	2.6	1.8	2.0	2.2

1 = Weakly Mapped
2 = Moderately Mapped
3 = Strongly Mapped

		L	T	P	C
CSE11126	**Cloud Security**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Fundamentals of Cloud Computing and Cryptography**				
Co-requisite	**NIL**				

Course Objectives:

- To understand core cloud computing concepts and fundamental principles, including standard delivery models and service designs
- To understand the foundational security practices that are required to secure modern cloud computing infrastructures.
- To enable the students to analyse the differences between traditional data security practices and cloud-based data security methodologies.
- To allow students to identity and access management practices of both cloud providers and consumers
- To allow the student how to protect data-at-rest, data-in-transit, and data-in-use within a cloud environment.

Course Outcomes:

On the completion of this course the student will be able to

- **Understand** the differences between deployment models and service models of cloud computing
- **Explain** how cloud computing changes the traditional enterprise security considerations compared

  to on premise
- **Distinguish** different types of security risk and challenges occurred in cloud Computing.
- **Understand** different types of data security in Cloud Computing and how to handle it.
- **Analyze** complex technologies leading to the development of current and future cloud

  Computing security.

Course Description:

This course will provide a foundational understanding of what is required to secure a cloud ecosystem, regardless of the vendor. The concepts and principles discussed will help bridge the gaps between traditional and cloud architectures while accounting for the shifting thought patterns involving enterprise risk management. Students who complete this course will enter into any organization utilizing the cloud and immediately bring value to the infrastructure and security teams.

Course Content:

Unit-I **09 Lecture Hours**

Cloud Computing Fundamentals:

Introduction to Cloud Computing, The Evolution of Cloud Computing, Essential Characteristics of Cloud, Benefits and Challenges of Cloud Computing, Cloud Computing vs. Cluster Computing vs. Grid Computing, Cloud Computing Architecture, Cloud Service Models (XaaS), Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), Cloud deployment Models, Public Cloud, Private Cloud, Hybrid Cloud, Community Cloud, Limitation and Issues Cloud computing.

Unit-II **09 Lecture Hours**

Cloud Computing deployment and Service Security Needs:

Cloud Information Securities Objectives: Confidentiality, Integrity, and Availability;

Cloud Security Services: Authentication, Authorization, Auditing, Accountability, Relevant Cloud Security Design Principles, Secure Cloud Software Requirements, Secure Development Practices, Approaches to Cloud Software Requirements Engineering, Cloud Security Policy Implementation and Decomposition, Secure Cloud Software Testing, Cloud Computing and Business Continuity Planning, Disaster Recovery.

Unit-III **09 Lecture Hours**

Cloud Computing Security Risk Issues and Challenges:

The TIA Triad: Confidentiality, Integrity, Availability, Privacy and Compliance Risk, Information Privacy & Privacy Laws, Treat to Infrastructure, Data & Access Control, Common Threats & Vulnerabilities, Cloud Access Control Issues, Cloud Service Provider Risk. Security Policy Implementation, Virtualization Security Management, Virtual Threats: Hypervisor Risk, Increased Denial of Service Risk, VM Security Recommendations, Best Practice Security Techniques, VM Specific Security Techniques, Hardening The Virtual Machine, Securing VM Remote Access.

Unit-IV **09 Lecture Hours**

Data Security in Cloud Computing and Identity & Access Management(IAM)):

Overview of Data Security in Cloud Computing, Control Over Data, Common Risks With Cloud Data Security, Data Encryption, Overview of Cryptographic Techniques, Cloud Data Security: Sensitive Data Categorization, Authentication & Identity, Access Control Techniques, Deletion of Data, Data Masking, Cloud Data Storage. Identity & Access Management (IAM): Definitions & Challenges, Architectures & Practice, Standards & Protocols for Cloud Services. Open ID, Federated Identity (SSO), Cloud Authorization Management, Cloud Service Provider IAM Practice and Responsibilities, Customers IAM Responsibilities.

Unit-V **09 Lecture Hours**

Security Management in the Cloud:

Cloud Security Risk Management: Stages and Activities, Frame Work for Following Security Risks, Overview of Security Controls, Trusted Cloud Computing, Trusted Computing Characteristics, Secure Execution Environments & Communications, Security Management Standards, The Distributed Management Task Force (DMTF), The International Organization for Standardization (ISO) standards, The Organization for the Advancement of Structured, Information Standard (OASIS), Storage Networking Industry Association (SNIA), Open Grid Forum (OGF), The Open Web Application Security Project (OWASP), Incident Response, NIST Special Publication,800-61, Computer Security & Incident Response Teams.

Text Books:

Tim Mather, Subra Kumaraswamy, and Shahed "Latif Cloud Security & Privacy" First Edition, O Reilly Media, 2009
Vic (J.R) Winkler, Securing the Cloud: Cloud Computer Techniques and Tactics": Syngress (Elsevier), 2011
Ronald L.Krutz, "Cloud Security: A Comprehensive Guide to Secure Cloud Computing ", Wiley Publishing, 20210

Reference Books:

John W Rittinghouse, Jhon F. Ransome, "Cloud Computing: Implementation Management & Security ", CRC Press, 2009.

Rajkumar Buyya, James Broberg, "Cloud Computing: Principles, Systems, and Paradigm", Andrzej M Goscinski, Wile, 2011.

Cloud Computing Bible, Barrie Sosinsky, Wiley – India, 2010.

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11126	Cloud Security	CO11126.1	3	2	2	1	1	3	2	-	1	-	-	1	1	3	1
		CO11126.2	2	3	3	2	1	2	2	-	2	-	-	2	1	1	1
		CO11126.3	3	1	2	2	1	2	2	-	1	-	-	1	1	2	3
		CO11126.4	3	2	1	1	3	1	2	-	2	-	-	3	2	1	1
		CO11126.5	1	3	3	1	3	1	3	-	2	-	-	3	1	2	1
		CO11126	2.4	2.2	2.2	1.4	1.8	1.8	2.2	-	1.6	-	-	2.0	1.2	1.8	1.4

1 = Weakly Mapped
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3 = Strongly Mapped

CSE11127	**Cyber Law and Governance**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Computer Network, Engineering Mathematics**				
Co-requisite	**NIL**				

Course Objectives:

- To understand the different types of cybercrimes and cyber laws in India and abroad
- To impart sufficient knowledge on the fundamental legal issues in internet archiving.
- To expose to ethical issues in today's computer based environment
- To provide the exposure to different forms of Cyber crimes and the Indian and International laws to combat Cyber crimes and facilitate e-commerce.

Course Outcomes:

On the completion of this course the student will be able to

- **Understand** Cyber laws
- **Describe** Information Technology act and Related Legislation.
- **Demonstrate** Electronic business and legal issues.
- **Capability** to reason out different situations of ethics faced in the cyber world.
- **Interpret** Cyber Ethics.

Course Description:

This course explores technical, legal, and social issues related to cybercrimes, Laws Cyber Ethics. Cybercrime and laws is a broad term that includes offences where a computer may be the target, crimes where a computer may be a tool used in the commission of an existing offence, and crimes where a computer may play a subsidiary role such as offering evidence for the commission of an offence. It is also required to have knowledge of Cyber Ethics and its role and significance.

Course Content:

Unit-I **08 Lecture Hours**

Introduction to Cyber Law:

Evolution of computer Technology, emergence of cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace Web space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.

Unit-II **10 Lecture Hours**

Information Technology Act:

Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.

Unit-III **08 Lecture Hours**

Cyber Law and Related Legislation:

Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution , Online Dispute Resolution (ODR).

Unit-IV **09 Lecture Hours**

Electronic Business and Legal Issues:

Evolution and development in E-commerce, paper vs paper less contracts E-Commerce models- B2B, B2C, E security. Business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends.

Unit-V **10 Lecture Hours**

Cyber Ethics:

The Importance of Cyber Law, Significance of cyber Ethics, Need for Cyber regulations and Ethics. Ethics in Information society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Block chain Ethics.

Text Books:

Debby Russell and Sr. G. T Gangemi, “Computer Security Basics (Paperback), 2nd Edition, O Reilly Media, 2006.

Thomas R. Peltier, Information Security policies and procedures: A Practitioners Reference, 2nd Edition Prentice Hall, 2004.

Information Technology Act, 2000, S. R. Bhansali,, University Book House Pvt. Ltd., Jaipur (2003). **Reference Books:**

Cyber Laws: Intellectual property & E Commerce, Security- Kumar K, dominant Publisher

Hon C Graff, Cryptography and E-Commerce - A Wiley Tech Brief, Wiley Computer Publisher, 2001

Michael Cross, Norris L Johnson, Tony Piltzecker, Security, Shroff Publishers and Distributors Ltd

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11127	Cyber Law and Governance	CO11127.1	3	1	3	3	1	2	2	-	3	-	-	1	1	3	2
		CO11127.2	2	2	1	3	1	2	3	-	2	-	-	3	1	1	2
		CO11127.3	3	3	2	2	1	1	3	-	2	-	2	2	1	3	3
		CO11127.4	2	2	3	3	1	1	3	-	2	-	-	2	1	3	3
		CO11127.5	2	2	1	2	2	3	1	-	3	-	-	3	3	3	1
		CO11127	2.4	2.0	2.0	2.6	1.2	1.8	2.4	-	2.4	-	2.0	2.2	1.4	2.6	2.2

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3 = Strongly Mapped

CSE12128	**Computer Networks lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 30**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure	**Fundamental of Computer and LAN**				
Co-requisite	**NIL**				

Course Objectives:

- To introduce the idea of Network components like router, switch ,gateway
- To develop a Network topology in packet tracer
- To inculcate a concept of addressing mode and subnetting
- To analyse socket concept between client and server

Course Outcomes:

On the completion of this course the student will be able to

- Design a LAN Topology in Packet tracer with example
- Develop a network using distance vector routing protocol
- Apply the understanding in LAN Topology in Packet tracer with example
- Connectionless Iterative Echo-server, date and time, character generation using user-defined port
- Functional Overview of Client ser model

Course Description:

Use Networking-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and Networking tools including network design prediction and modelling to complex networking Ing activities with an understanding of the limitations

Course Content:

Suggested assignments to be framed based on the following Programming Language such as Network topology, Packet Tracer, Socket programming In C

Experiment 1:
Explain different type of network cables and their Usage with diagram

Experiment 2:
Explain the LAN Topology in Packet tracer with example

Experiment 3:
Study the Basic of Network commands and their Usage Windows/UNIX

Experiment 4:

Configure a network using distance vector routing protocol

Experiment 5:

Understanding and using of commands like ifconfig, netstat, ping, arp, telnet, ftp, finger, traceroute, whois

Experiment 6:

Socket Programming: Implementation of Connection-Oriented Service using standard ports.

Experiment 7:

Implementation of Connectionless Iterative Echo-server, date and time, character generation using user-defined port

Experiment 8:

Implementation of Connection-Oriented Concurrent Echo-server, date and time, character generation using user-defined ports

Experiment 9:

Program for connection-oriented Iterative Service in which server reverses the string sent by the client and sends it back

Experiment 10:

Program for connection-oriented Iterative service in which server changes the case of the strings sent by the client and sends back (Case Server).

Experiment 11:

Program for Connection-Oriented Iterative service in which server calculates the Net-salary of an Employee based on the following details sent by the

Experiment 12:

Program for Remote Command Execution using sockets

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Class Assessment	End Term
Weightage (%)	**50**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12128	Computer Networks lab	CO12128.1	2	1	1	3	2	2	1	-	2	2	-	1	2	1	2
		CO12128.2	3	1	3	3	1	3	2	-	2	2	-	1	2	1	2
		CO12128.3	2	1	3	3	1	2	3	-	1	3	-	1	2	3	1
		CO12128.4	1	1	2	3	2	1	2	3	2	-	-	3	3	3	1
		CO12128.5	1	2	2	3	2	1	2	2	3	-	-	3	3	1	3
		CO12128	1.8	1.2	2.2	3.0	1.6	1.8	2.0	2.5	2.0	2.33	-	1.8	2.4	1.8	1.8

1 = Weakly Mapped
2 = Moderately Mapped
3 = Strongly Mapped

CSE12129	**Computer Organization and Architecture Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 30**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure	**Digital Logic**				
Co-requisite	**NIL**				

Course Objectives:

To study the basic organization and architecture of digital computers (CPU, memory, I/O, software). Discussions will include digital logic and microprogramming. Such knowledge leads to better understanding and utilization of digital computers, and can be used in the design and application of computer systems or as foundation for more advanced computer-related studies.

Course Outcomes:

On the completion of this course the student will be able to

- Define functional block of a computer and relate data representation
- Explain and understand memory hierarchy design, memory access time formula, performance improvement techniques, and trade-offs.
- Analyze the concepts of memory utilization in a computer system.
- Analyze the concepts of memory utilization in a computer system.
- Define the implementation of parallel processors and nalyze the synchronization techniques

Course Description:

The architecture of computer systems and associated software. Topics include addressing modes, interrupt systems, input/output systems, external memory systems, assemblers, loaders, multiprogramming, performance evaluation, and data security.

This task is challenging for several reasons. First, there is a tremendous variety of products that can rightly claim the name of computer, from single-chip microprocessors costing a few dollars to supercomputers costing tens of millions of dollars. Variety is exhibited not only in cost, but also in size, performance, and application. Second, the rapid pace of change that has always characterized computer technology continues with no letup. These changes cover all aspects of computer technology, from the underlying integrated circuit technology used to construct computer components, to the increasing use of parallel organization concepts in combining those components. In spite of the variety and pace of change in the computer field, certain fundamental concepts apply consistently throughout. The application of these concepts depends on the current state of the technology and the price/performance objectives of the designer. The intent of this paper is to provide a thorough discussion of the fundamentals of computer organization and architecture and to relate these to contemporary design issues.The subtitle suggests the theme and the approach taken in this book. It has always been important to design computer systems to achieve high performance, but never has this requirement been stronger or more difficult to satisfy than today. All of the basic performance characteristics of computer systems, including processor speed, memory speed, memory capacity, and interconnection data rates, are increasing rapidly. Moreover, they are increasing at different rates. This makes it difficult to design a balanced system that maximizes the performance and utilization of all elements.

Course Content:

1. Write the working of 8085 simulator GNUsim8085 and basic architecture of 8085 along with small introduction.

2. Study the complete instruction set of 8085 and write the instructions in the instruction set of 8085 along with examples.

3. Write an assembly language code in GNUsim8085 to implement data transfer instruction.

4. Write an assembly language code in GNUsim8085 to store numbers in reverse order in memory location.

5. Write an assembly language code in GNUsim8085 to implement arithmetic instruction.

6. Write an assembly language code in GNUsim8085 to add two numbers using lxi instruction.

7. Write an assembly language code in GNUsim8085 to add two 8 bit numbers stored in memory and also storing the carry.

8. Write an assembly language code in GNUsim8085 to find the factorial of a number.

9. Write an assembly language code in GNUsim8085 to implement logical instructions.

10. Write an assembly language code in GNUsim8085 to implement stack and branch instructions

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination

Examination Scheme:

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12129	Computer Organization and Architecture Lab	CO12129.1	2	2	3	3	3	3	1	-	2	-	-	3	2	1	2
		CO12129.2	2	2	2	3	1	2	3	-	2	-	-	2	1	3	2
		CO12129.3	2	2	2	3	2	3	1	-	2	-	-	3	3	3	3
		CO12129.4	3	3	3	3	3	1	3	-	2	-	-	2	3	2	3
		CO12129.5	3	2	3	2	3	1	1	-	3	-	-	2	1	3	3
		CO12129	2.4	2.2	2.6	2.8	2.4	2.0	1.8	-	2.2	-	-	2.4	2.0	2.4	2.6

1 = Weakly Mapped
2 = Moderately Mapped
3 = Strongly Mapped

		L	T	P	C
CSE12168	**Software Enginering Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 30**	**0**	**0**	**2**	**1**
Co-requisite/Exposure	**A Course on "Software Engineering"**				
Co-requisite	**NIL**				

Course Objectives:To have hands on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development.

Course Outcomes

1. Ability to translate end-user requirements into system and software requirements

2. Ability to generate a high-level design of the system from the software requirements

3. Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

After completing this course the student will be able to:

CO1: To understand the software engineering methodologies involved in the phases for project development.

CO2: To gain knowledge about open source tools used for implementing software engineering methods.

CO3: To exercise developing product-start-ups implementing software engineering methods.

CO4: Able to study the problem and identify the project scope, Objectives and Infrastructure.

CO5: Able to identify the modules of the project and differentiate the functional and nonfunctional requirements.

CO6: Able to create prototypes for the projects.

List of Experiments

Do the following 8 exercises for any four projects given in the list of sample projects or any other projects:

1) Development of problem statement.

2) Preparation of Software Requirement Specification Document, Design Documents and Testing Phase related documents.

3) Preparation of Software Configuration Management and Risk Management related documents.

4) Study and usage of any Design phase CASE tool

5) Performing the Design by using any Design phase CASE tools.

6) Develop test cases for unit testing and integration testing

7) Develop test cases for various white box and black box testing techniques.

Sample Projects:

1. Passport automation System

2. Book Bank

3. Online Exam Registration

4. Stock Maintenance System

5. Online course reservation system

6. E-ticketing

7. Software Personnel Management System

8. Credit Card Processing

9. E-book management System.

10. Recruitment system

TEXT BOOKS: 1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, Mc Graw Hill International Edition.

2. Software Engineering- Sommerville, 7th edition, Pearson Education.

3. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.

L	**T**	**P**	**C**
30	0	0	2

Course Objectives:

CSE12169	Competitive Programming Lab	L	T	P	C
Version 1.0	Contact Hours -45	0	0	3	2
Prerequisites/Exposure	Basics of data structure, algorithm				
Co-requisites	Programming Concepts				

- To introduce problem solving approach through programming.
- To develop students to analyse the existing algorithms and approach for improvement.
- To introduce the students a perspective to different design and analysis approach for algorithm(s) to solve a problem.
- To develop students to select optimal solution to a problem by choosing the most appropriate algorithmic method.

Course Outcomes

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

- **Implement** the basics about arrays and learn how to analyse and design greedy methods.
- **Identify** different data structure techniques methods to solve computing problems
- **Choose** divide and conquer, dynamic programming methods to solve real life problems
- **Understand** the approach for solving problems using graphs.
- **Implement** different number theory and combinatorics related problems.

Course Description:

The focus of the course is the development and implementation of advanced algorithms, as well as the skills required for programming competitions. The students will learn to select appropriate algorithms for a given problem, integrate multiple algorithms for solving a complex problem, design new algorithms, and implement them. They will also learn skills required for participation in programming contests, which include evaluation of problem difficulty, solving problems in teams, and work under time pressure.

Course Content:

List of Programs:

- There is one meeting room in a firm. There are N meetings in the form of (start[i], end[i]) where start[i] is start time of meeting i and end[i] is finish time of meeting i. What is the maximum number of meetings that can be accommodated in the meeting room when only one meeting can be held in the meeting room at a particular time?

Note: Start time of one chosen meeting can't be equal to the end time of the other chosen meeting.

- Given a number N, calculate the prime numbers up to N using Sieve of Eratosthenes.
- Given an aarray A[] of N positive integers which can contain integers from 1 to P where elements can be repeated or can be absent from the array. Your task is to count the frequency of all elements from 1 to N.

Note: The elements greater than N in the array can be ignored for counting and do modify the array in-place.

- Given an array arr of integers of size N and an integer K, the task is to find the length of the longest subarray with at most K even elements

Input:

1. The first line of the input contains a single integer T denoting the number of test cases. The description of T test cases follows.

2. The first line of each test case contains two space-separated integers N and K.

3. The second line contains N space-separated positive integers represents array arr.

Output: For each test case, print the length of the longest subarray with at most K even elements.

Constraints:

1. 1 <= T <= 10

2. 1 <= K <= N <= 100000

3. 0 <= arr[i] <= 100000

- Given a number N, find the least prime factors for all numbers from 1 to N. The least prime factor of an integer X is the smallest prime number that divides it.

Note :

- 1 needs to be printed for 1.
- You need to return an array/vector/list of size N+1 and need to use 1-based indexing to store the answer for each number.
- Given two numbers A and B. The task is to find out their LCM and GCD.
- Given two integers ‘a’ and ‘m’. The task is to find the smallest modular multiplicative inverse of ‘a’ under modulo ‘m’.
- There are N students in a class. Each student got arr[i] (1 <= i <= N) marks in mathematics exam. Geek loves mathematics, so, he wanted to solve the questions. But to his surprise, he got different marks every time he solved. There are Q queries, each query represents a number X. For each query, your task is to find the sum of the marks of students who got marks greater than X.

Input:

1. The first line of the input contains a single integer T denoting the number of test cases. The description of T test cases follows.

2. The first line of each test case contains a single integer represents N

3. Next line contains N space-separated integers

4. The next line contains a single integer represents Q.

5. Next, Q lines contain a single integer X.

Output: For each query, print the sum of the marks of students who got marks greater than X.

Constraints:

1. 1 <= T <= 5

2. 1 <= N, Q <= 100000

3. 1 <= arr[i], X <= 10^9

- Given a weighted, undirected and connected graph of V vertices and an adjacency list adj where adj[i] is a list of lists containing two integers where the first integer of each list j denotes there is edge between i and j , second integers corresponds to the weight of that edge . You are given the source vertex S and You to Find the shortest distance of all the vertex's from the source vertex S. You have to return a list of integers denoting shortest distance between each node and Source vertex S.

Note: The Graph doesn't contain any negative weight cycle.

- Given a weighted directed graph with n nodes and m edges. Nodes are labeled from 0 to n-1, the task is to check if it contains a negative weight cycle or not.

Note: edges[i] is defined as u, v and weight.

- Given four integers A, B, C, D. A represents the initial position of the geek on the x-axis. In each step, geek can go to X+B or X-B if he is standing at X. The tasks is to check if it is possible for the geek to reach C exactly after D steps. If it is possible to reach C in exactly D steps, then print all distinct possible paths in lexicographical order. Otherwise, print -1

Input:

1. The first line of the input contains a single integer T denoting the number of test cases. The description of T test cases follows.

2. The first line of each test case contains four space-separated integers A, B, C, and D.

Output: For each test case, print all distinct possible paths in lexicographical order if it is possible to reach C. Otherwise, print -1.

Constraints:

1. 1 <= T <= 5

2. -10^9 <= A, C <= 10^9

3. 1 <= B <= 10^9

4. 1 <= D <= 12

- Geek created a random series and given a name geek-onacci series. Given four integers A, B, C, N. A, B, C represents the first three numbers of geek-onacci series. Find the Nth number of the series. The nth number of geek-onacci series is a sum of the last three numbers (summation of N-1th, N-2th, and N-3th geek-onacci numbers)

Note: The answer can be very large. So, output answer modulo 109 + 7.

Input:

1. The first line of the input contains a single integer T denoting the number of test cases. The description of T test cases follows.

2. The first line of each test case contains four space-separated integers A, B, C, and N.

Output: For each test case, print Nth geek-onacci number

Constraints:

1. 1 <= T <= 102

2. 1 <= A, B, C <= 105

3. 4 <= N <= 104

- Given a string of characters, find the length of the longest proper prefix which is also a proper suffix.

NOTE: Prefix and suffix can be overlapping but they should not be equal to the entire string.

- Given an array arr[], its starting position l and its ending position r. Sort the array using merge sort algorithm.

Text Books:

- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms, first or second edition, McGraw Hill.
- "Programming Challenges" by Steven S. Skiena and Miguel A. Revilla:

Reference Books:

- "Competitive Programming" by Steven Halim and Felix Halim

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	**Internal Assessment**	**End Semester Examination**
Weightage (%)	**50**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12169	Competitive Programming Lab	CO12169.1	2	3	2	1	2	3	1	-	2	-	-	2	3	3	2
		CO12169.2	2	2	3	2	3	2	1	-	3	-	-	2	3	2	3
		CO12169.3	2	1	3	3	3	2	3	-	2	-	-	1	1	1	3
		CO12169.4	3	1	1	2	2	3	2	-	3	-	-	2	2	2	1
		CO12169.5	3	2	1	2	2	3	2	-	2	-	-	1	3	1	1
		CO12169	2.4	1.8	2.0	2.0	2.4	2.6	1.8	-	2.4	-	-	1.6	2.4	1.8	2.0

1=weakly mapped

2= moderately mapped

3=strongly mapped

CSE11177	**Distributed Database Management System**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45 Hours**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Database Management Systems & Networking**				
Co-requisite	**NIL**				

Course Objectives:

- Fragment a database both horizontally and vertically for optimal performance.
- Allocate replicas of fragments for best performance.
- Optimize queries for optimal performance across a distributed database.
- Add distributed transaction management control including concurrency control and replica control to a distributed database.

Course Outcomes:

On the completion of this course the student will be able to

- Understand what is Distributed DBMS
- Understand various architectures of DDBMS
- Apply various fragmentation techniques given a problem
- Understand and calculate the cost of enforcing semantic integrity control
- Understand the applications of DDBMS architecture

Course Description:

This course will deal with the fundamental issues in large distributed database systems which are motivated by the computer networking and distribution of processors, and control. The theory, design, specification, implementation, and performance large systems will be discussed. Concurrency, Consistency, Integrity, Reliability, Privacy, and Security in distributed database systems will be included. A special feature of the course includes interesting problems in Mobile Ad hoc networks and Cloud Computing that can benefit from research ideas in distributed database systems. Research related to Mobile Computing, Streaming databases, Video conferencing, Peer to Peer systems, Cloud computing will be covered.

Course Content:

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination

Unit-I **09 Lecture Hours**

Introduction: Distributed Data Processing, Distributed Database Systems, Promises of DDBSs, Complicating factors, Problem areas

Unit-II **09 Lecture Hours**

Overview of RDBMS: Concepts, Integrity, Normalization

Unit-III **09 Lecture Hours**

Distributed DBMS Architecture : Models- Autonomy, Distribution, Heterogeneity DDBMS Architecture – Client/Server, Peer to peer, MDBS

Unit-IV **09 Lecture Hours**

Data Distribution Alternatives: Design Alternatives – localized data, distributed data Fragmentation – Vertical, Horizontal (primary & derived), hybrid, general guidelines, correctness rules distribution transparency – location, fragmentation, replication Impact of distribution on user queries – No Global Data Dictionary(GDD), GDD containing location information, Example on fragmentation

Unit-V **09 Lecture Hours**

Applications of DDBMS Architecture: Heterogeneous Distributed Databases, Peer- to-Peer Architecture for DDBMS: Global Conceptual Schema, Local Conceptual Schema, Local Internal Schema, External Schema; Multi - DBMS Architectures: Multi-database View Level, Multi-database Conceptual Level, Multi-database Internal Level, Local database View Level, Local database Conceptual Level, Local database Internal Level.

Text Books:

Principles of Distributed Database Systems – Ozsu – Pearson Publication
Distributed Database Management Systems – Rahimi & Haug – Wiley
Distributed Database Systems – Chanda Ray – Pearson Publication
Distributed Databases – Sachin Deshpande – Dreamtech

Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course	Course	COs	P	P	P	P	P	P	P	P	P	PO	PO	PO	PS	PS	PS

Code	Name		O 1	O 2	O 3	O 4	O 5	O 6	O 7	O 8	O 9	10	11	12	O1	O2	O3
CSE11 177	Distributed Database Management System	CO1117 7.1	2	2	2	2	2	1	3	-	2	-	3	3	2	2	1
		CO1117 7.2	3	1	2	3	3	3	1	-	3	-	-	2	1	3	2
		CO1117 7.3	1	2	1	3	2	1	3	-	3	-	3	1	1	2	2
		CO1117 7.4	2	2	2	3	3	3	3	-	2	-	-	3	1	3	2
		CO1117 7.5	2	2	3	2	3	3	3	-	2	-	2	1	1	2	3
		CO1117 7	2.0	1.8	2.0	2.6	2.6	2.2	2.6	-	2.4	-	2.67	2.0	1.2	2.4	2.0

1 = Weakly Mapped

2 = Moderately Mapped

3 = Strongly Mapped

SEMESTER VI

CSE11131	Web Technology	L	T	P	C
Version 1.0	Contact hour -45	3	0	0	3
Pre-requisites/Exposure	Browser compatibility knowledge /HTML				
Co-requisites	--				

Course Objectives:

1. To help the pupils to develop an understanding of client /server model.
2. To enable students a precise understanding of web protocol.
    - To give the students a perspective of web design language for designing a web site.
    - To enable students design a structure of web page model for any organization.

Course Outcomes:

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

CO1. **Understanding** of E- Mail, Telnet, FTP, E-Commerce, Video Conferencing, E-Business.
CO2. **Formalize** HTML Tag Reference, Global Attributes, Event Handlers, Document Structure.
CO3. **Classify** a detailed analysis of form, frame and CSS in HTML.
CO4. **Demonstrate** effectively a web page with HTML/JavaScript/XML style.
CO5. **Create** rich internet application using XML

Course Description:

The methods by which computers communicate with each other through the use of markup languages and multimedia packages is known as web technology. In the past few decades, web technology has undergone a dramatic transition, from a few marked-up web pages to the ability to do very specific work on a network without interruption. Let's look at some examples of web technology. Being a web developer gives you the power to create new cool things. If you can imagine it you can build it (or kind of). You don't need any kind of material - just your knowledge about web development.

Course Content:

Unit-I **08 Lecture Hours**

Unit Heading: Internet And WWW: Introduction, E- Mail, Telnet, FTP, E-Commerce, Video Conferencing, E-Business. Internet Service Providers, Domain Name Server, Internet Address, World Wide Web (WWW): World Wide Web And Its Evolution, Uniform Resource Locator (URL), Browsers - Internet Explorer, Netscape Navigator, Opera, Firefox, Chrome, Mozilla. Search Engine, Web Server - Apache, IIS, Proxy Server, HTTP Protocol. Case Study of E-Business website like (Myntra,Jabong,Amazon)

Unit-II **12 Lecture Hours**

Unit Heading: HTML And Graphics: HTML Tag Reference, Global Attributes, Event Handlers, Document Structure Tags, Formatting Tags, Text Level Formatting, Block Level Formatting, List Tags, Hyperlink Tags, Image And Image Maps, Table Tags, Form Tags, Frame Tags, Executable Content Tags.

Imagemaps: Introduction, Client-Side Imagemaps, Server-Side Imagemaps, Using Server-Side And Client-Side Imagempas Together, Alternative Text For Imagemaps, Tables : Introduction To HTML Tables And Their Structure, The Table Tags, Alignment, Aligning Entire Table, Alignment Within A Row, Alignment Within A Cell, Attributes, Content Summary, Background Colour, Adding A Caption, Setting The Width, Adding A Border, Spacing Within A Cell, Spacing Between The Cells, Spanning Multiple Rows Or Columns, Elements That Can Be Placed In A Table, Table Sections And Column Properties, Tables As A Design Tool.

Frames: Introduction To Frames, Applications, Frames Document, The Tag, Nesting Tag, Placing Content In Frames With The Tag, Targeting Named Frames, Creating Floating Frames, Using Hidden Frames,Frame analysis in Online Job portal.

Forms: Creating Forms, The<FORM>

Tag, Named Input Fields, The <INPUT> Tag, Multiple Lines Text Windows, Drop Down And List Boxes, Hidden Text, Text Area, Password, File Upload, Button, Submit, Reset, Radio, Checkbox, Select, Option, Forms And Scripting, Action Buttons, Labelling Input Files, Grouping Related Fields, Disabled And Read-Only Fields, Form Field Event Handlers Passing

Form Data Style Sheets: Introduction, Different Approaches To Style Sheets, Using Multiple Approaches, Linking To Style Information In Separate File, Setting Up Style Information, Using The <LINK>Tag, Embedded Style Information, Using <STYLE> Tag, Inline Style Information. Real life case study analysis of E-Ticket booking, with suitable linking of travel destination.

Unit-III **08 Lecture Hours**

Unit Heading: Java Script: Introduction, Client-Side Javascript, Server-Side Javascript, Javascript Objects, Javascript Security.

Operators: Assignment Operators, Comparison Operators, Arithmetic Operators, % (Modulus), ++ (Increment), -- (Decrement), -(Unary Negation), Logical Operators, Short.

Java Script: Introduction, Client-Side Javascript, Server-Side Javascript, Javascript Objects, Javascript Security.

Operators: Assignment Operators, Comparison Operators, Arithmetic Operators, % (Modulus), ++ (Increment), -- (Decrement), -(Unary Negation), Logical Operators, Short-Circuit Evaluation, String Operators, Special Operators, ? (Conditional Operator), ,(Comma Operator), Delete, New, This, Void

Statements: Break, Comment, Continue, Delete, Do … While, Export, For, For…In, Function, If…Else, Import, Labelled, Return, Switch, Var, While, With,

Core Javascript: Array, Boolean, Date, Function, Math, Number, Object, String, Regexp

Document And Its Associated Objects: Document, Link, Area, Anchor, Image, Applet, Layer

Events And Event Handlers: General Information About Events, Defining Event Handlers: Onabort, Onblur, Onchange, Onclick, Ondblclick, Ondragdrop, Onerror, Onfocus, Onkeydown, Onkeypress, Onkeyup, Onload, Onmousedown, Onmousemove, Onmouseout, Onmouseover, Onmouseup, Onmove, Onreset, Onresize, Onselect, Onsubmit, Onunload,Case study analysis of E-commerce website in transaction processing of client order

Unit-IV **10 Lecture Hours**

Unit Heading: Introduction Client-Side JavaScript, Server-Side Javascript, Javascript Objects, Javascript Security.

Operators: Assignment Operators, Comparison Operators, Arithmetic Operators, % (Modulus), ++ (Increment), -- (Decrement), -(Unary Negation), Logical Operators, Short-Circuit Evaluation, String Operators, Special Operators, ? (Conditional Operator), ,(Comma Operator), Delete, New, This, Void

Statements: Break, Comment, Continue, Delete, Do … While, Export, For, For…In, Function, If…Else, Import, Labelled, Return, Switch, Var, While, With,

Core Javascript: Array, Boolean, Date, Function, Math, Number, Object, String, Regexp

Document And Its Associated Objects: Document, Link, Area, Anchor, Image, Applet, Layer

Unit-V **07 Lecture Hours**

Unit Heading: XML: Introduction, Anatomy, Document, Creating XML Documents, Creating XML Dtds, XML Schemas, XSL, Mapping of XML ontology for a web site.

PHP: Introduction, Server-Side Web Scripting, Installing PHP, Adding PHP To HTML, Syntax And Variables, Passing Information Between Pages, Strings, Arrays And Array Functions, Numbers, Basic PHP Errors / Problems

Text Books:

“Web Design The Complete Reference”, Thomas Powell, Tata Mcgrawhill

Reference Books:

HTML And XHTML The Complete Reference”, Thomas Powell,Pearson education.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Internal Assessment	MTE	ETE
Weightage (%)	30	20	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11131	Web Technology	CO11131.1	3	3	1	1	2	2	1	2	2	-	-	2	3	3	3
		CO11131.2	2	2	2	1	3	2	1	2	3	-	-	2	3	1	3
		CO11131.3	2	3	3	3	1	1	1	-	1	-	-	2	1	3	1
		CO11131.4	1	2	3	2	1	2	2	2	1	-	-	2	3	2	2
		CO11131.5	1	3	3	1	3	1	3	3	2	-	-	2	3	2	2
		CO11131	1.8	2.6	2.4	1.6	2.0	1.6	1.6	2.25	1.8	-	-	2.0	2.6	2.2	2.2

CSE11132	**Compiler Design**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Finite Automata, Data structures, Computer Organization.**				
Co-requisite	**NIL**				

Course Objectives:

- To understand students how the process of language translation process.
- To interpret students the theory and practice of compiler implementation.
- To enhance the skills of student to implement lexical analysis, a variety of parsing techniques and semantic analysis of a programming language, along with error detection and recovery.
- To allow the students to identify the various storage allocation, code optimization techniques and code generation.
- To understand students the use of object code generation process

Course Outcomes:

On the completion of this course the student will be able to

- **Understand** the major phases of compilation, particularly lexical analysis.
- **Understand** the basic concepts of parsing and Design parser for a given language using top down and Bottom-up parser.
- **Demonstrate** the use of formal attributed grammars for specifying the syntax and semantics of Programming languages.
- **Apply** various optimization techniques for the design of a compiler.
- **Understand** the concepts of symbol tables and implement code generation techniques.

Course Description:

This course will teach students the fundamental concepts and techniques used for building a simple compiler. It will also discuss the major ideas used today in the implementation of programming language compilers, including lexical analysis, parsing, syntax-directed translation, abstract syntax trees, types and type checking, intermediate languages, dataflow analysis, program optimization, code generation, and runtime systems. As a result, you will learn how a program written in a high-level language designed for humans is systematically translated into a program written in low-level assembly more suited to machines. Along the way we will also touch on how programming languages are designed, programming language semantics, and why there are so many different kinds of programming languages.

Course Content:

Unit-I **09 Lecture Hours**

Introduction of Compilers and Lexical Analysis and Lex/Flex:

Overview of language processing – pre-processors – compiler – assembler – interpreters, pre-processors, – linkers & loaders - structure of a compiler – phases of a compiler. Lexical Analysis – Role of Lexical Analysis – Lexical Analysis Vs Parsing – Token, patterns and Lexemes – Lexical Errors – Regular Expressions – Regular definitions for the language constructs – Strings, Sequences, Comments – Transition diagram for recognition of tokens, Reserved words and identifiers, Examples.

Unit-II **09 Lecture Hours**

Syntax Analysis and Yacc/Bison:

Syntax Analysis – discussion on CFG, LMD,RMD, parse trees, Role of a parser – classification of parsing techniques – Brute force approach, left recursion, left factoring, Top down parsing – First and Follow- LL(1) Grammars, Non-Recursive predictive parsing – Error recovery in predictive parsing.

Bottom up parsing, Types of Bottom up approaches. Introduction to simple LR – Why LR Parsers – Model of an LR Parsers – Operator Precedence- Shift Reduce Parsing – Difference between LR and LL Parsers, Construction of SLR Tables. More powerful LR parses, construction of CLR (1), LALR Parsing tables, Dangling ELSE Ambiguity, Error recovery in LR Parsing, Comparison of all bottoms up approaches with all top down approaches.

Unit-III **09 Lecture Hours**

Intermediate Code Generation:

Semantic analysis, SDT Schemes, evaluation of semantic rules.

Intermediate Code Generation: Intermediate languages, three address code, quadruples, triples, abstract syntax trees. Types and declarations, Assignment statements, Boolean expressions, Case statements, Back Patching, Procedure calls type Checking.

Unit-IV **09 Lecture Hours**

Code Optimization:

Code Optimization: Introduction, The Principal sources of optimization, Optimization of basic blocks, Loops in flow graphs, Introduction to global data-flow analysis, Iterative solution of data-flow equations, Code improving transformations, Dealing with aliases, Data-flow analysis of structured flow graphs, Efficient data-flow algorithms, A tool for data-flow analysis, Estimation of types, Symbolic debugging of optimized code.

Unit-V **09 Lecture Hours**

Run-Time Environment and Code Generation:

Symbol tables: use and need of symbol tables. Runtime Environment: storage organization, stack allocation, access to non-local data, heap management, parameter passing mechanisms, introduction to garbage collection, Reference counting garbage collectors. Code generation: Issues, target language, Basic blocks & flow graphs, Simple code generator, Peephole optimization, Register allocation and assignment.

Text Books:

Compilers, Principles Techniques and Tools- Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D. Ullman,2ndEdition, Pearson,2007.
Compiler construction, Principles and Practice, Kenneth C Louden, 1st Edition, CENGAGE

Reference Books:

Compiler Design, K. Muneeswaran, Oxford. 2012
Engineering a compiler, Keith D.Cooper& Linda Torczon, Morgan Kaufman, 2nd edition. MK publishers, 2012.
Principles of compiler design, V. Raghavan, 2nd Edition, Tata Mcgraw Hill, 2011.

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11132	Compiler Design	CO11132.1	3	3	3	3	2	1	1	-	3	-	-	1	2	1	2
		CO11132.2	3	2	3	1	3	2	1	-	2	-	-	3	2	3	2
		CO11132.3	1	2	2	1	3	2	1	-	2	-	-	2	3	3	2
		CO11132.4	2	3	1	1	2	2	3	-	2	-	-	1	3	3	3
		CO11132.5	2	2	2	1	3	3	1	-	3	-	-	3	2	2	1
		CO11132	2.2	2.4	2.2	1.4	2.6	2.0	1.4	-	2.4	-	-	2.0	2.4	2.4	2.0

1 = Weakly Mapped
2 = Moderately Mapped
3 = Strongly Mapped

CSE11133	**Mobile Computing and Android**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure					
Co-requisite					

Course Objectives:

Encourage students to learn by building increasingly more sophisticated and meaningful mobile applications for Android

Enable students to build their own complete Android application incorporating most of the key aspects of the platform

Course Outcomes:

CO1 :	Explain concepts of JAVA and SQL
CO2 :	Understand basic concepts of Android
CO3 :	Build basic applications, interfaces and UI
CO4 :	Explore advanced concepts of Android
CO5 :	Utilize various services provided by android.

Course Description:

The course is for designing and building mobile applications using Android™ open-source platform. It will be a combination of lecture and laboratory course which will help the student understand the philosophy of developing for Android™ through its main application development building blocks and their interaction with one another.

Course Content:

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Unit-I **9 Lecture Hours**

JAVA Concepts - OOPs Concepts, Inheritance in detail, Exception handling, Packages & interfaces, JVM & .jar file extension, Multi threading (Thread class & Runnable Interface)

SQL - DML & DDL Queries in brief

Unit-II **9 Lecture Hours**

What is Android?, Setting up development environment, Dalvik Virtual Machine & .apk file extension

Fundamentals: Basic Building blocks - Activities,Services,Broadcast Receivers & Content providers

UI Components - Views & notifications, Components for communication -Intents & Intent Filters, Android API levels (versions & version names)

Unit-III **9 Lecture Hours**

Application Structure: AndroidManifest.xml, uses-permission & uses-sdk, Resources & R.java o Assets

Layouts & Drawable Resources, Activities and Activity lifecycle, First sample Application

Emulator-Android Virtual Device, Basic UI design, Form widgets, Text Fields, Layouts

Unit-IV **9 Lecture Hours**

Preferences: Shared Preferences, Preferences from xml, Examples, Menu : Option menu, Context menu

Sub menu, menu from xml, menu via code, Examples

Intents, Explicit Intents, Implicit intents

UI design: Time and Date, Images and media, Composite, AlertDialogs & Toast, Popup, Examples, Tabs and Tab Activity, Styles and Themes

Unit-V **9 Lecture Hours**

Content Providers, SQLite, Android Debug Bridge, Linkfy, Adapters and Widgets, Notifications, Threads, Advanced Services: Maps, GPS, Call, SMS etc., Network connectivity, Sensors

Text Books:

1. Head First Android Development: A Brain-Friendly Guide - David Griffiths and Dawn **Griffiths**
2. Android Cookbook - Ian Darwin

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11	Mobile	CO1113	3	3	3	2	2	3	1	-	1	-	2	2	1	2	1

133	Computing and Android	3.1														
		CO1113 3.2	2	3	2	3	3	3	1	-	1	-	3	1	1	3	1
		CO1113 3.3	1	2	2	2	2	2	2	-	1	-	3	3	2	1	2
		CO1113 3.4	3	2	3	2	2	3	1	-	3	-	2	1	1	1	2
		CO1113 3.5	1	2	2	2	2	1	3	-	2	-	2	1	3	3	3
		CO1113 3	2.0	2.4	2.4	2.2	2.2	2.4	1.6	-	1.6	-	2.4	1.6	1.6	2.0	1.8

1 = Weakly Mapped, 2 = Moderately Mapped, 3= Strongly Mapped

CSE11134	Machine Learning	L	T	P	C
Version 1.0	Contact Hours – 45	3	0	0	3
Pre-requisite/Exposure	Probability & Statistics				
Co-requisite	NIL				

Course Objectives:

- Understand the concepts of machine learning.
- Understand the clustering techniques and their utilization in machine learning.
- Study the neural network systems for machine learning.
- Learn and understand the linear learning models in machine learning.
- Study the tree based machine learning techniques and to appreciate their capability.

Course Outcomes:

On the completion of this course the student will be able to

CO1 : **List** the various types of machine learning techniques

CO2 : **Explain** basic machine learning techniques

CO3 : **Compare** classification and clustering techniques

CO4 : **Design** modern machine learning techniques

CO5 : **Apply** machine learning techniques in various domains

Course Description:

This subject aims to introduce undergraduate students to the world of Machine Learning. This course serves as a first course and expect the learners pile their fundamentals in this field. . The course introduces the motivation for machine learning and other cognitive techniques by different learning methods. It emphasizes on different categories of machine learning like supervised, unsupervised learning. Each of these categories is further described in detail through several problems in each class.

Course Content:

Unit-I **9 Lecture Hours**

Overview of Machine Learning – The Landscape. The Learning Problem. Feasibility of Learning. General-to-Specific Hypotheses Ordering. Find-S and Candidate Elimination Algorithm. Version Space and Inductive Bias.

Linear Classification. Linear Regression. Non-linear Transformation. Logistic Regression.

Unit-II **9 Lecture Hours**

Bayesian Learning : Probability Overview. MLE and MAP Estimates. Naive Bayes Classifier. Gaussian Naive Bayes Classifier. Bayesian Networks.

Decision Trees: Decision Tree Representation and Learning Algorithm (ID3). Attribute Selection using Entropy Measures and Gains. Hypotheses Space and Inductive bias. Overfitting, Generalization and Occam's Razor.

Unit-III **9 Lecture Hours**

Instance based Learning : k-Nearest Neighbour (kNN) Classifier, Voronoi Diagram and Distance-Weighted kNN. Distance Metrics and Curse of Dimensionality. Computational Complexity: Condensing and High Dimensional Search (kd-tree).

Clustering: Partitional Clustering and Hierarchical Clustering. Cluster Types, Attributes and Salient Features. k-Means, Hierarchical and Density-based Clustering Algorithms. Inter and Intra Clustering Similarity, Cohesion and Separation. MST and DBSCAN Clustering Algorithms.

Unit-IV **12 Lecture Hours**

Neural Networks : Advanced Topics: Perceptron Learning Algorithm: Delta Rule and Gradient Descent. Multi-layer Perceptron Learning: Backpropagation and Stochastic Gradient Descent. Hypotheses Space, Inductive Bias and Convergence. Variants of Neural Network Structures.

Support Vector Machine: Decision Boundary and Support Vector: Optimization and Primal-Dual Problem. Extension to SVM: Soft Margin and Non-linear Decision Boundary. Kernel Functions and Radial Basis Functions (detailed later).

Unit-V **6 Lecture Hours**

Applied Machine Learning : Accuracy, Precision, Recall and F-Measures. Scores, Sampling, Bootstraping and ROC. Hypotheses Testing and Cross-validation. Bagging and Boosting. Adaboost and Random Forest. Dimensionality Reduction and Principal Component Analysis (PCA).

Modern Learning Techniques: Reinforcement Learning, Deep Learning, Transfer Learning, Semi-supervised Learning, Active Learning.

Text Books:

1. Machine Learning – Tom M. Mitchell
2. Introduction to Machine Learning - Nils J Nilsson

Reference Books:

1. Pattern Recognition and Machine Learning – Christopher M. Bishop

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination

Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11134	Machine Learning	CO11134.1	2	3	3	2	2	2	2	-	1	-	3	2	2	1	2
		CO11134.2	3	3	3	3	3	2	3	-	3	-	2	1	3	3	1
		CO11134.3	1	3	3	3	3	1	3	-	2	-	3	1	3	1	3
		CO11134.4	3	2	2	3	3	2	3	-	2	-	3	3	2	2	3
		CO11134.5	2	3	3	3	3	2	1	-	1	-	2	3	3	3	3
		CO11134	2.2	2.8	2.8	2.8	2.8	1.8	2.4	-	1.8	-	2.6	2.0	2.6	2.0	2.4

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3 = Strongly Mapped

CSE11135	Real Time Analytics	L	T	P	C
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Statistical Modelling for data analytics**				
Co-requisite	**Machine Learning**				

Course Objectives:

- To enable students to understand various challenges in real time data processing.
- To provide the fundamentals of building blocks for real time solution design.
- To enhance the skill of students to understand speed and complexity issues while designing real time systems.
- To allow students to identify challenging areas in prediction and forecasting.

Course Outcomes:

On the completion of this course the student will be able to

- **Understand** the fundamental of real time processing.
- **Analyze** the different parameters for time series.
- **Explain** various time series models.
- **Evaluate** the results and interpret using machine learning models.
- **Develop** some reports along with interpretation results on real world case studies and applications.

Course Description:

This course requires minimal knowledge in probability and high school statistics. The course starts from basic concepts of streaming of data. With the rise of Big Data, there is an increasing need to process large amounts of data continuously, with a shorter turnaround time. Real-time data processing involves continuous input, processing and output of data, with the condition that the time required for processing. The objective of this course is to provide students an understanding of real-time solution aspects, from the source to the presentation to persistence.

Course Content:

Unit-I	9 Lecture Hours
Introduction to data stream with forecasting and analysis: Introduction: data stream, big data analytics, challenges of conventional systems, stream data model and architecture, sampling data in a stream, Realtime Analytics Platform (RTAP) applications, Evolution of Analytic scalability, analytic processes and tools, Analysis vs reporting - Modern data analytic tools	
Unit-II	**9 Lecture Hours**
Stochastic process: Introduction to stochastic process, discrete stochastic process, autocorrelation, stationary stochastic process, case studies of stochastic process.	

Unit-III	9 Lecture Hours
Time series models: Trends and seasonality, Autoregression (AR), Moving average models (MA), ARMA Model, Box-Jenkins model, non-stationary models, forecasting and analysis using ARIMA.	
Unit-IV	**9 Lecture Hours**
Machine Learning Models for Time Series Analysis: Ways to work with ML models for Time Analysis models, time series analysis using decision trees, analysis with random forests	
Unit-V	**9 Lecture Hours**
Applications and Case Studies: Insurance and Premium, credit card detection, product sales analysis, stock prediction analysis, sales/demand forecasting.	
Text Books: Andrew C. Harvey. Time Series Models. Harvester wheatsheaf, 1993. P. J. Brockwell, R. A. Davis, Introduction to Time Series and Forecasting. Springer, 1996 **Reference Books:** Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, CUP, 2012 Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.	

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Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CSE11135	Real Time Analytics	CO111135.1	3	2	2	3	3	1	3	-	2	-	-	2	1	3	3
		CO111135.2	2	3	3	2	2	3	2	-	2	-	-	3	2	1	2
		CO111135.3	3	3	2	3	2	3	2	-	3	-	-	1	3	1	2
		CO111135.4	3	3	2	3	2	1	3	-	2	-	-	3	1	2	3
		CO111135.5	1	1	2	3	1	1	2	-	2	-	-	3	3	3	1
		CO111135	2.4	2.4	2.2	2.8	2.0	1.8	2.4	-	2.2	-	-	2.4	2.0	2.0	2.2

1 = Weakly Mapped

2 = Moderately Mapped

3 = Strongly Mapped

CSE11136	**Virtualization and Applied Cloud Computing**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Familiarity with Java, Python**				
Co-requisite	**NIL**				

Course Objectives:

- To explain the evolving computer model called cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.

Course Outcomes:

On the completion of this course the student will be able to

- **Understand** the fundamentals of Cloud Computing and Virtualization
- **Analyze** different cloud infrastructure
- **Explain** Various aspects of Virtualization
- **Comparing** different advance virtualization techniques
- **Developing** software models on different virtualization platforms

Course Description:

The course presents a top-down view of cloud computing, from applications and administration to programming and infrastructure. Its main focus is on parallel programming techniques for cloud computing and large scale distributed systems which form the cloud infrastructure. The topics include: overview of cloud computing, cloud systems, parallel processing in the cloud, distributed storage systems, virtualization, security in the cloud, and multicore operating systems. Students will study state-of-the-art solutions for cloud computing developed by Google, Amazon, Microsoft, Yahoo, VMWare, etc. Students will also apply what they learn in one programming assignment and one project executed over Amazon Web Services.

Course Content:

Unit-I: Introduction **9 Lecture Hours**

Introduction Definition and evolution of Cloud Computing; Enabling Technologies, Service and Deployment Models Popular Cloud Stacks and Use Cases; Benefits, Risks, and Challenges of Cloud Computing Economic Models and SLAs. Topics in Cloud Security; Common cloud providers and their associated cloud stacks and popular cloud use case scenarios.

Unit-II: Cloud Infrastructure **9 Lecture Hours**

Historical Perspective of Data Centers; Datacenter Components: IT Equipment and Facilities; Design Considerations: Requirements, Power, Efficiency, & Redundancy, Power calculations, PUE (Power usage effectiveness) and Challenges in Cloud Data Centres; Cloud Management and Cloud Software Deployment Considerations.

Unit-III: Virtualization **5 Lecture Hours**

Introduction to Virtualization, Popek Goldberg criteria for virtualization, Traditional IT infrastructure and its shortcomings, Virtualization benefits. Comparison of traditional and virtualized environment, Implementing virtualization(Hands on in lab), Logical equivalence, Types of virtualization: Hardware emulation and technology classification, X86, IBM power VM virtualization.

Unit-IV: Server Virtualization **10 Lecture Hours**

Server virtualization and its classification, Para virtualization, Emulation vs Simulation, Hardware assisted virtualization, Hypervisors, Desktop virtualization and its classification, Xen Server architecture, Storage virtualization and its classification, Host based mirroring, Network based storage virtualization, Network virtualization and its classification, VPN and VLAN

Unit-V: Case Study **12 Lecture Hours**

Unit Heading: Amazon EC2; Software Defined Networks (SDN); Software Defined Storage (SDS), Microsoft's Virtualization solutions: Microsoft's Infrastructure Optimization Model, Virtualization and the Infrastructure Optimization Model, Benefits of Virtualization, Challenges while migrating to Cloud, Broad approaches to migrating into the cloud why migrate -deciding on cloud migration, the Seven-step model of migration into a cloud, Migration Risks and Mitigation.

Text Books:

David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach

Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010.

Reference Books:

Publications, 2006. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011
Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11136	Virtualization and Applied Cloud Computing	CO11136.1	2	2	2	1	3	3	3	-	3	-	-	2	3	1	1
		CO11136.2	2	2	3	3	3	1	3	-	1	-	-	2	3	1	1
		CO11136.3	3	2	3	2	3	3	2	-	1	-	-	3	2	3	2
		CO11136.4	3	3	2	2	3	1	1	-	2	-	-	3	3	3	1
		CO11136.5	2	1	3	3	2	2	2	-	3	-	-	1	2	2	1
		CO11136	2.4	2.0	2.6	2.2	2.8	2.0	2.2	-	2.0	-	-	2.2	2.6	2.0	1.2

1 = Weakly Mapped
2 = Moderately Mapped
3 = Strongly Mapped

CSE11137	Network Security	L	T	P	C
Version 1.0	Contact Hours – 45	3	0	0	3
Pre-requisite/Exposure	Computer Network				
Co-requisite	NIL				

Course Objectives:

The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competencies:

- Determine appropriate mechanisms for protecting networked systems by applying various cryptographic techniques.

- Secure the network by using firewalls on various networks in order to identify various network attacks and resolve them.

Course Outcomes:

On the completion of this course the student will be able to

- Identify and describe the common types of security threats are risks to the Computer Systems and the nature of common Information hazards.
- Identify the potential threats to confidentiality, integrity and availability of Computer Systems.
- Describe the working of standard security mechanisms and applied to the external and internal network.
- Define cryptography, describe the elements of the encryption process and select best algorithm to encrypt data and protocols to achieve Computer Security.
- Apply concepts of Public Key Cryptography.

Course Description:

Present computing era is based on internet and hence networking is an essential part of course. Prime concern is that in current advanced digital world various security threats are increasing day by day posing problems to data confidentiality, integrity and availability. This course aims at learning basic cryptography techniques and applying security mechanisms for operating systems as well as private and public network to protect them from various threats.

Course Content:

Unit-I **09 Lecture Hours**

Introduction and Security Threats: Threats to security : Viruses and Worms, Intruders, Insiders, Criminal

organizations, Terrorists, Information warfare; Avenues of Attack, steps in attack; Security Basics – confidentiality, Integrity, Availability; Types of attack: Denial of service (DOS), backdoors and trapdoors,

Sniffing, spoofing, man in the middle, replay, TCP/IP Hacking, Phishing attacks, Distributed DOS, SQL Injection. Malware : Viruses, Logic bombs

Unit-II **09 Lecture Hours**

Organizational Security: Password selection, Piggybacking, Shoulder surfing, Dumpster diving, Installing unauthorized software /hardware, Access by non-employees; People as Security Tool: Security awareness, and Individual user responsibilities; Physical security: Access controls Biometrics: finger prints, hand prints,

Retina, Patterns, voice patterns, signature and writing patterns, keystrokes, Physical barriers; Password Management, vulnerability of password, password protection, password selection strategies, components of a good password.

Unit-III **09 Lecture Hours**

Cryptography and Public key Infrastructure: Introduction to Symmetric encryption & Asymmetric encryption; Encryption algorithm / Cifer, Encryption and Decryption using: Caesar's cipher, playfair cipher, shift cipher, shift cipher, Vigenere cipher, one time pad (vermin cipher), hill cipher; Transposition techniques (rail fence), steganography; Hashing function : SHA1; Asymmetric encryption: Digital Signatures, Key escrow;
Public key infrastructures : basics, digital signatures, digital certificates, certificate authorities, registration

authorities, steps for obtaining a digital certificate, steps for verifying authenticity and integrity of a certificate; Centralized or decentralized infrastructure, private key protection; Trust Models: Hierarchical, peer to peer, hybrid.

Unit-IV **09 Lecture Hours**

Network security: Firewalls: working, design principles, trusted systems, Kerberos; Security topologies – security zones, DMZ, Internet, Intranet, VLAN, security implication, tunnelling; IP security: overview, architecture, IPSec configurations, IPSec security; Email security: security of email transmission, malicious code, spam, mail encryption.

Web Security: Intruders, Intrusion detection systems (IDS): host based IDS, network based IDS, logical components of IDS, signature based IDS, anomaly based IDS, network IDS components, advantages and disadvantages of NIDS, host based IDS components, advantages and disadvantages of HIDS; Web security threats, web traffic security approaches, Introduction to Secure Socket Layer (SSL) & Transport Layer Security (TLS), Concepts of secure electronic transaction.

Unit-V **09 Lecture Hours**

Case Study on Public Key Cryptography: Diffie–Hellman key exchange protocol, Elliptic-curve cryptography, Paillier cryptosystem, Cramer–Shoup cryptosystem, McEliece cryptosystem, Merkle–Hellman knapsack cryptosystem.

Text Books:

Principles Of Computer Security CompTIA Security+ And Beyond (Exam SY0-301) - Conklin, Wm. Arthur Gregory White, Dwayne Williams, Roger Davis, Chuck Cothren, Corey Schou - Mc Graw Hill ISBN:9781259061196, 2012
Cryptography and Network Security Principles and Practices – Williams Stallings – Pearson Education, Third Edition
Computer Security Basics – Deborah Russell G.T. Gangenisr – O'Reilly publication

Reference Books:

Cryptography and Network Security Principal and Practices – Atul Kahate – Tata-McGraw-Hill Sixth reprint 2006
Cryptography and Network Security – B A Forouzen – TMH
Computer Security– Dieter Gollman – Wiley India Education, Second Edition

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11137	Network Security	CO11137.1	3	3	3	2	1	2	3	-	2	-	-	3	2	3	1
		CO11137.2	3	2	3	3	3	1	1	-	2	-	-	1	2	2	1
		CO11137.3	3	2	3	1	3	3	2	-	2	-	-	2	1	1	2
		CO11137.4	2	3	2	2	3	2	1	-	3	-	-	3	1	2	1
		CO11137.5	3	2	3	2	1	2	3	-	1	-	-	3	1	2	1
		CO11137	2.8	2.4	2.8	2.0	2.2	2.0	2.0	-	2.0	-	-	2.4	1.4	2.0	1.2

1 = Weakly Mapped
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3 = Strongly Mapped

CSE11138	**Application Development with Python**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Python**				
Co-requisite					

Course Objectives:

To allow students to develop desktop applications using python
To allow students to develop web applications using python
To allow students to develop data science applications using python

Course Outcomes:

CO1 :	Recall concepts of python
CO2 :	Compare popular packages in python
CO3 :	Understand the concepts of GUI Design with Tkinter
CO4 :	Apply Django Framework for web development
CO5 :	Implement machine learning systems with sklearn

Course Description:

Python app development can be used for multiple purposes including web development, logical and numeric computing, software development, creating desktop GUIs, and building eCommerce mobile apps or ERP systems. With such a wide-ranging application domain, it turns out to be the most compatible and featured-rich technology. This course will explore various principles for development of desktop, web and data science applications.

Course Content:

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Unit-I **9 Lecture Hours**

Python Refresher : Datatypes**, e**xpressions, statements, conditions, loops, classes, objects, functions, data structures, I/O, packages.

Unit-II **9 Lecture Hours**

Popular Python Packages : Numpy, Scipy, Pandas, Matplotlib

Unit-III **9 Lecture Hours**

GUI Design with Tkinter : mainloop, windows, widgets, pack, grid, place, buttons, canvas, check, entry, frame, label, listbox, menu, messages, scale, radiobutton, scrollbars, Toplevel, Spinbox

Unit-IV **9 Lecture Hours**

Django Framework for web development: Django URL Patterns and Views, Django Forms, Django & REST APIs, Unit Testing with Django.

Unit-V **9 Lecture Hours**

Machine Learning Applications with scikit-learn : Dimensionality Reduction, Classification, Clustering, Visualization

Text Books:

1. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython - Wes McKinney – O'Reilly

2. Machine Learning with Python Cookbook: Practical Solutions from Preprocessing to Deep Learning – Chris Albon- O'reilly

Reference Books:

1. Introduction to Machine Learning with Python: A Guide for Data Scientists by Andreas C. Müller, Sarah Guido-O'Reilly

2. Learning Python: Powerful Object-Oriented Programming, Mark Lutz- O'Reilly

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11138	Application Develop	CO11138.1	3	2	2	2	2	2	1	-	1	-	-	2	2	1	1
		CO1113	1	2	2	2	3	1	3	-	1	-	-	2	3	3	2

	ment with Python	8.2														
		CO11138.3	1	2	2	3	2	3	2	-	1	-	-	2	3	3	1
		CO11138.4	3	2	2	2	3	2	3	-	1	-	-	2	1	3	2
		CO11138.5	2	2	3	3	3	1	3	-	3	-	-	2	3	3	1
		CO11138	2.0	2.0	2.2	2.4	2.6	1.8	2.4	-	1.4	-	-	2.0	2.4	2.6	1.4

1 = Weakly Mapped, 2 = Moderately Mapped, 3= Strongly Mapped

CSE11139	**Neural Networks and Deep Learning Application**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Discrete Mathematics, Calculus, Machine Learning**				
Co-requisite	**NIL**				

Course Objectives:

- To enable students to analyze different components of a neural network
- To provide the fundamentals of building problem specific neural networks
- To enhance the skill of students to manipulate the parameters of deep learning models
- To allow students to identify challenging areas where deep learning solutions can be implemented

Course Outcomes:

On the completion of this course the student will be able to

- **Understand** the fundamental building blocks neural networks
- **Analyze** the different parameters that controls the performance of neural networks
- **Explain** various types of deep learning techniques
- **Compare** several key deep learning models for different types of problems
- **Develop** deep learning models by using state-of-the-art tools.

Course Description:

This course requires minimal knowledge in discrete mathematics, differential calculus and basic machine learning. The course starts from single node neurons to multi-layered neural networks. While discussing all relevant challenges in this field, deep learning techniques are introduced. Most advanced features of deep learning techniques have been discussed; A broad array of deep learning models have been analysed to aid in problem specific model design. Finally, with the help of modern deep learning tools such as Tensorflow, Keras and Pytorch, students are prepared to tackle challenging problems in the field of computer vision, natural language processing, sequence analysis and so on.

Course Content:

Unit-I **9 Lecture Hours**

Introduction:

Evolution of machine learning techniques, history of neural learning systems, linear and logistic regression, decision boundaries.

Neural Network Architecture:

Biological vs artificial neuron, perceptron, XOR problem, stochastic gradient descent, weights and biases, activation functions, non-linearity, multi-layered perceptron

Unit-II **9 Lecture Hours**

Controlling the Neural Network:

Restricted Boltzmann machines, backpropagation, learning rate, momentum, adaptive learning rates, regularization, hyper-parameter management, ensemble techniques.

Neural Network Models:

Hopfield neural networks, recurrent neural networks, Self-organizing feature maps, auto-encoders.

Unit-III **9 Lecture Hours**

Deep Learning Techniques:

Vanishing gradients, deep belief networks, long short-term memory, representation learning, convolutional neural networks, Subsampling, rectified-linear units, deep convolutional auto-encoders, layer-wise training, auxiliary classifiers, residual connections, adversarial learning.

Unit-IV **9 Lecture Hours**

Deep Learning Models:

Classification: LeNet-5, AlexNet, VGG-Net, GoogLeNet, ResNet, DenseNet, MobileNet.
Detection: R-CNN, YOLO
Segmentation: Seg-Net, U-Net, SegFast

Sequential Learning: LSTM, GRU

Generative Learning: Variational auto-encoder, GAN, Conditional GAN

Unit-V **9 Lecture Hours**

Deep Learning Tools:

PyTorch: Installation, Tensors, autograd, modules, dataset and dataloader, Training and Testing

TensorFlow: Installation, Loading dataset, Model, Training, Testing

Text Books:

Neural Networks and Learning Machines - Simon Haykin – Pearson Prentice Hall

Deep Learning – Ian Goodfellow, Yoshua Bengio, Aaron Courville – MIT Press

Reference Books:

Deep Learning with PyTorch: A 60 Minute Blitz

TensorFlow 2 quickstart for beginners

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11139	Neural Networks and Deep Learning Application	CO11139.1	3	3	1	3	3	1	2	-	3	-	-	2	3	2	1
		CO11139.2	3	3	3	2	1	1	1	-	1	-	-	1	2	2	1
		CO11139.3	3	3	2	3	3	1	3	-	2	-	-	3	3	3	2
		CO11139.4	1	2	3	3	3	2	1	-	3	-	-	1	2	3	3
		CO11139.5	2	1	2	1	2	3	3	-	3	-	-	2	3	3	2
		CO11139	2.4	2.4	2.2	2.4	2.4	1.6	2.0	-	2.4	-	-	1.8	2.6	2.6	1.8

1 = Weakly Mapped
2 = Moderately Mapped
3 = Strongly Mapped

		L	T	P	C
CSE11140	**Statistical Modelling for Data Analytics**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Probability and Statistics**				
Co-requisite	**High School Statistics**				

Course Objectives:

- To enable students to understand use of statistics in real life.
- To provide the fundamentals of analysing problem using statistics.
- To enhance the skill of students to understand whether the problem could be solve using descriptive or inferential statistics.
- To allow students to identify challenging areas where analysing and interpreting results using statistics will help to model real world problems.

Course Outcomes:

On the completion of this course the student will be able to

- **Understand** the fundamental of descriptive statistics.
- **Analyze** the different parameters in real world datasets.
- **Explain** various types of inferential techniques to draw insights.
- **Evaluate** the results and interpret with the help of analysis tools.
- **Develop** some reports along with interpretation results on real world case studies.

Course Description:

This course requires minimal knowledge in probability and high school statistics. The course starts from basic concepts of descriptive statistics like mean, median, mode, variation, standard deviation, etc. The objective of this course is to provide students an understanding for the graduate business student on statistical concepts to include measurements of location and dispersion, probability, probability distributions, sampling, estimation, hypothesis testing, regression, and correlation analysis, multiple regression and forecasting. Most advanced features regression and correlation analysis techniques have been discussed; Exploratory data analysis techniques have been used in real world datasets from various fields like business, e-commerce, etc. Finally, compute and interpret the results of Regression and Correlation Analysis, for forecasting and also perform some statistical tests using language like Python, R, etc.

Course Content:

Unit-I **9 Lecture Hours**

Basic concepts of statistics:

Introduction to statistics, need of statistics in modeling real world problems, types of statistics, descriptive statistics: graphical and tabular methods, descriptive statistics: measure of central tendency, variance and dispersion, skewness.

Probability and Random Variables: Discrete and continuous random variables, distributions

Unit-II **9 Lecture Hours**

Exploratory data analysis:

Data collection, sampling, variables, temporal and spatial data

Data Analysis Pipeline: Collect, Import, Clean, Transform, Visualize, Model, Communicate

Unit-III **9 Lecture Hours**

Regression Modelling Techniques:

Simple and multiple linear regression models, least square estimation techniques, residuals, goodness of fit, test of significance and confidence intervals, polynomial regression model, detection of outliers, multicollinearity, logistic regressions models.

Unit-IV **9 Lecture Hours**

Inferential and Hypothesis Testing: Basics of hypothesis testing, populations vs samples, Central limit theorem, one sample test, two sample test, contingency table.

Packages and Tools:

Language and Tools used in statistics, working with data, Implementation of descriptive statistics concepts using tools, NumPy and SciPy package, matplotlib, data visualisation, inferential statistics analysis using tools.

Unit-V **9 Lecture Hours**

Applications and Case Studies:

Importing data and analyse using descriptive statistics: dataset from various sectors like e-commerce, business, healthcare, Olympic games project review, titanic survivors' dataset.

Text Books:

Statistics: The conceptual approach, Gudmund R. Iversen, Mary Gergen, Springer; 1997th edition (April 30, 1997)

Introduction to Linear Regression Analysis by Douglas C. Montgomery, Elizabeth A. Peck, G. Geoffrey Vining

(Wiley), Low price Indian edition is available.

Montgomery, D. C., Peck, E. A., and Vinning, G. G., Introduction to Linear Regression Analysis, 5th Edition, Wiley, 2012. ISBN 978-0-470-54281-1

Reference Books:

Statistics, Data Analysis, and Decision Modeling (5th Edition), James R. Evans

Regression: Linear Models in Statistics (Springer Undergraduate Mathematics Series) 2010th Edition, N.H.H. Bingham, John M. Fry, Springer

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11140	Statistical Modelling for Data Analytics	CO11140.1	3	3	2	2	2	2	1	-	2	-	-	1	2	1	2
		CO11140.2	1	3	2	3	2	3	1	-	1	-	-	2	2	1	1
		CO11140.3	2	3	3	2	1	3	3	-	3	-	-	1	3	3	3
		CO11140.4	3	3	2	3	2	3	1	-	2	-	-	3	1	2	3
		CO11140.5	3	2	2	2	3	3	3	-	2	-	-	3	3	3	2
		CO11140	2.4	2.8	2.2	2.4	2.0	2.8	1.8	-	2.0	-	-	2.0	2.2	2.0	2.2

1 = Weakly Mapped

2 = Moderately Mapped

3 = Strongly Mapped

CSE11141	**Cloud Management**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure					
Co-requisite					

Course Objectives:

To allow students manage cloud infrastructure

To develop concepts of metering and billing in cloud services

Course Outcomes:

CO1 :	Gain Knowledge of Service, security management in cloud.
CO2 :	Understand the concept of Cloud service management.
CO3 :	Analyze, manage metering and billing of Cloud service application
CO4 :	Understand the concept of Cloud provisioning.
CO5 :	Analyze cloud computing platforms and case studies

Course Description:

Cloud monitoring and cloud service management tools allow cloud providers to ensure optimal performance, continuity and efficiency in virtualized, on demand environments. This tool manages and monitor networks, systems and applications that enable cloud providers not just to assure performance, but also to improve, orchestrate an automatic provisioning of resources. Cloud monitoring tools explicitly support cloud providers to track the continuity, performance and security of all the component that support service delivery: the hardware, software and services in the data center and throughout the network setup.

Course Content:

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Unit-I **9 Lecture Hours**

Service Management in Cloud: Concept of Service Management, ITSM-ITIL framework, ANEKA Cloud Architecture, WINSAT, Characteristics of Cloud Service Management, Cloud Service Management, Workflows In Cloud, Case study: VM task scheduling

Unit-II **9 Lecture Hours**

Calculating the score of a virtual machine, The general architecture of Cloud workflow system, Cloud Provisioning: Concept and classification, Dimensions of Cloud Provisioning, Dimensions of Cloud Provisioning, Cloud Usage Monitor, Cloud Usage Monitoring Agent and their functionalities, Cloud Usage Monitor: Key Benefits and features,

Unit-III **9 Lecture Hours**

Metering And Billing: Its impact on customer, IaaS billing and Metering Service, PaaS and SaaS billing and Metering Service, DaaS and MaaS billing and Metring service, Smart metering architecture for private cloud, Hyperic and Eucalyptus, Virtual Infrastructure Manager, Slab based metering

Unit-IV **9 Lecture Hours**

Patch management in enterprise solution, Patch management in Cloud, Cloud patch management workflow, Google cloud patch management case study

Unit-V **9 Lecture Hours**

Cloud Computing environment, Operational view of Cloud Management, Application Hosting On Cloud, Customer Application Hosting

Text Books:

1. Cloud Management and Security by Imad M. Abbadi
2. The Practice of Cloud System Administration: DevOps and SRE, by Christine Hogan, Strata R. Chalup, and Tom Limoncelli

Components	Mid Term	Class Assessment	End Term
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11141	Cloud Management	CO11141.1	3	2	3	3	3	1	2	-	1	-	2	2	3	1	3
		CO11141.2	2	2	2	3	2	2	1	-	3	-	3	2	2	1	3
		CO11141.3	2	2	3	2	3	3	1	-	1	-	2	1	1	1	3
		CO11141.4	3	2	3	2	2	2	2	-	1	-	3	2	3	3	1
		CO11141.5	1	2	3	3	3	3	1	-	1	-	3	1	3	2	3
		CO11141	2.2	2.0	2.8	2.6	2.6	2.2	1.4	-	1.4	-	2.6	1.6	2.4	1.6	2.6

1 = Weakly Mapped, 2 = Moderately Mapped, 3= Strongly Mapped

CSE11142	Malware Analysis	L	T	P	C
Version 1.0	Contact Hours – 45	3	0	0	3
Pre-requisite/Exposure	Linear Algebra and Cyber Security				
Co-requisite	NIL				

Course Objectives:

- To enable students to about the modern malware and anti-malware landscape.
- To provide the fundamentals of malware functioning and how it infects companies' IT infrastructures through their weakest points, exploiting these weaknesses after infection.
- To enhance the skill of students to learn all the main methods and malware analysts' routines.
- To allow students to identify challenging areas of intrusion detection.

Course Outcomes:

On the completion of this course, the student will be able to

- **Understand** the fundamental of modern malware and anti-malware.
- **Analyze** the different frameworks of Malware.
- **Explain** various types of intrusion detection techniques.
- **Compare** several modern-day malware and their impact on IT infrastructure.
- **Develop** analytical models for detecting intrusions and malware.

Course Description:

Android commanded 86.8% of the global smartphone operating system market share in the third quarter of 2018, according to IDC. Google announced in May 2019 that over 2.5 billion Android devices are used monthly. Android's popularity has grown, as has the number of active users and their daily Android activity. Targeting Android cellphones is becoming easier. Every day, Gadgets360 reports 8400 new Android malware incidents. It appears every ten seconds. Worms are a serious cyber danger that may disrupt online banking and social networking. Every day, the AV-Test Institute predicts 250,000 new malicious samples across several platforms (Android, Windows, Linux). Manual disassembly and reverse engineering of these samples take time. So it annoys security analysts. As a result, low-human-interaction malware analysis solutions are vitally needed Antivirus software works by comparing newly downloaded executables to known malware signatures. However, zero-day malware, which lacks a signature, cannot be discovered using this approach. Static and dynamic analysis are also popular. It forecasts results without launching executables. It works fine unless malware is packed, encrypted, or camouflaged. Dynamic analysis is used to overcome static restrictions. To collect data for detection and classification, the sample is run in a sandbox. There are no virtual environments or code coverage issues. As a result, scientists are using a hybrid strategy that incorporates both.

Course Content:

Unit-I **9 Lecture Hours**

Introduction:

Malware classification, types, and platform-specific issues with malware, Intrusion into IT and operational network (OT) and their signs

Unit-II **9 Lecture Hours**

Basic Malware Analysis signature-based

Manual Malware Infection analysis, signature-based malware detection and classification – pros and cons, and need for machine learning-based techniques

Unit-III **9 Lecture Hours**

Advanced Techniques Malware Analysis:

Static Analysis, Dynamic Analysis and Hybrid Analysis of Windows Malware, Linux Malware and Android Malware

Unit-IV **9 Lecture Hours**

Basic Intrusion Detection:

Intrusion into the network – Firewalls, Rule-based techniques, signature-based Techniques, Simple Machine Learning Models on Network Data

Unit-V **9 Lecture Hours**

Case Studies on Malware Analysis and Intrusion Detection:

Study papers in Malware Analysis from most recent conferences, Presentations and Discussions, and Implementations

Latest Papers in Intrusion Detection, Their theory and Implementations, and Data Analysis Techniques

Text Books:

Practical Malware Analysis by by Michael Sikorski, Andrew Honig O'Reilly publisher

Handbook of Research on Intrusion Detection Systems by Brij B. Gupta, Srivathsan Srinivasagopalan IGI Global publisher

Reference Books:

1. Intrusion Detection Systems by Roberto Di Pietro, Luigi Mancini
2. Malware Analysis and Detection Engineering: A Comprehensive Approach to Detect and Analyze Modern

Malware by Abhijit Mohanta and Anoop Saldanha Apress

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CSE11142	Malware Analysis	CO11142.1	2	3	3	3	1	2	1	-	1	-	-	1	2	2	3
		CO11142.2	3	3	1	1	3	3	2	-	1	-	-	3	1	1	2
		CO11142.3	3	3	2	3	2	3	1	-	3	-	-	2	2	2	1
		CO11142.4	2	3	3	3	2	1	1	-	3	-	-	1	2	2	3
		CO11142.5	1	1	2	3	3	2	1	-	3	-	-	2	3	2	2
		CO11142	2.2	2.6	2.2	2.6	2.2	2.2	1.2	-	2.2	-	-	1.8	2.0	1.8	2.2

1 = Weakly Mapped
2 = Moderately Mapped
3 = Strongly Mapped

CEE11029	Disaster Management	L	T	P	C
Version 1.0	Contact Hours - 45	3	0	0	3
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

- To introduce students about disaster (natural or man-made both), their types, causes, effects onvarious sectors and some of the practical examples to aware students about it.
- To enhance the student to make them able to understand the risk scale and develop the strategies for Vulnerability.
- To prepare students about preparedness to response immediately and execute the plan for search, rescue operations, Logistic Management etc.
- To make students handling the post disaster situations, accordingly psychological and medical point of views.
- To get them brief idea that how the area will rehabilitated, the damage are reconstructed andrecover the society and victims as well.

Course Outcomes

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

CO1. Show various types of disasters, occurred naturally or mankind will be responsible.

CO2. Analyze the Risk and Vulnerability; reduce it using different strategic developments.

CO3. Organize the response in emergency basis to the disaster, handle the situation efficiently, give psychological and medical supports to the victims; understand the role of various bodies to the incident.

CO4. Assess the damage, rehabilitate, reconstruct it, recover the victims and handle the post- disaster effects.

Catalog Description

Disaster Management is introduce to combat the disaster and tried to minimize the losses by developing suitable plans and strategies. In present world, except the natural disasters, artificial disasters also occurred in the large scale which becomes more threatened to the mankind. Hence, as a responsible person, students need to not only aware about it but also know about the process of responding, execute the operations and handling the situation. As a student of Civil Engineering, one must know about the repair and rehabilitation techniques to recover the damaged structures. Classes will be conducted by lecture, practical examples as well as power point presentation. The tutorials willfamiliarize the students with practical problem-solving techniques led by the course coordinator. Students will strongly grab the basic concepts of the subject via exercise and discussions with the coordinator.

Course Content

Module I: 10 Lecture Hours

Introduction on Disaster: Different Types of Disaster: Natural Disaster: such as Flood, Cyclone, Earthquakes, Landslides etc., Man-made Disaster: such as Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea, Rail & Road), Structural failures (Building and Bridge), War & Terrorism etc. Causes, effects and practical examples for all disasters.

Unit II: 10 Lecture Hours

Risk and Vulnerability Analysis: Risk and Vulnerability Analysis, Risk: Its concept and analysis, Risk Reduction, Vulnerability: Its concept and analysis, Strategic Development for Vulnerability.

Unit III: 13 Lecture Hours

Disaster Response: Introduction, Disaster Response Plan. Communication, Participation, and Activation of Emergency Preparedness Plan. Search, Rescue, Evacuation and Logistic Management, Role of Government, International and NGO Bodies, Psychological Response and Management(Trauma, Stress, Rumour and Panic), Relief and Recovery, Medical Health Response to Different Disasters.

Unit IV: 12 Lecture Hours

Rehabilitation, Reconstruction and Recovery: Reconstruction and Rehabilitation as a Means of Development, Damage Assessment, Post Disaster effects and Remedial Measures. Creation of Long- term Job Opportunities and Livelihood Options, Disaster Resistant House Construction, Sanitation and Hygiene, Education and Awareness, Dealing with Victims' Psychology, Long-term Counter Disaster Planning, Role of Educational Institute.

Reference Books

- Dr. Mrinalini Pandey, Disaster Management, Wiley India Pvt. Ltd.
- Jagbir Singh, Disaster Management : Future Challenges and Opportunities, K W Publishers Pvt. Ltd.
- Shailesh Shukla, Shamna Hussain, Biodiversity, Environment and Disaster Management, Unique Publications.
- J. P. Singhal, Disaster Management, Laxmi Publications.
- C. K. Rajan, Navale Pandharinath, Earth and Atmospheric Disaster Management: Nature and Manmade, B S Publication

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written ExaminationScheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEE11029	Disaster Management	CO11029.1	2	2	3	3	3	1	3	-	3	-	-	3	2	3	3
		CO11029.2	3	2	3	3	3	3	3	-	2	-	-	3	3	3	3
		CO11029.3	2	2	2	2	3	3	3	-	1	-	-	3	3	3	3
		CO11029.4	2	2	3	3	1	3	3	-	2	-	-	2	1	2	1
		CO11029	2.25	2.0	2.75	2.75	2.5	2.5	3.0	-	2.0	-	-	2.75	2.25	2.75	2.5

1=weakly mapped 2= moderately mapped 3=strongly mapped

		L	T	P	C
ECE11046	**Digital Signal Processing**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisites/Exposure	**12th level Mathematics, Knowledge of Signal and Systems**				
Co-requisites	**--**				

Course Objectives

- To get basic idea about basic of Signals, Systems and Signal Processing.
- To analyze discrete time signals using Fourier and Z-Transform
- To familiarize with the different Structures of Discrete-Time Systems
- To acquire the knowledge of different filter design.

Course Outcomes

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

CO1. **Illustrate** the basic of Signals, Systems and Signal Processing
CO2. **Examine** the discrete time signals using Fourier and Z-Transform
CO3. **Demonstrate** the different Structures of Discrete-Time Systems
CO4. **Design** and examine the FIR Filter
CO5. **Design** and examine the IIR Filter

Catalog Description

Digital signal processing (DSP) is the use of digital processing to perform a wide variety of signal processing operations. In this course student will know basic discrete-time signal and system types, convolution sum, impulse and frequency response concepts for linear, time-invariant (LTI) systems, difference equation realization of LTI systems and discrete-time Fourier transform and basic properties of these. Student will understand periodic sampling of analog signals and grasps z and inverse z transform, region of convergence concepts and their properties, performs simple transform calculations, understands the system function concept with its relations to impulse and frequency responses. Student will understand definitions and basic properties of forward and inverse discrete Fourier transform and their computation by fast algorithms. Student will learn the difference structure of FIR and IIR system and how to design and study the FIR and IIR digital filter.

Course Content

Unit I: 7 lecture hours

Introduction to Digital Signal Processing:

Types of Signal and systems, Sampling theorem, Frequency domain representation of sampling, Reconstructions of band limited signals from its samples, Aliasing, Linear Time Invariant (LTI) system, Stability and causality.

Unit II: 11 lecture hours

Frequency Domain Analysis of Discrete Time Signals and Systems:

Z-transform, Regions of convergence (ROC) and Z-transform properties, Inverse z-transform, System analysis using Z transform, Discrete Fourier analysis, Discrete-Time Fourier Transform (DTFT), Inverse DTFT. Discrete Fourier Transform (DFT), Inverse DFT. Fast Fourier Transform, Types of FFT, N-point Radix-2 FFT, Inverse FFT. Discrete Linear Convolution, Circular Convolution, Fast Convolution, Frequency Response of LTI system using Discrete Fourier Analysis, All pass systems, Minimum/Maximum phase systems, Discrete Cosine Transform.

Unit III: 09 lecture hours

Structures of Discrete-Time Systems:

Realization of discrete-time systems, FIR systems: Direct, Cascade, Frequency Sampling and Lattice structures. Structures for IIR systems: Direct, Signal Flow Graphs and Transposed, Cascade, Parallel, Lattice and Lattice-Ladder structures. State space system analysis and structures

Unit IV: 09 lecture hours

FIR Filter Design

Symmetric and Anti-symmetric FIR filters, FIR Filter design by window method (Rectangular, Bartlett, Hamming, Hanning, Blackman and Kaiser window), Frequency Sampling method, Optimum approximation of FIR filters, Design of FIR differentiators, Design of Hilbert transformers

Unit V: 09 lecture hours

IIR Filter Design

Design of Discrete-time IIR filters from Continuous-time Filters: Filter design by Impulse invariant and bilinear transformation method: Butterworth, Chebyshev and Elliptic approximation Filter, Frequency transformation.

Text Books:

- Digital Signal Processing – Principles, Algorithms and Applications by J. G. Proakis and D. G. Manolakis, 4th Edition, Pearson
- Discrete Time Signal Processing by A.V. Oppenheim, R. W. Schafer, & John R. Buck, , 2nd Edition, Prentice Hall, 1999.

Reference Books:

- Digital Signal Processing: Fundamentals and Applications – Li Tan, Academic Press, Elsevier.
- Digital Signal Processing – S. Salivahan, A. Vallavraj and C. Gnanapriya, TMH.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ECE11046	Digital Signal Processing	CO11046.1	2	3	3	2	3	1	1	-	2	-	-	3	1	3	3
		CO11046.2	2	2	3	3	1	3	2	-	2	-	-	3	2	1	3
		CO11046.3	3	2	2	2	1	2	2	-	3	-	-	1	3	2	2
		CO11046.4	2	3	3	1	2	2	1	-	1	-	-	2	3	3	1
		CO11046.5	3	2	3	3	1	3	2	-	3	-	-	2	2	3	3
		CO11046	2.4	2.4	2.8	2.2	1.6	2.2	1.6	-	2.2	-	-	2.2	2.2	2.4	2.4

1=weakly mapped;

2= moderately mapped;

3=strongly mapped

ECE11048	VLSI Systems Design	L	T	P	C
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisites/Exposure	**12^{th} level Mathematics, Knowledge of 12^{th} level**				
Co-requisites	**Understanding of Electronic Devices, Understanding of Analog Electronics**				

Course Objectives

- To help to understand the functionality of VLSI design.
- To familiar with different types of VLSI fabrication technology
- To explain the use of MOS and CMOS Circuits
- To acquire the knowledge of fabrication of VLSI chip.
- To study the system hardware design.

Course Outcomes

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

CO1. **Utilize** the basic design principles of VLSI.
CO2. **Develop** the concept of the different fabrication techniques.
CO3. **Find** the basics of MOS and CMOS circuit design.
CO4. **Illustrate** the necessities of memory devices and able to design various types of Semiconductor memories.
CO5. **Find** the concept of VLSI system hardware design

Catalog Description

Very large-scale integration (**VLSI**) is the process of creating an integrated circuit (IC) by combining millions of MOS transistors onto a single chip. VLSI began in the 1970s when MOS integrated circuit chips were widely adopted, enabling complex semiconductor and telecommunication technologies to be developed.
The microprocessor and memory chips are VLSI devices. Before the introduction of VLSI technology, most ICs had a limited set of functions they could perform. An electronic circuit might consist of a CPU, ROM, RAM and other glue logic. VLSI lets IC designers add all of these into one chip.

Course Content

Unit I: **9 lecture hours**

Introduction to VLSI Design:

Historical Perspective and Future Trends, Moor's Law;Scale of Integration (SSI, MSI, LSI, VLSI, ULSI), Types of VLSI Chips (Analog & Digital VLSI chips, General purpose, ASIC, PLA, FPGA), Design principles (Digital VLSI – Concept of Regularity, Granularity etc), Design Domains (Behavioural, Structural); VLSI design styles: Full custom, Gate array, Standard cell, Micro-cell based design, Field programmable device; Design quality.

Unit II: **9 lecture hours**

Fabrication Technology

Si semiconductor technology: Wafer preparation, Oxidation, Ion implantation, Different deposition processes, Metallization, Etching, Lithography; Bipolar, CMOS and Bi-CMOS fabrication processes; Layout design rule.

Unit III: **9 lecture hours**

MOS & CMOS Circuit Characterization and Performance Estimation

Resistance Estimation, Capacitance Estimation: MOS Device Capacitance, Diffusion Capacitance, Routing Capacitance, RC Effects, Capacitance Design Guide; Switching Characteristic: Fall Time, Rise Time, Delay Time; RC Circuit Delay Computation: Cascaded RC Stages, Elmore Delay. Propagation Delay Calculation with Elmore Model for Multiple RC Stages; CMOS Gate Transistor Sizing, Determination of Conductor Size, Power Consumptions: Static Dissipation, Dynamic Dissipation.

Unit IV: **9 lecture hours**

CMOS logic design & Semiconductor memories

CMOS logic circuit, NMOS and CMOS Logic, Dynamic and Pass-transistor logic, Design of logic gate: Inverter, NAND and NOR gate, CMOS Full Adder ,Multiplexer, Decoder, logic minimization, Advanced CMOS Logic circuits; Sequential CMOS logic circuits; SR Latch circuit, clocked JK Latch/ Master-Slave JK , CMOS D-latch & Edge triggered flip-flop , Series and parallel transistor connection, source drain capacitance, charge sharing, Logic style comparison, Physical layout logic gate, CMOS standard cell design, Layout and layout design rules.SRAM:

CMOS SRAM cell, Bipolar SRAM cell; DRAM: basic DRAM cell and its Operation Device design and scaling Considerations for a DRAM Cell; Non-volatile memories: MOSFET nonvolatile memory devices, Flash Memory Arrays, Floating-Gate Non-volatile Memory Cells, Nonvolatile Memory Cells with Charge Stored in Insulator

Unit V: 9 lecture hours

VLSI system hardware design

Basics of system hardware design: Hierarchical design using top-down and bottom-up methodology, System partitioning techniques, interfacing between system components, Logic synthesis with verilog HDL: Impact of logic synthesis – Interpretation of a few verilog constructs – Synthesis design flow. Introduction to FPGA and its architectures. Testing in VLSI: Defects, Fault Models, Path Sensitization, Scan, Built-in-self Test (BIST), IDDQ.

Text Books:

- Digital Integrated Circuit, J.M.Rabaey, Chandrasan, Nicolic, Pearson Education,2nd edition 2003
- Weste and Eshrighian, ―Principle of CMOS VLSI Design‖ Pearson Education

Reference Books:

- Wayne, Walf, "Modern VLSI design: System on Silicon" Pearson Education, 2nd Edition, 1998.
- Pucknull, "Basic VLSI Design" PHI 3rd Edition

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
ECE11048	VLSI Systems Design	CO11048.1	3	2	2	1	1	2	3	-	2	-	-	2	2	3	1
		CO11048.2	2	2	2	2	2	3	1	-	3	-	-	3	1	1	3
		CO11048.3	3	2	2	2	3	3	1	-	3	-	-	3	1	1	1
		CO11048.4	2	3	3	3	2	3	2	-	1	-	-	1	3	2	1
		CO11048.5	3	2	2	2	3	3	2	-	1	-	-	3	2	1	2
		CO11048	2.6	2.2	2.2	2.0	2.2	2.8	1.8	-	2.0	-	-	2.4	1.8	1.6	1.6

1=weakly mapped

2= moderately mapped

3=strongly mapped

ECO11505	**Economics for Engineers**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours –45**	**3**	**0**	**0**	**3**
Pre-requisites/Exposure	**12th level Mathematics**				
Co-requisites					

Course Objectives:

1. Prepare engineering students to function in the business and management side of professional engineering practice.
2. Help students in general to analyse, understand and explain the past, present economic conditions of the country.
3. To forecast the future course of changes and development through their knowledge of policies and programmes set by the governments and other development agencies.
4. Evaluate the economic theories, cost concepts and pricing policies.
5. Apply the concepts of financial management for project appraisal.

Course Outcomes:

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

CO1. **Illustrate** the basic economic concepts and make economic analyses in the decision making.

CO2. **Apply** principals of economics to analyse the behaviour of consumers and producers in a well- functioning economy and also in case of market failures.

CO3. **Develop** the ability to account for time value of money using factors and formulas, estimate annual and future worth comparisons for cash flows.

CO4. **Illustrate** how factor market works, identify the manpower and resources management, need of credit/finance for initiating and accelerating projects.

Catalog Description:

This paper introduces students to the terminology and analytic principles used in microeconomics, which is broadly defined as the study of markets, and to the application of these conceptual tools to several policy issues. As the design and manufacturing process become more complex, an engineer is required to make decisions that involve money more than ever before. The competent and successful engineer at present must have an improved understanding of the principles of economics. This paper is concerned the analysis of individual behaviors and market structure, and systematic evaluation of the benefits and costs of projects.

Course Content:

Module 1: Basic Concepts of Economics: 10 lecture hours

Introduction to the Literature of Microeconomics centering around Decision Making at Individual Level. Some Fundamental Concepts: Maximization, Equilibrium and Efficiency.

Module 2: Theories of Economics: 12 lecture hours

The Theory of Consumer Choice and Demand, the Theory of Supply, market equilibrium, market structure, market failure and environmental issues, Game Theory, concept of yield and Theories of Term Structure, the Theory of Asset Pricing, decision-making under uncertainty: risk and insurance.

Module 3: Sustainability Study of a Project: 5 lecture hours

Budget plan, estimation of the project cost, prices, fees and cost recovery, financing of recurrent costs, sustainability of the activities generated by the project.

Module 4: Economic Feasibility Study: 12 lecture hours

Problem of pricing under oligopoly, problem of market stagnation, problem of volatility in open economy, problem of global meltdown, problem of financing a project.

Module 5: Project Report: 6 lecture hours

Facets of project viability – commercial, technical, financial, outline of a model project report, a real life case study.

Text Books:

- R. Panneersalvam, *Engineering Economics*, 2nd Ed., Prentice Hall of India, 2014.
- James Riggs, *Engineering Economics*, 4th Ed., McGraw Hill Education, 2004.

Reference Books:

- Donald G. Newnan, Ted G. Eschenbach and Jerome P. Lavelle, *Engineering Economic Analysis*, 13th Ed., Oxford University Press, 2017.
- Chan S. Park, *Contemporary Engineering Economics*, 6th Ed., Pearson, 2015.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ECO11505	Economics for Engineers	CO11505.1	1	3	3	3	2	2	3	-	1	-	-	3	1	2	1
		CO11505.2	3	2	3	3	1	2	2	-	2	-	-	2	1	3	1
		CO11505.3	2	1	2	3	1	2	3	-	3	-	2	2	2	1	3
		CO11505.4	2	3	2	2	1	2	1	-	2	-	3	1	1	1	2
		CO11505	2.0	2.25	2.5	2.75	1.25	2.0	2.25	-	2.0	-	2.5	2.0	1.25	1.75	1.75

1=weakly mapped
2= moderately mapped
3=strongly mapped

Course Objectives:

CSE12143	Web Technology Lab	L	T	P	C
Version 1.0	Contact Hours -30	0	0	2	1
Pre-requisites/Exposure	Basic Knowledge of Coding				
Co-requisites	---				

- To introduce students how to design static webpage using HTML and CSS
- To provide knowledge on web architecture, web services, client side and server side scripting technologies to focus on the development of web-based information systems and web services
- To provide skills to design interactive and dynamic web sites
- To develop students knowledge for implementing web applications using PhP

Course Outcomes:

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

CO1: **Design** a static webpage by applying HTML elements
CO2: **Apply** CSS concepts for designing HTML web pages.
CO3: **Develop** DHTML pages by using JavaScript with DOM events
CO4**:** **Implement** a webpage with database connectivity using PhP
CO5: **Create** rich internet application using XML.

Course Description:

The main objective of this course is on the World Wide Web as a platform for interactive applications, content publishing and social services. The development of web-based applications requires knowledge about the underlying technology and the formats and standards the web is based upon. In this course you will learn about the HTTP communication protocol, the markup languages HTML, XHTML and XML, the CSS and XSLT standards for formatting and transforming web content, interactive graphics and multimedia content on the web, client-side programming using JavaScript.

Course Content:

Suggested assignments to be framed based on the following Programming Language such as

HTML, CSS, Java script, XML and PH

Experiment 1:

Introduction to web page design, attributes and concept by taking an example of online job-portal

Experiment 2:

Explain the logic of HTML and its feature, heading, color, background color, (h1 to h6).

Experiment 3:

Design a preliminary web page by using HTML table, create, row, header, data insertion.

Experiment 4:

Design a web page by using HTML form tag and explore its features by taking reference of some

E-commerce web site (Mantra, Zabong etc)

Experiment 5:

Design a web page by using HTML form attributes (Radio button, submit button, drop down menu, check box etc) in

Online Ticket booking

Experiment 6:

Design a List in HTML (Ordered list and Un-ordered list).

Experiment 7:

Design an event page by using JavaScript in E-commerce website.

Experiment 8:

Design a web page by using JavaScript for arithmetic and logical operation.

Experiment 9:

Design a page enabling idea of Java string, Java switch, DOM model. By taking an online movie ticket booking

Experiment 10:

Design a web repository knowledge base by using XML-ontology.

Experiment 11:

Write a PHP class that sorts an ordered integer array with the help of sort () function.

Experiment 12:

Write a PHP Calculator class which will accept two values as arguments, then add them, subtract them, multiply them together, or divide them on request.

Text Books:

1. "Web Design The Complete Reference", Thomas Powell, Tata McGraw-Hill

Reference Books:

1. "PHP : The Complete Reference", Steven Holzner, Tata McGraw-Hill The Easy Guide to Operating Systems, Larry Miller, 2012.
2. "Javascript 2.0 : The Complete Reference", Second Edition By Thomas Powell And Fritz Schneider

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Internal Assessment	ETE
Weightage (%)	50	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12143	Web Technology Lab	CO12143.1	2	3	1	2	2	2	2	-	3	3	-	1	3	2	3
		CO12143.2	2	1	3	3	2	3	3	-	1	3	-	3	3	3	3
		CO12143.3	1	2	1	3	3	3	3	-	2	2	-	3	1	2	2
		CO12143.4	1	3	2	1	3	2	3	2	1	-	-	2	2	3	1
		CO12143.5	3	3	3	2	3	2	3	2	3	-	-	2	1	3	2
		CO12143	1.8	2.4	2.0	2.2	2.6	2.4	2.8	2.0	2.0	2.67	-	2.2	2.0	2.6	2.2

1=weakly mapped

2= moderately mapped

3=strongly mapped

CSE15144	Technical Seminar	L	T	P	C
Version 1.0	Contact Hours - 30	0	0	2	1
Pre-requisites/Exposure	Knowledge on Computer domain				
Co-requisites	--				

Course Objectives:

1. To **develop** skills in doing literature survey, technical presentation and report preparation.
2. To **enable** project identification and execution of preliminary works on final semester project

Course Outcomes:

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

CO1. **Identify** the advanced technologies and globalization

CO2. **Develop** communication and representation skills towards becoming a good team leader and manager

CO3. **Plan** for lifelong learning towards industry readiness

CO4. **Build** the ability to identify an engineering problem, analyze it and propose a work plan to Solve it.

Catalog Description:

The course involves presentation and report submission by every student. Reference search and technical writing skills along with effective presentation skills are focused. The course strengthens the research attributes including literature survey.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Continuous Assessment	ETE
Weightage (%)	**50**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE15144	Technical Seminar	CO15144.1	3	3	3	2	2	3	2	-	1	-	-	2	3	2	3
		CO15144.2	2	1	2	2	2	2	1	-	3	-	-	1	2	1	3
		CO15144.3	3	1	1	3	2	2	1	-	3	-	-	3	1	3	2
		CO15144.4	2	3	3	3	3	2	1	-	1	-	-	1	3	3	3
		CO15144	2.5	2.0	2.25	2.5	2.25	2.25	1.25	-	2.0	-	-	1.75	2.25	2.25	2.75

CSE12145	**Android Application Development Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 30**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure					
Co-requisite					

Course Objectives:

Know the components and structure of mobile application development frameworks for Android and windows OS based mobiles.

Understand how to work with various mobile application development frameworks.

Learn the basic and important design concepts and issues of development of mobile applications.

Understand the capabilities and limitations of mobile devices.

Course Outcomes:

CO1 :	Understand GUI components, Layout Managers and Event Listeners
CO2 :	Create basic applications using databases
CO3 :	Apply Android Service based modules to create advanced applications
CO4 :	Solve issues related to notifications and alert

Course Description:

This course contains several key lab assignments to give an overview of all the components of android development

Course Content:

List of Experiments

1. Develop an application that uses GUI components, Font and Colors.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Develop an application that makes use of RSS Feed.
7. Implement an application that implements Multi-threading.
8. Develop a native application that uses GPS location information.
9. Implement an application that writes data to the SD card.

10. Implement an application that creates an alert upon receiving a message.
11. Write a mobile application that creates alarm clock.

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12145	Android Application Development Lab	CO12145.1	1	2	2	3	3	2	1	-	3	-	2	3	1	3	3
		CO12145.2	1	3	2	3	2	1	3	-	2	-	2	3	1	2	2
		CO12145.3	3	2	3	2	3	3	1	-	3	-	3	1	2	2	2
		CO12145.4	3	3	3	2	2	3	2	-	1	-	2	3	2	3	1
		CO12145	2.0	2.5	2.5	2.5	2.5	2.25	1.75	-	2.25	-	2.25	2.5	1.5	2.5	2.0

1 = Weakly Mapped, 2 = Moderately Mapped, 3= Strongly Mapped

CSE12146	**Machine Learning Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 30**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure	**Probability & Statistics**				
Co-requisite	**NIL**				

Course Objectives:

- Understand the overview of the various machine learning techniques and can able to demonstrate those using python.
- Make use of Data sets in implementing the machine learning algorithms.
- Implement the machine learning concepts and algorithms in any suitable language of choice. Learn and understand the linear learning models in machine learning.
- Study the tree based machine learning techniques and to appreciate their capability.

Course Outcomes:

On the completion of this course the student will be able to

CO1: **Understand** complexity of Machine Learning algorithms and their limitations and modern notions in data analysis-oriented computing.

CO2: **Develop** an appreciation for what is involved in learning from data.

CO3: **Apply confidently** common Machine Learning algorithms in practice and implementing their own.
CO4: **Apply** the concept of regression methods, classification methods and clustering methods.

CO5: **Design** and perform various experiments in Machine Learning using real-world data.

Course Description:

1. The programs can be implemented in either JAVA or Python.

2. For Problems 1 to 6 and 10, programs are to be developed without using the built in classes or APIs of Java/Python.

3. Data sets can be taken from standard repositories (https://archive.ics.uci.edu/ml/datasets.html) or constructed by the students.

Course Content:

Unit-I **6 Lecture Hours**

Introduction:

1. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is the probability that a student is absent given that today is Friday? Apply Bayes rule in python to get the result. (Ans: 15%)

2. Extract the data from database using python

3. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

4. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

5. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Unit-II **6 Lecture Hours**

Clustering Approaches:

1. Implement k-nearest neighbours classification using python

2. Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of k means clustering with 3 means (i.e., 3 centroids)

VAR1	VAR2	CLASS
1.713	1.586	0
0.180	1.786	1
0.353	1.240	1
0.940	1.566	0

1.486	0.759	1
1.266	1.106	0
1.540	0.419	1
0.459	1.799	1
0.773	0.186	1

3. Implement Naïve Bayes theorem to classify the English text

4. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

5. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

Unit-III **6 Lecture Hours**

Neural Networks:

1. Implement the finite words classification system using Back-propagation algorithm

2. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.

3. Implement an algorithm to demonstrate the significance of genetic algorithm.

Unit-IV **6 Lecture Hours**

Linear Models:

1. Implement linear regression using python.

2. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

3. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.

4. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Unit-V **6 Lecture Hours**

Case studies:

Mini project on **Supply chain optimization or any other real life example.**

Text Books:

Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
Tom Mitchell, *"Machine Learning",* McGraw-Hill, 1997.

Ethem Alpaydin, Introduction to Machine Learning, 3rd Ed., MIT Press, 2014.

Reference Books:

Laurene Fausett, *"Fundamentals of Neural Networks, Architectures, Algorithms and Application,* Pearson Education, 2008.

Peter Flach, Machine Learning: The Art and Science of Algorithms that Make Sense of Data, CUP, 2012.
S Kulkarni, G Harman, An Elementary Introduction to Statistical Learning Theory, Wiley, 2011.

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination

Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CSE12146	Machine Learning Lab	CO12146.1	1	2	3	3	3	1	2	-	2	-	2	1	1	1	2
		CO12146.2	2	3	3	2	2	2	1	-	3	-	2	1	1	3	2
		CO12146.3	3	3	2	2	2	2	3	-	3	-	2	2	1	3	2
		CO12146.4	3	2	2	2	3	1	1	-	3	-	2	1	2	1	2
		CO12146.5	2	2	3	2	2	1	2	-	3	-	2	2	3	1	3
		CO12146	2.2	2.4	2.6	2.2	2.4	1.4	1.8	-	2.8	-	2.0	1.4	1.6	1.8	2.2

1 = Weakly Mapped
2 = Moderately Mapped
3 = Strongly Mapped

		L	T	P	C
CSE12148	**Virtualization and Applied Cloud Computing Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 30**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure	**NIL**				
Co-requisite	**NIL**				

Course Objectives:

- To enable student to develop a knowledge on virtualization
- To provide the fundamentals of Virtual Disks
- To enhance the skill of the students to have a concept on Destop and Server Virtualization
- To enable students to create Virtual Networks

Course Outcomes:

On the completion of this course the student will be able to

- **Understanding** the Basics of Virtualization
- **Demonstrate** Virtual Storage
- **Explain** Different Destop Virtualization
- **Analyze** Vitrtualization techniques for Servers
- **Develop** Virtual Networks

Course Description:

This course requires minimal knowledge virtualization. The course starts from learning basics of virtualization. A concept of virtual storage is being introduced. Student will be able to learn different techniques of desktop virtualization. Different techniques of server virtualization have also been discussed. This mainly includes ESXI server virtualizations, Student will also be able to create virtual networks using VLAN in CISCO packet tracker,KVM, and VPN.

Course Content:

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Unit-I: Basics of Virtualization **6 Lecture Hours**

Create type 2 virtualization in VMWARE. Allocate memory and storage space as per requirement. Install Guest OS on that VMWARE.
Adding a New Virtual Disk to a Virtual Machine. Convert basic disc to dynamic disc and vice versa

Unit-II: Exploring Virtual Disks **6 Lecture Hours**

Shrink and extend virtual disk
Create, Manage, Configure and schedule snapshots
Create Spanned, Mirrored and Striped volume
Create RAID 5 volume
Sharing and data transfer between the virtual machines

Unit-III: Desktop Virtualization **6 Lecture Hours**

Desktop Virtualization using VNC
Desktop Virtualization using Chrome Remote Desktop

Unit-IV: Virtualization on ESXI server **6 Lecture Hours**

Create type 2 virtualization on ESXI 6.5 server
Access ESXI server from another VM and create multiple OS on top of ESXI 6.5 server
Create ESXI server as Bare metal OS

Unit-V: Creating Virtual Networks **6 Lecture Hours**

Create a VLAN in CISCO packet tracer
Install KVM in Linux
Create a VPN from one virtual machine to another virtual and pass data secure way

Text Books:

David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach
Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010.

Reference Books:

Publications, 2006. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011
Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008

Components	Class Assessment	End Term
Weightage (%)	50	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12148	Virtualization and Applied Cloud Computing Lab	CO12148.1	2	3	1	3	2	3	2	-	2	-	-	2	3	2	1
		CO12148.2	2	1	1	3	1	2	3	-	1	-	-	3	1	2	2
		CO12148.3	2	3	1	3	2	3	3	-	3	-	-	1	3	2	1
		CO12148.4	3	2	1	2	3	3	2	-	1	-	-	3	3	1	1
		CO12148.5	2	3	2	1	3	1	1	-	2	-	-	1	3	1	2
		CO12148	2.2	2.4	1.2	2.4	2.2	2.4	2.2	-	1.8	-	-	2.0	2.6	1.6	1.4

1 = Weakly Mapped

2 = Moderately Mapped

3 = Strongly Mapped

CSE12149	**Network Security Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 30**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure	**---**				
Co-requisite					

Course Objectives:

To introduce several modern tools to perform network breaches

To provide platforms for defending against network breaches

Course Outcomes:

CO1 :	Understand the use of Netcat and Nmap
CO2 :	Apply Wireshark and Dumpsec tools
CO3 :	Explain wireless audit, ARP poisoning and Intrusion detection
CO4 :	Implement several modern tools for breaching the network
CO5 :	Understand decryption systems

Course Description:

This course introduces several experiments to allow students to perform network breaches and develop systems to defend against the same. This course covers a large number of tools and techniques related to network security

Course Content:

- Perform an experiment to grab a banner with telnet and perform the task using Netcat utility.
- Using Nmap find open ports on a system
- Using Nmap find the machines which are active
- Using Nmap find the version of remote OS on other systems
- Using Nmap find the version of s/w installed on other system
- Perform an experiment to demonstrate how to sniff for router traffic by using the tool Wireshark.
- Perform an experiment to show how to use DumpSec
- Perform a wireless audit of an access point / router and decrypt WEP and WPA.
- Perform an experiment to sniff traffic using ARP poisoning.
- Demonstrate intrusion detection system (ids) using any tool e.g., Snort or any other s/w
- Install rootkits and study variety of options

- Generating password hashes with openssl
- Setup a honey pot and monitor the honeypot on network
- Install JCrypt tool (or any other equivalent) and demonstrate asymmetric, symmetric crypto algorithm, hash and digital/PKI signature
- Install IPCop on a linux system and learn all the function available on the software.
- Use John the ripper to crack password
- Use IP Spoofing for packet transfer
- Use and Implement SQL injection

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination

Examination Scheme:

Components	Class Assessment	End Term
Weightage (%)	50	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CSE12149	Network Security Lab	CO12149.1	3	3	3	1	2	2	2	-	3	-	-	2	2	1	3
		CO12149.2	2	1	2	1	3	1	1	-	2	-	-	2	1	2	2
		CO12149.3	1	3	3	3	3	1	1	-	2	-	-	3	2	1	3
		CO12149.4	1	2	1	3	3	3	1	-	2	-	-	3	3	1	3
		CO12149.5	2	3	3	3	2	3	1	-	1	-	-	1	2	1	1
		CO12149	1.8	2.4	2.4	2.2	2.6	2.0	1.2	-	2.0	-	-	2.2	2.0	1.2	2.4

1 = Weakly Mapped, 2 = Moderately Mapped, 3= Strongly Mapped

CSE11178	Big Data on Cloud	L	T	P	C
Version 1.0	Contact Hours – 45 Hours	3	0	0	3
Pre-requisite/Exposure	NIL				
Co-requisite	NIL				

Course Objectives:

- To make students familiar with cloud computing
- To enable students to know and conceptualize Big Data
- To enhance the skill of solving Big Data problems over Cloud

Course Outcomes:

On the completion of this course, the student will be able to

- **Understand** the fundamentals of Cloud Computing
- **Evaluating** the concept of Big Data
- **Explain** different Big Data Framework
- **Explain** different cloud computing storage and architectures
- **Develop** the Big Data Application over Cloud

Course Description:

The course presents an overview of cloud computing in the context of its architecture and storage modules. Its main focus is on parallel programming techniques for cloud computing and large-scale distributed systems that form the cloud infrastructure. The topics include Overview of Cloud Computing, Introduction to Big Data, Big Data Frameworks, Cloud Architectures and Storage Systems and Deployment of Massive Datasets over cloud. Students will study the concept of Big Data, different frameworks to solve Big Data problems. Students will also be able to learn how to deploy massive datasets over cloud using different cloud computing tools and to analyze it.

Course Content:

Unit-I: Overview of Cloud Computing **10 Lecture Hours**

Introduction, Definition and evolution of Cloud Computing; Enabling Technologies, Service and Deployment Models Popular Cloud Stacks and Use Cases; Benefits, Risks, and Challenges of Cloud Computing Economic Models and SLAs. Contrast traditional software development and development for the cloud. Public v private cloud apps. Understanding Cloud ecosystems – what is SaaS/PaaS, popular APIs.

Unit-II: Introduction to Big Data **7 Lecture Hours**

Big Data Definition, Characteristic Features, Structure, Applications - Big Data vs Traditional Data - Risks of Big Data - Challenges of Conventional Systems - Web Data – Evolution of Analytic Scalability - Evolution of Analytic Processes, Tools and methods - Analysis vs Reporting - Modern Data Analytic Tools.

Unit-III: Big Data Frameworks **10 Lecture Hours**

Apache Hadoop, MapReduce, Apache Spark, Hadoop Yarn, Large-Scale File System Organization – Master-Slave/Master-Worker Architecture– HDFS concepts – MapReduce Execution, Matrix-Vector Multiplication, Concept of Apache Pig and Apache Hive

Unit-IV: Cloud Architectures and Storage Systems **9 Lecture Hours**

Service Oriented architecture, SOAP and REST architecture, Utility Computing, Web2.0, Cluster computing and Grid Computing, Cloud Storage Concepts Distributed File Systems (HDFS, Ceph FS); Cloud Databases (HBase, MongoDB, Cassandra, DynamoDB) ; Cloud Object Storage (Amazon S3, OpenStack Swift, Ceph)

Unit-V: Deployment of Massive Datasets over cloud **9 Lecture Hours**

Distributed Programming for the Cloud; Data-Parallel Analytics with Hadoop, Setting -up Hadoop and Spark Cluster on different cloud tools, MapReduce (YARN), Iterative Data-Parallel Analytics with Apache Spark, Graph-Parallel Analytics with GraphLab 2.0 (PowerGraph)

Text Books:

Chuck Lam, Hadoop in Action, Manning Publications,2010.
David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", 2013.

Reference Books:

Big Data and Analytics by Seema Acharya, Subhashini Chellapan
Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses by Michael Minelli ,Michele Chambers , Ambiga Dhiraj

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CSE11178	Big Data on Cloud	CO11178.1	3	3	1	2	1	2	3	-	3	-	-	3	2	3	3
		CO11178.2	2	3	2	1	3	2	2	-	1	-	-	2	2	1	1
		CO11178.3	2	2	2	3	1	2	2	-	1	-	-	1	2	1	1
		CO11178.4	2	2	2	3	2	2	1	-	3	-	-	1	3	2	1
		CO11178.5	3	2	2	2	3	3	1	-	2	-	-	2	1	1	1
		CO11178	2.4	2.4	1.8	2.2	2.0	2.2	1.8	-	2.0	-	-	1.8	2.0	1.6	1.4

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3 = Strongly Mapped

CSE12179	**Big Data on Cloud Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 30 Hours**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure	**Python/Java**				
Co-requisite	**NIL**				

Course Objectives:

- To have an experience of setting up physical cluster for Apache Hadoop/Spark
- To enable students to develop applications for Big Data
- To allow students to identify challenging areas where large-scale datasets can be analysed by deploying it over cloud.

Course Outcomes:

On the completion of this course the student will be able to

- **Understanding** the clusters for Big Data Framework
- **Solve** and understand the application using Apache Hadoop Framework
- **Solve** and understand the application using Apache Saprk Framework
- **Illustrate** applications over Cloud
- **Applying** the concept to some real problem

Course Description:

Big Data Analytics provides a basic introduction to big data and corresponding quantitative research methods. The objective of the course is to familiarize students with big data analysis as a tool for addressing substantive research questions. The course presents an overview of deploying Big Data problems over cloud using its architecture and storage modules. Its focus is on parallel programming techniques for cloud computing and large-scale distributed systems that form the cloud infrastructure. The topics include Setting Up Clusters, Developing Application Using Hadoop Framework, Developing Application Using Spark Framework, Basic Application on Cloud. Student will also learn to deploy different Big dataset over cloud resources and can manage, execute and analysis the data. Students will also be able perform a mini-project using Big Data framework over cloud environment for large scale datasets.

Course Content:

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Unit-I: Setting Up Clusters **9 Lecture Hours**

Setting up Physical Apache Hadoop Cluster with n nodes.
Setting up Physical Apache Spark Cluster with n nodes.

Unit-II: Developing Application Using Hadoop Framework. **9 Lecture Hours**

Write a Word Count Map Reduce program using Java/Python
Implementing Matrix Multiplication Using One Map-Reduce Step.
Develop a mini-application using Hadoop/Mapreduce

Unit-III: Developing Application Using Spark Framework. **9 Lecture Hours**

Write a WordCount program in Apache Spark using Java/Pyspark
Write a program in Apache Spark to find the Squares and Cubes of n numbers
Write a program to draw the difference between all the action components of Spark
Write a program to draw the difference between all the transformation components of Spark
Develop a mini-application using Apache Spark

Unit-IV: Basic Application on Cloud **9 Lecture Hours**

Create EC2 Linux instance on Amazon AWS and create SSH client configuration through PUTTY.
Install Hadoop multi-node node cluster on cloud.
Implement aMapReduce program in a multi-node cluster on Cloud
Install Spark multi-node node cluster on cloud.
Implement a Spark program in a multi-node cluster on Cloud

Unit-V: Case Study **9 Lecture Hours**

Develop a mini project using Hadoop/Spark Framework and deploy it in the Cloud Architecture

Text Books:

Chuck Lam, Hadoop in Action, Manning Publications,2010.
David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", 2013.

Reference Books:

Big Data and Analytics by Seema Acharya, Subhashini Chellapan
Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses by Michael Minelli ,Michele Chambers , Ambiga Dhiraj

Components	Class Assessment	End Term
Weightage (%)	**50**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CSE12179	Big Data on Cloud Lab	CO12179.1	3	3	1	1	1	2	1	-	3	-	-	2	1	2	1
		CO12179.2	2	2	2	1	2	3	3	-	1	-	-	2	2	2	1
		CO12179.3	2	3	3	3	2	3	3	-	1	-	-	2	3	3	1
		CO12179.4	2	2	2	1	3	1	2	-	1	-	-	2	1	1	3
		CO12179.5	1	2	3	2	1	2	1	-	3	-	-	3	1	3	2
		CO12179	2.0	2.4	2.2	1.6	1.8	2.2	2.0	-	1.8	-	-	2.2	1.6	2.2	1.6

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SEMESTER VII

Year IV

MGT11402	**Industrial Management**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 45**	**3**	**0**	**0**	**3**
Pre-requisites/Exposure	**Basic Calculation Skill**				
Co-requisites	-				

Semester VII

Course Objective:

- To enable students to understand operational complexities of a business.
- To enable students to conceptualize the process, functions and theories of management.
- To enable students to provide knowledge about quality control processes.
- To enable students to conceptualize different strategies relating to people management

Course Outcomes:

CO 1	Understand the concepts related to Industrial Management.
CO 2	Demonstrate skills to perform Different Managerial Functions
CO 3	Define and analyze the importance of Quality control procedures.
CO 4	Illustrate different techniques to be used in Materials Management process
CO 5	Understand the concepts of production planning and implications of the samein industrial management processes.
CO 6	Evaluate importance of project management and its applications through PERT CPM method.

Course Description:

The purpose of this course is to provide an understanding of the theories and principles of modern management and encourage the course participants to make an appreciation of these principles in relation to their own experiences and selected managerial case studies.

The aims of the course is to understand the basic principles of management, and the four major functions of managers e.g. planning, organizing, leading and controlling and how managers actually operate. Students will be required to think critically and strategically about management theories and issues which will enable them to develop their decision-making and analytical skills. They will be involved in application exercises and case studies, which will assist them to develop graduate attributes.

Course Content:

Module 1: Introduction **[6Lecture Hours]**

Industrial management - Introduction: Concept, Development, application and scope of Industrial Management. Productivity: Definition, measurement, productivity index, types of production system,Industrial Ownership.

Module 2: Managerial Functions **[10 LectureHours]**

Management Function: Principles of Management – Time and motion study, work simplification –process charts and flow diagrams, Production Planning. Inventory Control: Inventory, Cost, Deterministic Models, and Introduction to supply chain management.

Module 3: Quality Assurance **[6Lecture Hours]**

Quality Control: Process control, SQC, Control charts, Single, Double and Sequential Sampling,Introduction to TQM.

Module 4: Materials Management **[8Lecture Hours]**

Fundamentals of Materials Management; Material cycle; Forecasting; Material Classification-need and usage, Single and Multidimensional classifications; Materials Codification-Usage, Codificationtypes;

Module 5: Production Planning **[8Lecture Hours]**

Production Planning and Materials Requirements, Materials Procurement; Tendering; Types of Tenders, Storage and warehousing concepts, Receipt, Warehouse type, Layout, issue of materials andUpdation of records; Manpower and equipment;

Module 6: Project Management **[7Lecture Hours]**

Project Management concept, Project Feasibility Studies, Project Identification, Market and Demand Analysis, Technical Analysis, Project Scheduling with PERT/CPM, Project Cost Estimate, Financial Appraisal of Single Project, Financial Appraisal of Multiple Projects, Project Cost Control (PERT/Cost).

Text Books:

- Arnold, Chapman: Introduction to Materials Management: Pearson, 5th edition, 2008

Reference Books:

- Gopal Krishnan &Sundarsan: Material Management: An Integrated Approach, Prentice Hallof India Private Limited, New Delhi, 2003
- Industrial Engineering and Management by OP Khanna, DhanpatRai Publications, Delhi. Management Information Systems by Larry Long (Prentice Hall)
- Industrial Management by VK Sharma, OP Harkut.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination Scheme:

Components	**Internal Assessment**	**MTE**	**ETE**
Weightage (%)	**30**	**20**	**50**

Course Outcome: At the end of the course, the student will be able to:

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MGT11402	Industrial Manage	CO11402.1	2	3	1	1	3	2	2	-	3	-	-	2	3	1	3
		CO114	3	3	1	1	2	3	2	-	2	-	-	3	2	3	2

	ment	02.2															
		CO11402.3	2	2	2	3	2	3	3	2	2	-	-	2	2	3	3
		CO11402.4	2	3	2	2	1	2	1	-	3	-	-	3	3	3	3
		CO11402.5	2	3	2	1	2	1	2	-	1	-	-	3	2	2	3
		CO11402.6	2	2	3	3	2	3	3	3	2	-	2	3	1	1	1
		CO11402	2.17	2.67	1.83	1.83	2.0	2.33	2.17	2.5	2.17	-	2.0	2.67	2.17	2.17	2.5

1=weakly mapped 2= moderately mapped 3=strongly mapped

CSE11150	**Operating System**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45 Hours**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Data structures, Programming Languages, and Computer Architecture.**				
Co-requisite	**NIL**				

Course Objectives:

- To understand the students to study the basic principles and functionality of operating systems
- To provide the students to identify the concepts of CPU scheduling, concurrent processes, deadlock
- To allow the students to identify the significance of memory management and virtual memory.
- To enhance the skill of students to identify the disk scheduling, file systems, and device management.
- To understand the students to explain the performance trade-offs inherent in advance OS implementation.

Course Outcomes:

On the completion of this course the student will be able to

- **Understand** functionalities and features of Operating System
- **Analyze** various scheduling algorithms and threading concepts to identify a suitable algorithm for a Given criteria.
- **Assess** various solutions for critical Section problem. Applying deadlock avoidance principles and Check for the occurrence of deadlock.
- **Explain** different memory management techniques and its uses. Structuring an overview of file Systems and mass storage
- **Understand** the functionalities of modern operating system like Android, oxygen, Windows11 etc.

Course Description:

The course will begin with an overview of the structure of computer operating systems. The purpose of this course is to provide students basic knowledge of operating systems, difference between the kernel and user modes, concepts of application program interfaces, methods and implementations of interrupts. Students are introduced to the schedulers, policies, processes, threads, memory management, virtual memory, protection, access control, and authentication. Students learn system calls in different popular operating systems used in the industry. Particular emphasis will be given to three major OS subsystems: process management (processes, threads, CPU scheduling, synchronization, and deadlock), memory management (segmentation, paging, swapping), and file systems; and on modern operating system architecture.

Course Content:

Unit-I **09 Lecture Hours**

Introduction to Operating System:

Introduction: Concept of Operating Systems, Operating Systems Objectives and Functions, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Protection and Security, Case study on UNIX and WINDOWS Operating System.

Unit-II **09 Lecture Hours**

Introduction to Process and Process Scheduling :

Process Management – Process concept- process scheduling, operations, Inter process communication. Multi Thread programming models. Process scheduling criteria and algorithms (FCFS, SJF, Priority, RR, Multilevel queue Scheduling), and their evaluation.

Unit-III **09 Lecture Hours**

Inter-process Communication and Deadlock :

Process synchronization, the critical- section problem, Peterson's Solution, synchronization Hardware, semaphores, classic problems of synchronization, monitors, Producer Consumer problem, Readers & Writers Problem, Dining Philosopher Problem .

Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, and Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

Unit-IV **09 Lecture Hours**

Memory and File Management :

Memory Management : Swapping, contiguous memory allocation, paging, structure of the page table, segmentation, Virtual memory, demand paging, page-Replacement, algorithms, Allocation of Frames, Thrashing.

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed),Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.

Unit-V **09 Lecture Hours**

Modern OS Architectures :

Case Study on: Android, Windows 11, Mac, oxygen OS and other contemporary Operating system.

Text Books:

Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 9th Edition, John Wiley publishers, 2012

Operating Systems' – Internal and Design Principles, Stallings, Sixth Edition, Pearson education, 2005.

Reference Books:

Operating System a Design Approach-Crowley, 3 rd Edition, Tata Mcgraw Hill, 2009.

Operating systems- A Concept based Approach-D.M.Dhamdhere, 2nd Edition, Tata Mcgraw Hill, 2012

Modern Operating Systems, Andrew S Tanenbaum 3rd edition Prentice-Hall, Inc, 2008

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11150	Operating System	CO11150.1	3	1	3	3	3	3	1	-	3	-	-	3	3	3	1
		CO11150.2	3	3	2	3	2	1	1	-	2	-	-	3	3	1	2
		CO11150.3	2	2	3	2	3	3	2	-	2	-	-	2	3	1	1
		CO11150.4	1	2	2	1	2	2	3	-	2	-	-	1	1	2	1
		CO11150.5	2	3	2	1	2	3	2	-	3	-	-	2	2	3	2
		CO11150	2.2	2.2	2.4	2.0	2.4	2.4	1.8	-	2.4	-	-	2.2	2.4	2.0	1.4

1 = Weakly Mapped

2 = Moderately Mapped

3 = Strongly Mapped

		L	T	P	C
CSE11151	**Advanced Web Technologies**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45 Hours**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Web Technologies**				
Co-requisite					

Course Objectives:

To provide the concepts of full stack web development
Introduce the MERN stack to make students industry-ready

Course Outcomes:

CO1 :	Define basic concepts of HTML and CSS
CO2 :	Explain concepts of bootstrap, javascript and jquery
CO3 :	Apply concepts of Node.js to develop backends
CO4 :	Design databases for web applications
CO5 :	Build attractive front-end for web applications

Course Description:

This course will allow students to master both front and back-end development, becoming a full-stack developer by the end of the course. They can build fully-fledged websites and web apps, master frontend development with React and will learn the latest technologies, including Javascript, React, Node and even Web3 development.

Course Content:

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Unit-I **10 Lecture Hours**

HTML-Refresher, The Anatomy of an HTML Tag, HTML Lists, HTML Image Elements, HTML Links and Anchor Tags, HTML Tables, HTML Forms

CSS Refresher - Online CSS, Internal CSS, External CSS, Classes vs. Ids, HTML Divs, CSS Display Property, CSS Static and Relative Positioning, Absolute positioning, CSS Sizing

Unit-II **10 Lecture Hours**

Bootstrap : Introduction to Bootstrap, Navigation Bar, Bootstrap grid layout system, containers, buttons and fonts, carousel, media query breakpoints, CSS Z index, CSS Selectors

Javascript : Variables, Dataypes, strings, functions, conditions, loops,

JQuery : Selections, Manipulation of styles, texts, attributes, event listeners, animations

9 Lecture Hours

Backend Web Development :

Introduction to Node.js , Node REPL, Native Node Modules

Introduction to Express.js, Express Servers,

Unit-IV **8 Lecture Hours**

Database Design : SQL, Basic SQL commands, MongoDB CRUD Operations, Relationships, Database management with Mongoose.

Unit-V **8 Lecture Hours**

Frontend Web Development :

What is React, JSX and Babel, JSX Expressions, React Styling, Components, React Props, React DevTools, React Hooks, Forms, Event Handling.

Text Books:

1. Beginning MERN Stack: Build and Deploy a Full Stack MongoDB, Express, React, Node.js App

Lim, Greg
2. Full-Stack React Projects: Learn MERN stack development by building modern web apps using MongoDB, Express, React, and Node.js, 2nd Edition

Components	Mid Term	Class Assessment	End Term
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11151	Advanced Web Technologies	CO11151.1	3	2	2	3	3	2	2	-	2	3	2	3	2	2	3
		CO11151.2	1	3	3	3	3	1	1	-	2	3	2	1	2	1	2
		CO11151.3	2	2	2	3	2	2	3	-	3	3	3	2	1	2	3
		CO11151.4	3	3	2	2	3	3	1	-	1	2	2	3	3	1	1
		CO11151.5	2	2	2	3	2	2	3	-	2	3	2	3	3	1	1
		CO11151	2.2	2.4	2.2	2.8	2.6	2.0	2.0	-	2.0	2.8	2.2	2.4	2.2	1.4	2.0

1 = Weakly Mapped, 2 = Moderately Mapped, 3= Strongly Mapped

CSE11152	**Applied Machine Intelligence.**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45 Hours**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	Basics of Algorithm, Linear Algebra, Probability, and Statistics				
Co-requisite	**NIL**				

Course Objectives:

- To help the student to acquire knowledge of basics of artificial intelligent computing.
- To enable students to gain basic knowledge of machine learning.
- To incorporate the evolutionary computational knowledge.
- To enable students to acquire various problem solving, learning, and planning ability.
- To enable students to apply machine learning models to solve real-life problems

Course Outcomes:

On the completion of this course the student will be able to

- **Understand** applications of Machine Learning in industry scenarios.
- **Analyse** different parameters that control implementation of Machine Learning in a practical scenario.
- **Explain** different data modelling techniques
- **Compare** among different practical implementations and their effects on business
- **Develop** AI models using state of the art tool.

Course Description:

There is a growing need for talented machine learning/data scientist developers across every industry. As technology advances, the ability to build quality machine learning driven software while considering design, development, security, and maintenance is sought after amongst all kinds of companies, from finance and banking to healthcare and national security. Machine Learning applies the knowledge and theoretical understanding gained through computer science to building high-quality intelligent software products. As a maturing discipline, Artificial Intelligence is becoming more and more important in our everyday lives. Our software development and engineering professional program is University's response to the tremendous growth of the software development industry.

Course Content:

Unit-I **9 Lecture Hours**

Data Analysis Refresher : Descriptive Statistics, Feature Extraction, Curse of dimensionality, Dimensionality Reduction, Types of Machine Learning Techniques, Neural Networks, CNNs, LSTMs

Unit-II **9 Lecture Hours**

Machine Learning on numeric/nominal features : Decision Trees, Naïve Bayes Classification, K-NN classifer, K-Means Clustering, Similarity Matrix, Cluster validity indices, Fuzzy-C-Means.

Unit-III **9 Lecture Hours**

Computer Vision : Grayscale Image Processing, Detection of edges, shapes, textures and gradient based features, Image classification, feature extraction using CNNs, image denoising, image-to-image translation, image segmentation, object detection

Unit-IV **9 Lecture Hours**

Natural Language Processing – tf-idf, bag-of-words, language models, POS-Tagging, dependency parsers, Word Sense Disambiguation, Named Entity Recognition,

Deep learning in language processing - word embeddings, glove, Word2Vec, Natural Language Generation, Translation, RNN, GRU, LSTMs, Transformers- BERT Transformer.

Unit-V **9 Lecture Hours**

Modern Case Studies

Sequential Analysis : Video processing with convolutional LSTMs

Time Series Forecasting : Stock Market Predictions

Graph based approaches : Bioinformatics

Text Books:

Neural "Design of Video Quality Metrics with Multi-Way Data Analysis: A data driven approach," C. Keimel, Springer Singapore, 2016

"Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build

Intelligent Systems," A. Géron, O'Reilly Media, 2017

Reference Books:

"Deep learning," I. Goodfellow, Y. Bengio, A. Courville, Y. Bengio, MIT press, Cambridge, 2016

"Automatic Speech Recognition: A Deep Learning Approach," D. Yu, L. Deng, Springer, London, 2015

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination

Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11152	Applied Machine Intelligence.	CO11152.1	3	2	2	1	3	1	2	-	2	-	-	1	1	3	2
		CO11152.2	2	3	3	2	1	2	3	-	1	-	-	3	1	3	2
		CO11152.3	2	3	3	2	1	3	2	-	2	-	-	3	1	2	1
		CO11152.4	1	2	2	3	2	2	2	-	2	-	-	2	3	2	2
		CO11152.5	3	3	2	3	3	3	2	-	2	-	-	2	3	1	2
		CO11152	2.2	2.6	2.4	2.2	2.0	2.2	2.2	-	1.8	-	-	2.2	1.8	2.2	1.8

1 = Weakly Mapped

2 = Moderately Mapped

3 = Strongly Mapped

CSE11153	**Data Analysis**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45 Hours**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Discrete Mathematics, Calculus, Machine Learning**				
Co-requisite	**NIL**				

Course Objectives:

- To introduce fundamental concepts of data analysis
- To develop statistical models to represent data
- To provide intelligent solutions for data mining processes

Course Outcomes:

On the completion of this course the student will be able to

- **Define** different types of data analysis techniques
- **Compare** various statistical tests
- **Explain** data using different types of data distributions
- **Build** algorithms for data processing
- **Interpret** different types of data visualization.

Course Description:

Data mining, or knowledge discovery in databases, has during the last few years emerged as one of the most exciting fields in Computer Science. Data mining aims at finding useful regularities in large data sets. Interest in the field is motivated by the growth of computerized data collections which are routinely kept by many organizations and commercial enterprises, and by the high potential value of patterns discovered in those collections. In this course we explore how this interdisciplinary field brings together techniques from databases, statistics, machine learning, and information retrieval. We will discuss the main data mining methods currently used, including data warehousing and data cleaning, clustering, classification, association rules mining, query flocks, text indexing and searching algorithms, how search engines rank pages, and recent techniques for web mining.

Course Content:

Unit-I **10 Lecture Hours**

Introduction to Data Analytics:

Introduction to core concepts and technologies: Introduction, Terminology, data analysis process, types of data, Example applications Basic Review on Statistics I: Distributions, Estimation.

Unit-II **11 Lecture Hours**

Probability & Statistics:

Basic Review on Statistics II: Type I and II errors, rejection regions; Z-test, T-test, F-test, Chi-Square test, Bayesian test, Markov process, Hidden Markov Models, Poisson Process, Bayesian Network, Regression, Queuing systems.

Unit-III **12 Lecture Hours**

Business Process Understanding & Acquiring Data:

Data Exploration: Observation, Interviews, Other sources. Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, using multiple data sources

Unit-IV **12 Lecture Hours**

Social Media and Text Analytics:

Data preparation: Removing unwanted data, missing data handling Data Visualization: Introduction, Types of data visualization, recent trends in various data collection and analysis techniques, Data Mining Trends and Research Frontiers: Mining Complex Data Types, Other Methodologies of Data, Mining, Data Mining Applications, Data Mining and Society, Data Mining Trends.

Text Books:

Data Mining: Concepts and Techniques - Jiawei Han, Jian Pei, Micheline Kamber

Data Mining: Practical Machine Learning Tools and Techniques - Ian H. Witten, Eibe Frank, Mark A. Hall

Reference Books:

Machine Learning and Data Mining - Igor Kononenko, Matjaz Kukar · 2007

Applied Data Mining for Business and Industry - Paolo Giudici, Silvia Figini ·

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CSE11153	Data Analysis	CO11153.1	3	3	3	1	1	1	2	-	3	-	-	3	2	1	2
		CO11153.2	1	3	3	2	3	3	1	-	2	-	-	1	3	2	1
		CO11153.3	2	2	3	2	3	1	2	-	3	-	-	3	2	2	1
		CO11153.4	1	2	2	2	2	2	1	-	1	-	-	2	1	1	1
		CO11153.5	2	3	3	1	2	1	2	-	2	-	-	1	3	2	2
		CO11153	1.8	2.6	2.8	1.6	2.2	1.6	1.6	-	2.2	-	-	2.0	2.2	1.6	1.4

1 = Weakly Mapped
2 = Moderately Mapped
3 = Strongly Mapped

CSE11154	**Cloud Architecture and Deployment**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45 Hours**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**NIL**				
Co-requisite	**NIL**				

Course Objectives:

- To enable students to have an overview of Cloud based Applkications
- To provide a concept of different Cloud Architectures
- To introduce with Delivery models in Cloud Computing
- To draw a comparison among different Cloud Deployment Models

Course Outcomes:

On the completion of this course the student will be able to

- **Understand** the fundamentals of Cloud Based Applications
- **Explain** different cloud computing architectures
- **Analyzing** the designing code for cloud
- **Evaluating** the Delivery models of Cloud Computing
- **Compare** different Cloud Deployment Models

Course Description:

The course presents a top-down view of cloud computing, from applications and administration to programming and infrastructure. Its main focus is on parallel programming techniques for cloud computing and large-scale distributed systems that form the cloud infrastructure. The topics include Introduction to Cloud-Based Application, Cloud Architectures, Designing Code For The Cloud, Overview of the Delivery models in Cloud Computing and Public and Hybrid Cloud Deployment Models. Students will study how to design different modules and web applications using web-based technologies and deploy them over the cloud. Students will also have a concept of delivery models of cloud computing and different models to deploy over the cloud.

Course Content:

Unit-I: Introduction to Cloud Based Application **9 Lecture Hours**

Introduction, Definition and evolution of Cloud Computing; Enabling Technologies, Service and Deployment Models Popular Cloud Stacks and Use Cases; Benefits, Risks, and Challenges of Cloud Computing Economic Models and SLAs. Contrast traditional software development and development for the cloud. Public v private cloud apps. Understanding Cloud ecosystems – what is SaaS/PaaS, popular APIs, mobile.

Unit-II: Cloud Architectures **9 Lecture Hours**

Service Oriented architecture, SOAP and REST architecture, Utility Computing, Web2.0, Cluster computing and Grid Computing, Web3.0 and Mashup, Distributed Computing, Cloud Computing Challenges, Cloud Computing Reference Architecture (CCRA)

Unit-III: Designing Code For The Cloud **5 Lecture Hours**

Class and Method design to make best use of the Cloud infrastructure; Web Browsers and the Presentation Layer: Understanding Web browsers attributes and differences. Building blocks of the presentation layer: HTML, HTML5, CSS, Silverlight, and Flash.

Unit-IV: Overview of the Delivery models in Cloud Computing **10 Lecture Hours**

Overview of Delivery models in Cloud Computing, IAAS: features and benefit, PAAS: features and benefit, SAAS: features and benefit, Virtualization to Cloud Transformation Roadmap, Cloud Computing Solution components and workflow, IAAS architecture case study: AWS EC2

Unit-V: Private, Public and Hybrid Cloud Deployment Models **12 Lecture Hours**

What is a Private Cloud?, Illustration of Private Cloud, Advantages of Private Cloud, Limitations of Private Cloud, Service Management, Journey into Private Cloud, Planning and Strategy, Standardization, Virtualization, Automation, Cloud, Case study, VMware vCloud, Case Study – IBM SmartCloud Entry, Private cloud. What is a Public Cloud?, Illustration of Public Cloud, Why Public Cloud, Advantages of Public Cloud, Limitations of Public Cloud, What is a Hybrid Cloud?, Why Hybrid Cloud, Illustration of Hybrid Cloud, Advantages of Hybrid Cloud, Challenges of Hybrid Cloud

Text Books:

Guo Ning Liu, Qiang Guo Tong, Harm Sluiman, Alex Amies, "Developing and Hosting Applications on the Cloud", IBM Press (2012)
Chris Hay, Brian Prince, Azure in Action [ISBN: 978-1935182481],2018

Eugenio Pace, Dominic Betts, Scott Densmore, Ryan Dunn, Masashi Narumoto, Matias Woloski, Developing Applications for the Cloud on the Microsoft Windows Azure Platform

Reference Books:

Eugene Ciurana, Developing with Google App Engine

Henry Li, Introducing Windows Azure [ISBN: 978-1-4302-2469-3]

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination

Examination Scheme:

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11154	Cloud Architecture and Deployment	CO11154.1	3	2	2	3	2	1	3	-	2	-	-	3	3	3	2
		CO11154.2	3	2	1	1	2	1	2	-	1	-	-	1	1	1	2
		CO11154.3	2	3	3	3	1	2	1	-	1	-	-	2	2	1	2
		CO11154.4	3	2	3	3	2	3	3	-	2	-	-	1	3	2	3
		CO11154.5	3	3	1	3	1	1	3	-	1	-	-	3	2	3	3
		CO11154	2.8	2.4	2.0	2.6	1.6	1.6	2.4	-	1.4	-	-	2.0	2.2	2.0	2.4

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3 = Strongly Mapped

CSE11155	Application Security	L	T	P	C
Version 1.0	Contact Hours – 45 Hours	3	0	0	3
Pre-requisite/Exposure	Web Technology				
Co-requisite	NIL				

Course Objectives:

- To enable students to identify different security needs for different applications.
- To provide the fundamentals of E-Commerce application security requirements.
- To enhance the skill of students to identify security requirements of Web Applications.
- To allow students to identify challenging areas in a proposed security protocol for web applications.

Course Outcomes:

On the completion of this course, the student will be able to

- **Describe** web-based applications and associated threats and differentiate them from mainframe, client-server, applications.
- **Understand** the role of web-based applications in E-commerce transactions.
- **Explain** social networking and evaluate associated risks.
- **Evaluate** web application security vulnerabilities.
- **Design** a web – application Vulnerability and Security Assessment Test Plan.

Course Description:

It is your responsibility as a student to learn about concepts, methods, procedures, and strategies that are used to secure the security of data contained within web-based applications over the duration of this course. This course covers web application security coding methodologies and processes, web application security configuration management strategies, and web application security standards, amongst other topics. It is the goal of this course to investigate the convergence of web application security, as well as the danger vectors and attack tactics that are associated with it. Other topics covered in this course include secure development techniques, web application secure configuration methodologies, and legal problems connected with protecting sensitive digital assets. Some of the subjects addressed include secure configuration and development, vulnerability and risk mitigation, vulnerability assessments, and quality assurance testing.

Course Content:

Unit-I **9 Lecture Hours**

Types of Applications:

Different types of applications and their security requirements. method of access, users, connection type

(internet/non-internet), protocols used, and languages used to develop the software for each type of application. Security Threats to Linux, Basic Components of Linux Security, User Privileges and Permissions, Filesystems, Volumes, and Encryption

Unit-II **9 Lecture Hours**

E-Commerce Transactions Web Application:

Security Testing of an Online Banking Service:- The online banking system, Understanding the services, Development of a custom application, Determining valid branch and account numbers, Determining valid PINs, Finding account owners, Finding personal information

New Security Issues in Mobile E-Commerce:- Mobile Commerce - The Next Generation of E-Commerce, Mobile E-Commerce Security, Security Risks in Mobile Commerce, The Wireless Device, Application Risks, Malicious code risks, Software flaws, Communication Link Risks.

Problems in Policing E-Commerce Crime:- Barriers to the Investigation of Computer Crime, Why National Law Will Fail to Address the Problem, Making Law Relevant, Conflict of Laws, The Hurdles to be Overcome.

Unit-III **9 Lecture Hours**

Web Application Security Vulnerabilities:

The Structure of a Modern Web Application, Modern Versus Legacy Web Applications, REST APIs, JavaScript Object Notation, Identifying Weak Points in Application Architecture, DoS Vulnerabilities
, Common Vulnerabilities and Exposures Database, Vulnerability Discovery
, Vulnerability Discovery
, Vulnerability Management.

Unit-IV **9 Lecture Hours**

Web Application Security Controls:

Defending Against Injection, Mitigating SQL Injection,
Detecting SQL Injection, Prepared Statements,
Generic Injection Defences, Exploiting Third-Party Dependencies, Methods of Integration,
Self-Hosted Application Integrations.

Unit-V **9 Lecture Hours**

Web-Based Application Security Solutions & Compliance :

Securing Modern Web Applications

, Defensive Software Architecture, Comprehensive Code Reviews

, Vulnerability Discovery

, Vulnerability Analysis

, Regression Testing

, Secure Application Architecture

, Analyzing Feature Requirements

, Secure Sockets Layer and Transport Layer Security, Hashing Credentials

, Secure Credentials

, Reviewing Code for Security, Archetypical Vulnerabilities Versus Custom Logic Bugs.

Text Books:

Harwood, M., Goncalves, M., and Pemble, M. (2010) Security Strategies in Web Applications and Social Networking (Information Systems Security & Assurance), Sudbury, MA. Jones & Bartlett +
E-Commerce Security and Privacy by Andra L. M. dos Santos, Giovanni Vigna, Richard A. Kemmerer, Anup K. Ghosh Publisher Springer US.

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination

Examination Scheme:

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11155	Application Security	CO11155.1	3	3	1	1	2	2	3	-	3	-	-	3	3	3	3
		CO11155.2	2	3	3	3	2	3	3	-	2	-	-	3	2	1	2
		CO11155.3	3	2	2	3	3	3	2	-	3	-	-	1	2	1	2
		CO11155.4	3	1	1	2	2	1	2	-	3	-	-	3	3	3	2
		CO11155.5	3	2	3	1	2	3	2	-	1	-	-	2	2	3	1
		CO11155	2.8	2.2	2.0	2.0	2.2	2.4	2.4	-	2.4	-	-	2.4	2.4	2.2	2.0

1 = Weakly Mapped

2 = Moderately Mapped

3 = Strongly Mapped

PHY11203	**Medical Image Processing and Analysis**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45 Hours**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Basic programming skills**				
Co-requisite	**Mathematical transforms**				

Course Objectives:

- To understand and apply different types of imaging modalities used for non-invasive diagnosis
- To understand various image processing techniques for enhancement, and visualization
- To compare normal and abnormal images with scientific aptitudes and design the solution accordingly.
- To apply computer-assisted detection, diagnosis, and decision support

Course Outcomes:

On the completion of this course the student will be able to

- Demonstrate on different medical imaging techniques.
- Apply the fundamentals of digital image and its properties.
- Illustrate the basics of digital image processing to improve image quality.
- Analyse clinical information through computational techniques in digital image processing.

Course Description:

An advanced graduate level course on medical imaging and medical image analysis. The course includes topics from medical image formation to analysis. It covers fundamentals of X-ray radiography, X-ray computed tomography (CT), ultrasonic imaging, nuclear imaging, magnetic resonance imaging (MRI), and functional MRI (fMRI), as well as more general concepts required for these, such as linear systems theory, the Fourier Transform, and numerical optimization. Popular techniques for the visualization, segmentation, and analysis of medical image data will also be discussed, as well as applications of medical imaging, such as image-guided intervention.

Course Content:

Unit-I **20 Lecture Hours**

Medical Imaging Techniques: Introduction to medical imaging technology, systems, and modalities. Brief history; importance; applications; trends; challenges. Medical Image Formation Principles: X-Ray physics; X-Ray generation, attenuation, scattering; dose Basic principles of CT; reconstruction methods; artifacts; PET CT hardware. Magnetic Resonance Imaging (MRI) Mathematics of MR; spin physics; imaging principles and hardware; image artifacts. Gamma camera, single photon emission computer tomography (SPECT) and other latest Medical imaging systems. Physics of ultrasound imaging, uses in diagnosis, Image quality description & patient risk, Theory and applications of optical, thermography imaging.

Unit-II **10 Lecture Hours**

Image Processing Fundamentals: Image Perception, image fidelity criteria, image model, image sampling and quantization – 2 dimensional sampling theory, image quantization, image transforms- 2 D – DFT and other transforms. Medical Image Visualization Fundamentals of visualization; surface and volume rendering/visualization.

Unit-III **15 Lecture Hours**

Image Enhancement and reconstruction: Image enhancement –point operation, histogram modelling, spatial operation, transforms operations. Image restoration- image degradation model, inverse and wiener filtering, spatial and frequency domain filtering. Image reconstructions from projections-radon transforms, filter back projection algorithm, algebraic methods ,3D tomography, imaging methods of CT images, imaging methods in magnetic resonance imagers, Fourier reconstructions of Magnetic resonance images.

Unit-IV **10 Lecture Hours**

Image Classification and Analysis: Medical Image analysis- spatial feature extraction, edge detection, image segmentation classification technique- Markov Random Field models; active contours; model-based segmentation. Multi-scale segmentation; semi-automated methods; clustering-based methods; classification-based methods; Applications in automated medical diagnosis and treatment planning.

Text Books:

Paul Suetens, "Fundamentals of Medical Imaging", Second Edition, Cambridge University Press.
J. Michael Fitzpatrick and Milan Sonka, "Handbook of Medical Imaging, Volume 2. Medical Image Processing and Analysis", SPIE Publications.
Geoff Dougherty, "Digital Image Processing for Medical Applications", First Edition, Cambridge University

Press.
Hand Book of Biomedical Instrumentation, R. S. Khandpur

Reference Books:

Digital image processing using Matlab, R. C. Gonzalaz, Richard. E. Woods, Steven L Eddins

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
PHY11203	Medical Image Processing and Analysis	CO11203.1	2	2	1	3	3	3	3	2	3	-	-	2	2	1	3
		CO11203.2	2	3	2	1	3	1	1	-	1	-	-	1	3	1	3
		CO11203.3	2	2	3	3	3	2	3	2	1	-	-	3	1	1	2
		CO11203.4	2	2	2	2	3	3	3	2	3	-	-	1	3	1	3
		CO11203	2.0	2.25	2.0	2.25	3.0	2.25	2.5	2.0	2.0	-	-	1.75	2.25	1.0	2.75

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2 = Moderately Mapped
3 = Strongly Mapped

ECE11047	Sensors and Actuators for IOT	L	T	P	C
Version 1.0	**Contact Hours – 45**	3	0	0	3
Pre-requisites/Exposure	Physics				
Co-requisites	Electronics Measurement, Basic Networking				

Course Objectives

- To study basic concepts of various sensors and actuators.
- To develop knowledge in selection of suitable sensor based on requirement and application.
- To understand the operation of resistive, inductive, capacitive, magnetic, thermal, radiation and piezoelectric sensors for the identification of appropriate sensors.
- To introduce the concept of M2M (machine to machine) with necessary protocols.
- To introduce the Raspberry PI platform, that is widely used in IoT applications.

Course Outcomes

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

CO1. **Identify** the appropriate sensor, including powering of the sensor and signal conditioning (electrical and Calculation conversions).

CO2. **Learn** the operation of strain gauge and different types of sensors.

CO3. **Identify** different actuators to monitor and control the behaviour of a process or product.

CO4. **Explore and learn about** Internet of Things with the help of preparing projects designed for Raspberry Pi.

CO5. **Understand** IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, and sensing modules.

Catalog Description

The course is intended to give knowledge about modern electrical sensors for measuring non- electrical variables. The course is oriented towards physical phenomena used to sense such variables as: displacement, temperature, radiation, pressure, etc. In particular, issues related to modern micro-sensors made in silicon, fiber, and film technology are treated.

Course Content

Module 1: Introduction: 7 lecture hours

Definition, classification, static and dynamic parameters, Characterization – Electrical, mechanical, thermal, optical, biological and chemical, Classification of errors – Error analysis, Static and dynamic characteristics of transducers, Performance measures of sensors.

Module 2: Sensors: 12 lecture hours

Classification of sensors basic working principles, Displacement Sensor - Linear and rotary potentiometers, LVDT and RVDT, incremental and absolute encoders. Strain gauges. Force/Torque – Load cells. Temperature – Thermocouple, Bimetallic Strips, Thermistor, RTD. Accelerometers, Velocity sensors Tachometers, Proximity and Range sensors – Eddy current sensor, ultrasonic sensor, laser interferometer transducer, Hall Effect sensor, inductive proximity switch. Light sensors – Photodiodes, phototransistors, Flow sensors – Ultrasonic sensor, laser Doppler anemometer tactile sensors – PVDF tactile sensor, micro-switch and reed switch Piezoelectric sensors, vision sensor.

Module 3: Actuators: 10 lecture hours

Electrical Actuators: Solenoids, relays, diodes, thyristors, TRIACS, BJT, FET, DC motor, Servo motor, BLDC Motor, AC Motor, stepper motors. Hydraulic & Pneumatic devices – Power supplies, valves, cylinder sequencing. Design of Hydraulic & Pneumatic circuits. Piezoelectric actuators, Shape memory alloys.

Module 4: Physical Devices and Endpoints: 6 lecture hours

Introduction to Arduino and Raspberry Pi- Installation, Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, reading input from pins.

Module 5: Introduction to IoT and M2M: 10 lecture hours

Introduction to Internet of Things- Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates.

Software defined networks, network function virtualization, difference between SDN and NFV for IoT, Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER.

Text Books

- Ernest Doebelin and Dhanesh N. Manik, Doebelin’s Measurement Systems, 6th Ed., McGraw Hill Education, 2017.
- Ian Sinclair, Sensors and Transducers, Elsevier, 2011.

- D. Patranabis, Sensors and Transducers, 2nd Ed., Prentice Hall of India Learning Pvt. Ltd., 2003.
- Internet of Things - A Hands-on Approach, Ars deep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
- Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

Reference Books

- Sawhney.A.K, Puneeth sawhney, "A Course in Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai Publications, 2012.
- Ernest O. Doeblin, "Measurement System, Application and Design", Tata McGraw Hill Publishing Company Ltd., 5th Edition, 2008
- Ronald K. Jurgen, Sensors and Transducers (Progress in Technology), 2nd Ed., SAE International, 2003.
- S. M. Sze, Semiconductor Sensors, Willy –Interscience Publications.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ECE11047	Sensors and Actuators for IOT	CO11047.1	2	2	3	1	2	2	1	-	2	-	-	3	2	1	1
		CO11047.2	3	3	2	2	2	3	1	-	3	-	-	3	2	1	3
		CO11047.3	2	2	2	2	2	1	3	-	3	-	-	1	1	1	1
		CO11047.4	2	3	2	1	2	3	3	-	1	-	-	3	2	3	2
		CO11047.5	3	2	3	1	2	2	1	-	2	3	-	2	2	3	1
		CO11047	2.4	2.4	2.4	1.4	2.0	2.2	1.8	-	2.2	3.0	-	2.4	1.8	1.8	1.6

1=weakly mapped

2= moderately mapped

3=strongly mapped

		L	T	P	C
BIT11074	**Bioinformatics**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 45**	3	0	0	3
Pre-requisites/Exposure	**Plus two level science**				
Co-requisites	--				

Course Objectives

- To provide those students with apt the knowledge to bioinformatics
- It will also provide in depth knowledge of the general database, and biological databases.
- Elaborating the alignment techniques
- Explore the knowledge of the applications of bioinformatics

Course Outcomes

On completion of this course, the students will be able to
CO1. **explain** basic of bioinformatics and its techniques and tools.
CO2. **demonstrate** the biological database and their role in bioinformatics.
CO3. **interpret** the knowledge of sequence alignments techniques
CO4. **explain** protein structure and functional analysis
CO5. **demonstrate** the applications of bioinformatics and current research activities in the field of bioinformatics

Catalog Description

The core-course of 'Bioinformatics' will help to understand the introductory level knowledge to bioinformatics tools, biological database, sequence alignments. This course is an beginning to the bioinformatics, the application of different bioinformatics methods to biological data analysis, and some current research activities in the field of bioinformatics. Furthermore, the possible applications of bioinformatics would also be illuminated. All the lectures will be devoted on discussions of basic theories and advanced topics, focusing on practical implementation of knowledge. Classes will be conducted by lecture as well as power point presentation, audio visual virtual lab session as per requirement. The tutorials will enable the students with problem-solving ability led by the course coordinator. Students will perceive the basic concepts of the subject via exercise and discussions with the coordinator.

Course Content

Unit I **(Contact Hours – 9)**

Introduction & NCBI:

Internet basics; Connecting to internet; Email; FTP; www; NCBI; BIOSEQ's, BIOSEQ sets, SEQ-ANNOT, SEQ-DESCR.

Unit II **(Contact Hours – 9)**

Biological databases:

Biological databases; primary sequence databases; Composite sequence databases; Secondary databases; composite protein pattern databases; structure classification databases; Genome Information Resources; DNA sequence databases; specialized genomic resources.

Unit III **(Contact Hours – 9)**

Alignment techniques:

Pairwise Alignment Technique; Database searching; algorithms & programs; comparing two sequences; identity & similarity; global & local alignments; pairwise database searching; Multiple sequence Alignment; computational Complexity; Manual methods; Simultaneous methods; Progressive methods; Databases of multiple alignment; Secondary database searching; Analysis packages.

Unit IV **(Contact Hours – 9)**

Protein analysis:

Protein identity based on composition, Motifs & patterns; secondary structure prediction; specialized secondary structures; tertiary structures.

Unit V **(Contact Hours – 9)**

Introduction to perl:

Using PERL to facilitate biological analysis; Strings, numbers, variables; Basic input and output; File handles; Conditional Blocks and loops; Pattern matching; Arrays-Hashes..

SUGGESTED BOOKS:

- Andreas D Baxevanis and B F Francis," Bioinformatics- A practical guide to analysis of Genes & Proteins", John Wiley, 2002.
- T K Attwood and D J Parry-Smith," Introduction to Bioinformatics", Pearson Education,

1st edition, 2005.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
BIT11074	Bioinformatics	CO11074.1	2	2	1	3	2	2	3	-	2	-	-	2	2	2	1
		CO11074.2	2	3	2	3	1	3	3	-	1	-	-	3	2	3	1
		CO11074.3	2	2	3	2	2	2	2	-	3	-	-	3	3	1	3
		CO11074.4	3	3	2	3	3	3	3	-	3	-	-	3	2	1	2
		CO11074.5	2	3	2	2	3	1	1	3	1	-	-	1	1	2	3
		CO11074	2.2	2.6	2.0	2.6	2.2	2.2	2.4	3.0	2.0	-	-	2.4	2.0	1.8	2.0

1=weakly mapped
2= moderately mapped
3=strongly mapped

CSE12156	Operating System Lab	L	T	P	C
Version 1.0	**Contact Hours – 30 Hours**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure	Data structures, Programming Languages, and Computer Architecture.				
Co-requisite	**NIL**				

Course Objectives:

- To introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix.
- To understand the students to study the basic principles and functionality of operating systems.
- To provide the students to identify the concepts of CPU scheduling, concurrent processes, deadlock
- To allow the students to identify the significance of memory management and virtual memory.
- To enhance the skill of students to identify the disk scheduling, file systems, and device management.

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Course Outcomes:

On the completion of this course the student will be able to

- **Understand** and implement basic services and functionalities of the operating system using system calls and shell script.
- **Analyze** and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority.
- **Assessing** various solutions for critical Section problem. Applying deadlock avoidance principles and

  Check for the occurrence of deadlock.
- **Implement** memory management schemes and page replacement schemes.
- **Simulate** file allocation and organization techniques.

Course Description:

The goal of this course is to have students understand and appreciate the principles in the design and implementation of operating systems software. The course will cover the concepts of operating systems, process management, memory management, file systems. Experiments on process scheduling and other operating system duties will be conducted through simulation/implementation in the laboratory.

Course Content:

Unit-I **09 Lecture Hours**

Linux Commands/Shell Programming:

To study about the basics of Linux commands.

Implementation of shell scripting using conditional/branching statement.

Implementation of shell scripting using Loop statement.

Implementation of shell scripting using Array.

Implementation of shell scripting using String.

Implementation of shell scripting using Function and recursion.

Unit-II **09 Lecture Hours**

Process Scheduling Algorithm:

Simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time.

FCFS b) SJF c) Priority

Simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time.

Shortest Remaining Time First b) Round Robin c) Priority

Simulate multi-level queue scheduling algorithm considering the following scenario. All the processes in the system are divided into two categories – system processes and user processes. System processes are to be given higher priority than user processes. Use FCFS scheduling for the processes in each queue.

Unit-III **09 Lecture Hours**

Process Synchronization Problems /Deadlock:

Simulate producer-consumer problem using semaphores.

Simulate the concept of Dining-Philosophers problem.

Simulate Bankers algorithm for the purpose of deadlock avoidance.

Unit-IV **09 Lecture Hours**

Memory Management Techniques:

Simulate page replacement algorithms

FIFO b) LRU c) Optimal

Simulate disk scheduling algorithms

FCFS b) SCAN c) C-SCAN

Simulate selection partition algorithm

a). Best Fit b). First Fit c). Worst Fit

Unit-V **09 Lecture Hours**

File Organization Techniques:

simulate the following file organization techniques

a) Single level directory b) Two level directory c) Hierarchical

Text Books:

Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 9th Edition, John Wiley publishers, 2012

Operating Systems' – Internal and Design Principles, Stallings, Sixth Edition, Pearson education, 2005.

Reference Books:

Operating System a Design Approach-Crowley, 3 rd Edition, Tata Mcgraw Hill, 2009.

Operating systems- A Concept based Approach-D.M.Dhamdhere, 2nd Edition, Tata Mcgraw Hill, 2012

Modern Operating Systems, Andrew S Tanenbaum 3rd edition Prentice-Hall, Inc, 2008

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12156	Operating System Lab	CO12156.1	3	1	2	1	1	2	3	-	2	-	-	3	3	2	2
		CO12156.2	2	3	2	3	2	1	3	-	1	-	-	3	3	1	1
		CO12156.3	2	2	2	1	2	3	1	-	3	-	-	2	1	1	1
		CO12156.4	3	3	2	1	2	1	3	-	2	-	-	2	1	2	3
		CO12156.5	2	3	3	1	3	2	1	-	3	-	-	3	1	3	2
		CO121566	2.4	2.4	2.2	1.4	2.0	1.8	2.2	-	2.2	-	-	2.6	1.8	1.8	1.8

1 = Weakly Mapped 2 = Moderately Mapped 3 = Strongly Mapped

CSE12157	**Advanced Web Technologies Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 30 Hours**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure					
Co-requisite					

Course Objectives:

To provide the concepts of full stack web development
Introduce the MERN stack to make students industry-ready

Course Outcomes:

CO1 :	Define basic concepts of HTML and CSS
CO2 :	Explain concepts of bootstrap, javascript and jquery
CO3 :	Apply concepts of Node.js to develop backends
CO4 :	Design databases for web applications
CO5 :	Build attractive front-end for web applications

Course Description:

This course will allow students to master both front and back-end development, becoming a full-stack developer by the end of the course. They can build fully-fledged websites and web apps, master frontend development with React and will learn the latest technologies, including Javascript, React, Node and even Web3 development.

Course Content:

List of Experiments:

1) Create a static HTML Page

2) Create a stylised HTML Page with CSS

3) Create a dynamic HTML Page with javascript elements

4) Use bootstrap to create a carousel

5) Create an express server to deploy a webpage

6) Using Node.js and MongoDB create a login, registration page

7) Create a profile page after login using reactJS

8) Create a Employment Webpage

9) Create a simple mouse based game using event listener

10) Use concepts of full stack to create a website to track student's fees payment

11) Create a portal to behave as payment gateway

12) Create a graph plotting webpage

13) Create a webpage to create an online calculator

14) Create a webpage for a e-commerce platform

15) Create a webpage to deploy a messenger service.

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12157	Advanced Web Technologies Lab	CO12157.1	2	2	2	2	2	3	1	-	3	-	3	1	1	2	1
		CO12157.2	1	2	3	3	3	2	3	-	3	-	2	3	3	2	3
		CO12157.3	1	2	2	3	3	3	2	-	1	-	2	1	1	3	1
		CO12157.4	2	2	3	3	2	1	2	-	2	-	3	2	1	2	3
		CO12157.5	1	3	2	3	3	3	2	-	1	-	2	1	2	2	2
		CO12157	1.4	2.2	2.4	2.8	2.6	2.4	2.0	-	2.0	-	2.4	1.6	1.6	2.2	2.0

1 = Weakly Mapped, 2 = Moderately Mapped, 3= Strongly Mapped

		L	T	P	C
CSE12158	**Applied Machine Intelligence Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 30 Hours**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure	Basics of Algorithm, Linear Algebra, Probability, and Statistics				
Co-requisite	**NIL**				

Course Objectives:

- To help the student to acquire knowledge of basics of artificial intelligent computing.
- To enable students to gain basic knowledge of machine learning.
- To incorporate the evolutionary computational knowledge.
- To enable students to acquire various problem solving, learning, and planning ability.
- To enable students to apply machine learning models to solve real-life problems

Course Outcomes:

On the completion of this course the student will be able to

- **Understand** applications of Machine Learning in industry scenarios.
- **Analyse** different parameters that control implementation of Machine Learning in a practical scenario.
- **Explain** different data modelling techniques
- **Compare** among different practical implementations and their effects on business
- **Develop** AI models using state of the art tool.

Course Description:

There is a growing need for talented machine learning/data scientist developers across every industry. As technology advances, the ability to build quality machine learning driven software while considering design, development, security, and maintenance is sought after amongst all kinds of companies, from finance and banking to healthcare and national security. Machine Learning applies the knowledge and theoretical understanding gained through computer science to building high-quality intelligent software products. As a maturing discipline, Artificial Intelligence is becoming more and more important in our everyday lives. Our software development and engineering professional program is University's response to the tremendous growth of the software development industry.

Course Content:

- Implement PCA using python
- Implement KNN Classification using python
- Implement KMeans Clustering using python
- Build a MLP using Pytorch
- Build a CNN using Pytorch
- Build an LSTM using Pytorch
- Edge Detection
- Shape Feature extraction,
- LBP and GLCM Features
- Implement a segmentation network using pytorch
- Import and deploy the YOLO-V3 in tensorflow
- Compute tf-idf from a set of documents
- Measure similarity between two sentence using word2vec embedding
- Use LSTMs to train a chatbot.
- Import and use the BERT transformer for language transaltion

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12158	Applied Machine Intelligence Lab	CO12158.1	2	3	2	2	3	2	3	-	3	-	-	2	2	2	1
		CO12158.2	3	3	2	3	1	3	2	-	1	-	-	1	3	2	3
		CO12158.3	2	3	1	3	2	3	3	-	1	-	-	1	3	1	3
		CO12158.4	3	3	3	3	3	3	2	-	3	-	-	3	2	3	2
		CO12158.5	1	2	3	3	3	1	2	-	3	-	-	3	1	1	3
		CO12158	2.2	2.8	2.2	2.8	2.4	2.4	2.4	-	2.2	-	-	2.0	2.2	1.8	2.4

1 = Weakly Mapped
2 = Moderately Mapped
3 = Strongly Mapped

CSE12159	**Data Analysis Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 30 Hours**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure	**Discrete Mathematics, Calculus, Machine Learning**				
Co-requisite	**NIL**				

Course Objectives:

- To introduce fundamental concepts of data analysis
- To develop statistical models to represent data
- To provide intelligent solutions for data mining processes

Course Outcomes:

On the completion of this course the student will be able to

- **Define** different types of data analysis techniques
- **Compare** various statistical tests
- **Explain** data using different types of data distributions
- **Build** algorithms for data processing
- **Interpret** different types of data visualization.

Course Description:

Data mining, or knowledge discovery in databases, has during the last few years emerged as one of the most exciting fields in Computer Science. Data mining aims at finding useful regularities in large data sets. Interest in the field is motivated by the growth of computerized data collections which are routinely kept by many organizations and commercial enterprises, and by the high potential value of patterns discovered in those collections. In this course we explore how this interdisciplinary field brings together techniques from databases, statistics, machine learning, and information retrieval. We will discuss the main data mining methods currently used, including data warehousing and data cleaning, clustering, classification, association rules mining, query flocks, text indexing and searching algorithms, how search engines rank pages, and recent techniques for web mining.

Course Content:

List of Experiments

- Introduction to Data Analytics:
- Calculate mean, median and mode from a dataset
- Calculate variance and s.d. from a dataset
- Calculate the correlation between two sequences
- Perform Z-Test, T-Test, F-Test
- Perform Chi-square Test
- Implement Linear Regression
- Scatter Plots,
- Time-series plots,
- error bars
- line plots
- bar graphs
- frequency histograms
- Compute similarity between two images based on colour distribution
- Classify twitter texts into positive or negative sentiment classes

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	**Mid Term**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**30**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CSE12159	Data Analysis Lab	CO12159.1	3	2	1	2	2	3	1	-	3	-	-	1	3	1	3
		CO12159.2	1	2	2	3	3	1	1	-	1	-	-	3	3	2	3
		CO12159.3	3	3	3	3	2	1	1	-	3	-	-	1	1	1	2
		CO12159.4	2	2	2	2	3	3	1	-	3	-	-	2	2	3	1
		CO12159.5	2	3	3	2	2	3	3	-	1	-	-	1	1	3	1
		CO12159	2.2	2.4	2.2	2.4	2.4	2.2	1.4	-	2.2	-	-	1.6	2.0	2.0	2.0

1 = Weakly Mapped
2 = Moderately Mapped
3 = Strongly Mapped

CSE12160	**Cloud Architecture and Deployment Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 30 Hours**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure	**Concept in Linux Operationg Syatem**				
Co-requisite	**NIL**				

Course Objectives:

- Understand cloud architecture
- Explore the caveats of deploying cloud infrastructure

Course Outcomes:

On the completion of this course the student will be able to

- **Understanding** the Basics of Virtualization
- **Demonstrate** instances over different Operating Systems and Databases.
- **Explain** Applications ove rCloud
- **Analyze** Vitrtualization techniques on Linux nodes
- **Develop** and design applications over cloud.

Course Description:

The course presents a top-down view of cloud computing, from applications and administration to programming and infrastructure. Its main focus is on parallel programming techniques for cloud computing and large-scale distributed systems that form the cloud infrastructure. The topics include Basics of Virtualization, Creating Instances on Different Operating Systems and Databases, Setting up Different Applications over Cloud, Creating nodes in Linux using VMWare and Developing Applications over Cloud. Students will study how to use different advanced virtualization tools and to able to design applications . Students will also have a concept of developing applications over cloud.

Course Content:

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Unit-I: Basics of Virtualization **5 Lecture Hours**

Desktop Virtualization using Chrome Remote Desktop
Create Nested Virtual Machine(VM under another VM)
Secure IOT integration with Cloud

Unit-II: Creating Instances on Different Operating Systems and Databases **9 Lecture Hours**

Create EC2 Linux instance on Amazon AWS and create SSH client configuration through PUTTY.
Create WINDOWS Server instance in AWS and Microsoft Azure.
Create MySQL database through AWS RDS. Connect AWS RDS through MySQL workbench from any remote location.

Unit-III: Setting up Different Applications over Cloud **7 Lecture Hours**

Setup Wordpress web application through Amazon AMI
Create a PHP based web application using Elastic Beansta

Unit-IV: Creating nodes in Linux using VMWare **9 Lecture Hours**

Install KVM emulator(Virtual Machine Manager) in Linux and Create Nested Virtual Machine(VM under another VM)
Configure and run integrated software packeges from virtual appliances(VMWARE marketplace

Unit-V: Developing Applications over Cloud **15 Lecture Hours**

Message queue service using AWS SNS and SQS
Creation of ChatBot using Amazon Lex
Create virtual IT infrastructure cost of company and make component wise comparison usin AWS TCO calculator
Create Software Application developement environment in AWS:Cloud9

Text Books:

Guo Ning Liu, Qiang Guo Tong, Harm Sluiman, Alex Amies, "Developing and Hosting Applications on the Cloud", IBM Press (2012)
Chris Hay, Brian Prince, Azure in Action [ISBN: 978-1935182481],2018
Eugenio Pace, Dominic Betts, Scott Densmore, Ryan Dunn, Masashi Narumoto, Matias Woloski, Developing Applications for the Cloud on the Microsoft Windows Azure Platform

Reference Books:

Eugene Ciurana, Developing with Google App Engine
Henry Li, Introducing Windows Azure [ISBN: 978-1-4302-2469-3]

Components	Class Assessment	End Term

Weightage (%)	50	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12160	Cloud Architecture and Deployment Lab	CO12160.1	3	1	2	3	2	3	1	-	3	-	-	3	3	3	3
		CO12160.2	2	2	3	3	3	1	3	-	2	-	-	3	1	3	3
		CO12160.3	2	3	3	2	3	2	1	-	1	-	-	2	3	2	1
		CO12160.4	2	1	2	1	2	1	1	-	1	-	-	2	3	1	1
		CO12160.5	2	3	3	2	3	3	3	-	1	-	-	2	2	3	2
		CO12160	2.2	2.0	2.6	2.2	2.6	2.0	1.8	-	1.6	-	-	2.4	2.4	2.4	2.0

1 = Weakly Mapped
2 = Moderately Mapped
3 = Strongly Mapped

CSE12161	Application Security Lab	L	T	P	C
Version 1.0	Contact Hours – 30 Hours	0	0	2	1
Pre-requisite/Exposure	Web Technology				
Co-requisite	NIL				

Course Objectives:

- To enable students to develop code for classical Encryption Techniques to solve the problems.
- To provide the fundamentals of building code for authentication algorithms.
- To enhance the skill of students to develop a signature scheme using the Digital signature standards.
- To allow students to identify the use of network security systems using open-source tools.

Course Outcomes:

On the completion of this course, the student will be able to

- **Develop** code for classical Encryption Techniques to solve the problems.
- **Build** cryptosystems by applying symmetric and public-key encryption algorithms.
- **Develop** a signature scheme using the Digital signature standard.
- **Demonstrate** the network security system using open-source tools

Course Description:

All websites are vulnerable to being hacked at any time and from any location, and this is true for all industries. This is partly due to the fact that hackers do not plan assaults with a specific website in mind when they decide to launch one when they decide to do so. They rely on computer programmes in order to locate websites that are vulnerable on an automated basis. These vulnerabilities are exploited as points of entry into a website in order to launch an attack against that particular website. Because you may not be aware of the existence of vulnerabilities on your website until it is too late, they may be incredibly detrimental. It is likely that your web host will be able to warn you if your website includes malware, but it is possible that they may not be able to notify you if your website contains vulnerabilities.

Course Content:

Unit-I **18 Lecture Hours**

Evaluate Business World Transformation:

Implement RSA Algorithm using HTML and JavaScript

Implement the Signature Scheme - Digital Signature Standard,

Setup a honey pot and monitor the honeypot on the network,

Installation of rootkits and study about the variety of options,

Implementation of Authorization protocol for web applications using hash value,

MD5 Encryption on Web application data communication

Unit-II **9 Lecture Hours**

Apply OWASP to a Web Security Assessment:

Improper Neutralization of Special Elements used in an SQL Command ('SQL Injection') ,

Neutralization of Special Elements used in an OS Command ('OS Command Injection'),

Buffer Copy without Checking Size of Input

Unit-III **9 Lecture Hours**

Exploit known Web Vulnerabilities on a Live Web Server:

Neutralization of Input During Web Page Generation ('Cross-site Scripting'),

Restricting Upload of File with Dangerous Type

URL Redirection to Untrusted Site ('Open Redirect')

Unit-IV **9 Lecture Hours**

Align Compliance Requirements to FISMA, SOX, HIPAA, GLBA, PCI DSS and AICPA:

Develop a web application having defence against all leading vulnerabilities.

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Class Assessment	End Term
Weightage (%)	50	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CSE12161	Application Security Lab	CO12161.1	3	2	3	1	3	2	1	-	2	-	-	1	3	1	3
		CO12161.2	3	3	2	3	1	1	1	-	1	-	-	1	1	2	2
		CO12161.3	2	2	2	2	3	2	1	-	1	-	-	2	3	2	3
		CO12161.4	3	1	3	2	2	3	1	-	1	-	-	2	1	3	3
		CO121611	2.75	2.0	2.5	2.0	2.25	2.0	1.0	-	1.25	-	-	1.5	2.0	2.0	2.75

1 = Weakly Mapped

2 = Moderately Mapped

3 = Strongly Mapped

CSE14162	Summer Internship #	L	T	P	C
Version 1.0		0	0	0	2
Pre-requisites/Exposure	Basic idea of the required subjects				
Co-requisites					

Course Objectives

- To Give and overview of Internship.
- To enable students building team.
- To give the students a outline of technical internship.
- To expound Idea dissemination for internship.

Course Outcomes

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

CO1 **Interpret** importance of Internship.
CO2.**Construct** the real-life scenario with internship.

CO3.**Analyse** and practical implementation with emerging application.CO4. **Classify** understanding in technology upgradation.

Catalog Description

The course involves presentation and report submission by every student. Reference search and technical internship skills along with effective presentation skills are focused. The course strengthens the research attributes including internship survey.

Course Content

An internship enables you to gain first-hand exposure of working in the real world. It also allows students toharness the skill, knowledge, and theoretical practice they learnt in university. You can

acquire endless amounts

about internships is that it teaches young professionals about the specific industries and companies they are

interested in.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written ExaminationExamination Scheme:

Components	Continuous Assessment	ETE
Weightage (%)	50	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course	Course	COs	PO	P	PO	PO	PO	PO	P	P	PO	PO	PO	PO	PS	PS	PS

Code	Name		1	O 2	3	4	5	6	O 7	O 8	9	10	11	12	O1	O2	O3
CSE14 162	Summer Internship #	CO1416 2.1	3	3	2	2	3	1	1	-	3	2	3	2	1	2	3
		CO1416 2.2	2	2	3	2	2	2	3	2	2	3	-	3	1	2	1
		CO1416 2.3	3	2	2	3	3	2	1	-	3	2	-	3	2	1	1
		CO1416 2.4	3	3	2	2	3	2	3	-	3	-	-	2	3	3	1
		CO1416 2	2.75	2.5	2.25	2.25	2.75	1.75	2.0	2.0	2.75	2.33	3.0	2.5	1.75	2.0	1.5

CSE14163	Minor Project	L	T	P	C
Version 1.0	Contact Hours -90	0	0	6	3
Pre-requisites/Exposure	Basic idea of the required subjects				
Co-requisites					

Course Objectives

1. To be able to design, develop, document, and test software using current techniques.
2. To understand the fundamentals of computer architecture and computing theory.
3. To be able to solve problems working in group settings.
4. To demonstrate the ability to give presentations and write technical reports.
5. To demonstrate understanding of the importance of social and ethical issues related to the profession.

Course Outcomes

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

CO1**. Identify** a real world problem
CO2. **Utilize** the modern tools to solve the problems
CO3. **Discuss** in a group to promote team spirit and leadership quality among the students
CO4. **Plan** a projects involving both technological aspects and finance
CO5. **Identify** newer areas of in depth study and research and lifelong learning

Catalog Description

The course encourages students to take project works that are based on current trends and technologies in various subjects, which will augment the theory subjects. The students will form a group to do their project work. This teaming is to encourage team spirit and to insist the importance of team work. The students typically undergo group formation, finalization of area of work, testing, generation and verification of results, and possible research publication procedure.

Course Content

The Evaluation of the project work are to be carried out in the following way:
1. In-depth study of a topic proposed by the supervisor
2. Continuous Evaluation through guide.
3. An open pre-submission seminar by the student.
4. End-semester University Examination (An open seminar followed by a Viva voce)

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Continious Assessment	ETE
Weightage (%)	50	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE14163	Minor Project	CO14163.1	2	2	2	1	1	2	1	-	3	-	-	1	3	3	1
		CO14163.2	2	2	3	3	2	2	2	-	3	-	-	1	1	3	2
		CO14163.3	3	1	3	1	3	3	1	-	2	-	-	1	2	2	1
		CO14163.4	3	3	3	3	1	1	1	-	2	-	2	1	1	2	1
		CO14163.5	1	1	3	2	2	1	1	-	3	-	-	3	2	3	2
		CO1416	2.	1.	2.	2.	1.	1.	1.	-	2.	-	2.0	1.4	1.8	2.6	1.4

		3	2	8	8	0	8	8	2		6					

1=weakly mapped

2= moderately mapped

3=strongly mapped

CSE11180	**IOT Application development on Cloud**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45 Hours**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Basic of IoT and Cloud Infrastructure knowledge**				
Co-requisite	**NIL**				

Course Objectives:

- To develop an idea of IOT Cloud data mapping and representation
- To design a aspect of IOT data analysis
- To apply understanding in cloud data propagation
- To Analise the Idea of MQTT protocol

Course Outcomes:

On the completion of this course the student will be able to

- Give a brief Understanding in IoT data representation
- Give a brief overview of IoT data analysis
- Apply understanding in decision making on Cloud data
- Formulate the concept of predictive analysis on IoT data
- Analyse the aspect of data visualization in Cloud service Google clod/AWS

Course Description:

This module provides an overview of the Internet of Things (IoT) and Cloud Computing concepts, infrastructures and capabilities. This will help students gain the necessary knowledge to construct IoT systems and use cloud services for processing and storage of the data produced by the IoT devices. Emphasis will be placed on the architecture and design of IoT systems, the different technologies (wireless/mobile/sensor) governing system implementation and the migration of the data to the Cloud for processing.

Course Content:

Unit-I **06 Lecture Hours**

Unit Heading: IoT and Edge Computing

IoT and Edge Computing Definition and Use Cases Introduction to Edge Computing Scenario's and Use cases - Edge computing purpose and definition, Edge computing use cases, Edge computing hardware architectures, Edge platforms, Edge vs Fog Computing, Communication Models - Edge, Fog and M2M.

Unit-II **08 Lecture Hours**

Unit Heading: IoT Architecture

IoT Architecture and Core IoT Modules-A connected ecosystem,IoT versus machine-to-machine versus, SCADA, The value of a network and Metcalfe's and Beckstrom's laws, IoT and edge architecture, Role of an architect, Understanding Implementations with examples-Example use case and deployment, Case study – Telemedicine palliative care, Requirements, Implementation, Use case retrospective.

Unit-III **11 Lecture Hours**

Unit Heading : **IoT Network, Wifi & Bluetooth**

"Wi-Fi & Bluetooth" focuses on the details of Wi-Fi and Bluetooth technology. First, Wi-Fi technology and the WLAN (Wireless Local Area Network) market is introduced, followed by a description of the functionality of Wi-Fi transmission modes (which include the Infrastructure mode and the Ad-Hoc mode) and wireless APs (Access Points) as well as BSS (Basic Service Set) and ESS (Extended Service Set) network formations. The internal process of Wi-Fi operations and role of DCF (Distributed Coordination Function) and CSMA/CA (Carrier-Sense Multiple Access with Collision Avoidance) are described followed by the characteristics of Wi-Fi standards (which include the IEEE 802.11a, 11b, 11e, 11g, 11n, 11p, 11ac, 11ad, 11ah specifications), Wi-Fi PHY (Physical Layer) modulation schemes, as well as the IFS (Inter-Frame Space) types and how IFSs are used in priority access control. In addition, the advantages of Wi-Fi Dual Band and Wi-Fi Direct are introduced. Second, Bluetooth standards and feature evolution are introduced, which include the specifications from 1.1 to 5 including EDR (Enhanced Data Rate), HS (High Speed), BLE (Bluetooth Low Energy), and Beacon technology. The description incudes the characteristics of Bluetooth piconets and types of operations (which include Classic Bluetooth and BLE (Bluetooth Low Energy)) as well as the channel specifications, advertising, and connection events.

Unit-IV **11 Lecture Hours**

Unit Heading: Cloud Technology

Implementation of "Cloud Technology" focuses on the Cloud market analysis, Cloud service types, MCC (Mobile Cloud Computing), and Edge Computing technology. Frist, the characteristics of the world's top cloud companies and their services including AWS (Amazon Web Service), Microsoft, IBM, Google, and Apple's iCloud are introduced. Then the characteristics of cloud models, which include public cloud, private cloud, community cloud, and hybrid cloud are described along with the differences in cloud service models, which include SaaS (Software as a Service), PaaS (Platform as a Service), and IaaS (Infrastructure as a Service). Based on the service models, the benefits and characteristics of Cloud services are introduced. More details on the operation process are introduced, which include the IaaS and VM (Virtual Machine) administration, PaaS Runtime Environment for application support, and Open SaaS applications access processes. Then the relation between IoT and state-of-the-art mobile cloud technology is introduced. First the differences in MCC (Mobile Cloud Computing) and Edge Computing are described, which includes details on Fog computing, MEC (Mobile Edge Computing), and Cloudlet technology. In addition, the functionality and characteristics of the Cloudlet architecture and its 3 layers are covered

Unit-V **09 Lecture Hours**

Unit Heading: IoT Bluetooth & Wi-Fi and EC2 Cloud Projects

"IoT Bluetooth & Wi-Fi & AWS EC2 Project" focuses on three IoT projects to provide experience in Bluetooth, Wi-Fi, and AWS (Amazon Web Service) EC2 (Elastic Compute Cloud) system details. The first project provides experience on the operation process of Bluetooth in Android and iPhone smartphones, teaching how to scan a Bluetooth packet and identify different Bluetooth versions being used on a smartphone. The second project provides experience on the operation process of Wi-Fi in Android and iPhone smartphones, teaching how to use a Wi-Fi network analyzer, conduct a LAN scan, send ping to a gateway, conduct a Wi-Fi signal scan, and use a Wi-Fi channel graph. The third project provides experience on how to setup an EC2 (Elastic Compute Cloud) Virtual Computer in AWS (Amazon Web Service) and how to use various options and compute a process on EC2 and use S3.

Text Books:

IoT and Edge Computing for Architects - Second Edition, by Perry Lea, Publisher: Packt Publishing, 2020, ISBN: 9781839214806

Raspberry Pi Cookbook, 3rd Edition, by Simon Monk, Publisher: O'Reilly Media, Inc., 2019, ISBN: 978149204322. REFERENCES 1. Fog and Edge Computing: Principles and Paradigms by Rajkumar Buyya, Satish Narayana Srirama, wiley publication, 2019, ISBN: 9781119524984. 2. David Jensen, "Beginning Azure IoT Edge Computing: Extending the Cloud to the Intelligent Edge, MICROSOFT AZURE

Reference Books:

"The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman, CRC Press.

Refer Open source

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	20	30	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11180	IOT Application development on Cloud	CO11180.1	2	2	1	1	2	1	1	-	2	-	-	2	1	1	1
		CO11180.2	3	2	2	1	1	2	2	-	1	3	2	2	3	3	1
		CO11180.3	2	2	2	2	1	3	2	-	3	-	-	1	2	2	1
		CO11180.4	2	1	3	1	2	2	1	-	1	3	3	3	1	3	2
		CO11180.5	2	3	2	1	2	2	3	-	1	2	2	1	2	1	2
		CO11180	2.2	2.0	2.0	1.2	1.6	2.0	1.8	-	1.6	2.67	2.33	1.8	1.8	2.0	1.4

1 = Weakly Mapped
2 = Moderately Mapped
3 = Strongly Mapped

CSE12181	**IOT Application development on Cloud Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours –30 Hours**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure	**Basic of IoT and Cloud Infrastructure knowledge**				
Co-requisite	**NIL**				

Course Objectives:

- To develop an idea of IOT Cloud data mapping and representation
- To design a aspect of IOT data analysis
- To apply understanding in cloud data propagation
- To Analise the Idea of MQTT protocol

Course Outcomes:

On the completion of this course the student will be able to

- Give a brief Understanding in IoT data representation
- Give a brief overview of IoT data analysis
- Apply understanding in decision making on Cloud data
- Formulate the concept of predictive analysis on IoT data
- Analyse the aspect of data visualization in Cloud service Google clod/AWS

Course Description:

This module provides an overview of the Internet of Things (IoT) and Cloud Computing concepts, infrastructures and capabilities. This will help students gain the necessary knowledge to construct IoT systems and use cloud services for processing and storage of the data produced by the IoT devices. Emphasis will be placed on the architecture and design of IoT systems, the different technologies (wireless/mobile/sensor) governing system implementation and the migration of the data to the Cloud for processing.

Course Content:

Suggested assignments to be framed based on the following IOT-cloud Interfacing simulator.Student can check for Cloud service for IOT device integration(AWS, Google cloud etc)

Experiment 1:
Explain different type of module in IOT-Cloud simulator Ex-IFog sim
Experiment 2:
Explain the Create Fog nodes with heterogeneous configurations.in Ifog sim

Experiment 3:
Study the Basic of Google/AWS Cloud-IOT integration platform with an example

Experiment 4:

Configure a network using Connect lower level Fog devices with nearby gateways

Experiment 5:

Create a device registry Go to the Google Cloud IoT Core page in Cloud Console

Experiment 6:

Introduction to Bevy-wise simulator and it's installation

Experiment 7:

Implementation of edge,fog device with example

Experiment 8:

Test your cloud and on-premise MQTT application using Bevy wise IoT Simulator

Experiment 9:

Configure a device response in Beevy wise simulator

Experiment 10:

Create a MQTT service with Pub/sub module in cloud platform

Experiment 11:

How to create Publish Events with Normal Text Payload in Beevy wise simulator

Experiment 12:

Program for Remote Command Execution using sockets

Experiment 13:

Create a real time application with IOT-Cloud mapping by EC2,S3

Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/ Written Examination
Examination Scheme:

Components	Class Assessment	End Term
Weightage (%)	50	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12181	IOT Application development on Cloud Lab	CO12181.1	3	2	3	3	2	2	3	-	2	-	-	2	3	1	3
		CO12181.2	2	3	2	2	2	1	3	-	2	3	3	3	3	2	3
		CO12181.3	3	3	3	2	3	3	3	-	3	-	-	3	3	3	3
		CO12181.4	1	1	3	2	3	2	3	-	2	3	2	3	3	2	3
		CO12181.5	1	3	3	1	2	2	3	-	3	2	2	1	2	1	3
		CO12181	2.0	2.4	2.8	2.0	2.4	2.0	3.0	-	2.4	2.67	2.33	2.4	2.8	1.8	3.0

1 = Weakly Mapped
2 = Moderately Mapped
3 = Strongly Mapped

SEMESTER VIII

CSE14164	Major Project	L	T	P	C
Version 1.0	**Contact Hours - 180**	**0**	**0**	**12**	**6**
Pre-requisites/Exposure	**Basic idea of the required subjects**				
Co-requisites					

Course Objectives

1. To be able to design, develop, document, and test software using current techniques.
2. To understand the fundamentals of computer architecture and computing theory.
3. To be able to solve problems working in group settings.
4. To demonstrate the ability to give presentations and write technical reports.
5. To demonstrate understanding of the importance of social and ethical issues related to the profession.

Course Outcomes

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

CO1**. Investigate** a real-world problem
CO2. **Utilize** the modern tools to solve the problems
CO3. **Take part in** a group to promote team spirit and leadership quality among the students
CO4. **Organize** projects involving both technological aspects and finance
CO5. **Identify** newer areas of in-depth study and research and lifelong learning

Catalog Description

The course encourages students to take project works that are based on current trends and technologies in various subjects, which will augment the theory subjects. The students will form a group to do their project work. This teaming is to encourage team spirit and to insist the importance of team work. The students typically undergo group formation, finalization of area of work, testing, generation and verification of results, and possible research publication procedure.

Course Content

The Evaluation of the project work are to be carried out in the following way:
1. In-depth study of a topic proposed by the supervisor
2. Continuous Evaluation through guide.
3. An open pre-submission seminar by the student.
4. End-semester University Examination (An open seminar followed by a Viva voce)

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Continious Assessment	ETE
Weightage (%)	**50**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CSE14164	Major Project	CO14164.1	3	3	2	3	3	3	2	-	3	-	-	1	1	2	3
		CO14164.2	2	3	2	2	1	1	2	-	1	-	-	1	3	2	3
		CO14164.3	2	1	3	2	3	2	3	-	3	3	-	1	2	2	3
		CO14164.4	2	2	1	3	1	3	3	-	1	-	2	2	1	3	3

		CO14164.5	1	3	3	2	1	2	1	-	1	-	-	2	3	1	2
		CO14164	2.0	2.4	2.2	2.4	1.8	2.2	2.2	-	1.8	3.0	2.0	1.4	2.0	2.0	2.8

1=weakly mapped

2= moderately mapped

3=strongly mapped

CSE15165	Comprehensive Viva Voce	L	T	P	C
Version 1.0		0	0	0	2
Pre-requisites/Exposure	Willing to knowledge acquisition				
Co-requisites	--				

Course Objectives

1. To Give an overview of emerging technology and relate to subject.
2. To enable students to improve their reasoning ability.
3. To give the students a outline of technical question.
4. To expound idea dissemination for a new technology by assessment of pupil knowledge.

Course Outcomes

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

CO1. **Interpret** the vital feature behind comprehensive viva.
CO2. **Analyse** the real-life scenario, based on viva question.
CO3. **Classify** effective team building for good software project analysis.
CO4. **Apply** logic of comprehensive viva in skill up gradation.

Catalog Description

The course tests the technical knowledge acquired during the study, spoken skills, and the ability to think logically under time pressure. The course proves extremely useful for placement interviews

Course Content

Scientific approach to resolve open end question, Theoretical Vs Practical exploration, in research paradigms, epistemology and ontology in management research, positivism vs. interpretivism, subjectivism vs. objectivism.

Foundations of confidence building in answering question, Categories of theory, theory building vs. theory testing, conceptualization and hypothesis testing. Analyze the conformity of the system to the functional requirements Appreciate importance of fundamental knowledge and its application.

Course Objective:

- To develop a problem and design the solution for the problem.
- To design and implement efficient algorithms for a specified application.
- To provide the ability to identify and apply the suitable algorithm for the given real world problem

Course Outcomes:

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

CO1. **Identify** the problem given and design the algorithm using various algorithm design techniques.

CO2. **Implement** various algorithms in a high level language
CO3. **Analyze** the performance of various algorithms.

CO4. **Compare** the performance of different algorithms for same problem.

Catalog Description:

Algorithmic study is a core part of Computer Science. This study caters to all possible applicable areas of Computer Science. This study includes observation, design, analysis and conclusion. Various types of algorithms have different notion of implementation according to their cost (in terms their time and space complexity). This study also includes refinement of one algorithm as per the applicability to real problems. Categorization of algorithms according to different method of design also includes in this course. It also compares the same algorithm using different algorithm design methods. For example, Knapsack problem can be solved in Greedy approach and Dynamic approach, both are optimization method. This course enables the students to think analytically while applying, designing an algorithm to solve a specific problem.

Course Content:

Experiment 1:

Implementation based on Divide and Conquer: Binary Search using Divide and Conquer approach, Quick sort and Merge Sort

Experiment 2:

Implementation based on Dynamic Programming : Implement all pair of Shortest path for a graph (Floyed-Warshall Algorithm), , Bellman Ford Algorithm and Implement Traveling Salesman Problem

Experiment 3:

Implementation based on Brunch and Bound :Implement 15 Puzzle Problem

Experiment 4:

Implementation based on Backtracking :Implement 8 Queen problem, Graph Coloring Problem, Hamiltonian Problem

Experiment 5:

Implementation based on Greedy method**:** Knapsack Problem and Job sequencing with deadlines, Minimum Cost Spanning Tree by Prim's Algorithm and Minimum Cost Spanning Tree by Kruskal's Algorithm

Experiment 6:

Implementation based on Graph Traversal Algorithm**:** Implement Breadth First Search (BFS) and Implement Depth First Search (DFS)

Text Books:

1. Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald L RivestAnd Clifford Stein, MIT Press/Mcgraw-Hill.

2 Fundamentals of Algorithms – E. Horowitz Et Al.

Reference Books:

- Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson.
- Algorithm Design: Foundations, Analysis, And Internet Examples, Second Edition, Michael T Goodrich And Roberto Tamassia, Wiley.
- Algorithms -- A Creative Approach, 3RD Edition, Udimanber, Addison-Wesley, Reading, MA.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination Examination Scheme:

Components	Continious Assessment	ETE
Weightage (%)	**50**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Course	Course	COs	P	P	P	P	P	P	P	P	P	PO	PO	PO	PS	PS	PS

Code	Name		O 1	O 2	O 3	O 4	O 5	O 6	O 7	O 8	O 9	10	11	12	O1	O2	O3
CSE15 165	Comprehe nsive Viva Voce	CO151 65.1	2	3	2	2	3	2	1	-	3	-	-	3	2	1	2
		CO151 65.2	3	2	3	2	2	3	1	-	2	-	-	2	1	3	1
		CO151 65.3	2	3	3	3	3	1	1	-	3	-	-	1	1	1	1
		CO151 65.4	1	3	2	3	3	2	2	-	1	-	-	1	1	3	2
		CO151 65	2. 0	2. 75	2. 5	2. 5	2. 75	2. 0	1. 25	-	2. 25	-	-	1.7 5	1.2 5	2.0	1.5

SPECIALIZATION COURSES